

POSTGRADUATE CURRICULUM (MD/MS/MDS)

2019



ALL INDIA INSTITUTE OF MEDICAL SCIENCES
BHUBANESWAR



FOREWORD



AIIMS Bhubaneswar started its first postgraduate courses in 2016 and followed the curriculum of AIIMS New Delhi. As there had been many innovations in medical education, the faculty believed that it was time to have a re-look at the curriculum and prepare one that is suited to the available facilities and infrastructure and take into account the gaps in the present postgraduate medical training so that they can be addressed. Hence began the long process of revising the existing curriculum.

The journey which started a year ago has been long and stormy at times. After a series of brainstorming sessions with faculty to agree on the general pattern, each department was requested to prepare a curriculum in keeping with a template, after comparing it with curricula from institutions within India and outside. Once this was done, the curriculum of each subject was sent to a subject consultant who then gave detailed feedback and comments on the content. Based on this the departments once again discussed what changes to make and include and what to delete. Then the compiled curriculum was sent to the members of the Board of Studies (BoS-PG) for PG subjects. The seven external members were well known medical educationists from various subjects who then gave their written recommendations after a meeting which was attended by the internal members of the BoS. Once the BoS-PG approved the curriculum it was put up for approval to the Academic Committee of AIIMS Bhubaneswar during its sixth meeting held on 17th March 2019. Once approved the curriculum was ratified by the Governing Body and Institute Body. This process, though time-consuming and lengthy allowed us to debate the changes being envisaged and prepare to make the change. I place on record my sincere thanks to all the subject experts and members of the BoS for so generously giving their time and expertise to go through the curricula and giving us feedback. I also appreciate the hard work put in by the faculty and the members of the Medical Education Unit of AIIMS Bhubaneswar in conducting the many sessions that were needed before the curriculum evolved into an acceptable document. I also hope that this curriculum will be revised every five years at least after getting feedback from all the stake-holders.

Any curriculum will be effective only if it is followed in letter and spirit. Unfortunately, postgraduate training programme to many faculty in many medical colleges is strictly 'learning by observation' kind of a process. We hope that this more structured approach will help students reach their learning goals easily, challenges their sense of curiosity to become life-long learners and enables them to become highly skilled professionals in their chosen subject.

Prof. (Dr) Gitanjali Batmanabane

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AIIMS, Bhubaneswar

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PGIMER, Chandigarh (Member)

Dr. Reba Kanungo
Professor of Microbiology,
PIMS, Puducherry (Member)

Dr. Manoj Kumar Mohanty
Professor & Head, Dept of FMT,
AIIMS, Bhubaneswar (Member)

Dr. Jayanta Kumar Mitra
Associate Professor of Anesthesiology,
AIIMS, Bhubaneswar (Member)

Dr. Somanath Padhi
Assistant Professor of Pathology & Laboratory
Medicine,
AIIMS, Bhubaneswar (Member)

Medical Education Unit, AIIMS, Bhubaneswar

Dr. Saurav Sarkar

Dr. Rituparna Maiti

Dr. Jayanta Kumar Mitra

Dr. Sweta Singh

Dr. Debapriya Bandopadhyay

Dr. Prabhas Ranjan Tripathy

Dr. Priyadarshini Mishra

Dr. Suravi Patra

Dr. Somanath Padhi

Dr. Vinaykumar Hallur

Dr. Mukund Namdev Sable

Dr. Ramadass Balamurugan

Dr. Upendra Hansda

Dr. Amit Kumar Satapathy

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INTRODUCTION

THE PROCESS FOLLOWED FOR THE REVISION OF PG CURRICULUM

Step 1: A draft regarding the format of the curriculum and uniform assessment method was made under the guidance of the Director and was circulated to all faculty by email and opinion was sought regarding the draft.

Step 2: All the opinions received from faculty members were collated and a meeting was called for open discussion on 13th September 2018.

Step 3: All the Heads of the Departments and faculty members who are in-charge of departmental PG academic activities attended the meeting under the chairmanship of the Director on 13.09.18. All points were discussed and final opinion was formed. The minutes of the meeting was prepared and signed by all the faculty members present in the meeting.

Step 4: All the departments were instructed to submit the PG Curriculum by 31st October 2018.

Step 5: The curriculum from various departments was distributed among the members of the Medical Education Unit for initial screening. If there was any deficiency, it was corrected by the individual department.

Step 6: A list of external evaluators for each subject was prepared and approval was taken from the Director.

Step 7: The curriculum was sent to the external experts for review and comments/suggestions were received.

Step 8: The suggestions/comments were communicated to the respective department and the final draft was submitted.

Step 9: The curriculum and the highlights of the changes were communicated to all the members of the Board of Studies, AIIMS-Bhubaneswar.

Step 10: The Board of Studies meeting for MD/MS/MDS course was held on 8th March 2019. The minutes of the meeting was circulated and the suggestions from the board members were incorporated into the curriculum.

Step 11: The agenda regarding the revision of PG curriculum was placed before the Standing Academic Committee and was approved in its 6th Meeting held on March 17, 2019, at AIIMS-Bhubaneswar.

Step 12: The revised curriculum was ratified by the Governing Body and Institute Body.

HIGHLIGHTS OF THE REVISED CURRICULUM

1. Compulsory written examination on Research Methodology & Biostatistics

- Timing: End of 2nd Semester
- Total marks: 100
- Will be considered as an internal examination.
- Candidate should pass (obtaining 50% marks) to appear in Final examination.
- No marks from this examination will be added to the final examination.
- Will be conducted by Examination Cell in the month of June & December.

It is to be noted that the Dean's office conducts a ~25 hours session on Research Methodology and Biostatistics for all newly admitted PG students in the month of March (for January session) and September (for July session) every year.

2. Internal Examination pattern

Theory and practical/clinical examinations will be held at specific intervals. The marks obtained will be added to the marks of the final (summative) examination.

Timeline: End of the 3rd, 4th and 5th semester, pre-final (2 months before final examination).

Marks distribution:

- Theory: 100 marks
- Practical: 100 marks (Clinical/ Experimental-70, viva-20, logbook-10)

The marks of the 4 internal examinations will be averaged to 100 each for theory and practical and will be added to the final examination.

3. Summative/Final Examinations:

- a. Theory:
- 4 papers (100 marks each)
 - Topic distribution to be made by the individual department.
- b. Theory question paper format:
- One Long question – 20 marks
 - Eight Short question/notes – 8 x 10 = 80 marks
- c. Total marks in theory: 500 marks
- 4 papers in the final examination – 400 marks
 - Average of 4 internal examinations – 100 marks
- d. Practical/clinical examination: Total marks: 500
- Practical/clinical and viva in the final examination – 400 marks
 - Average of 4 internal examinations- 100 marks
 - The format of the practical/clinical examination (400 marks) is as follows:

Part	Components	Marks allotted
Part A** 200 marks	Longcase (1)	100
	Short cases (2)	50
	OSCE/OSPE	50
Part B 200 marks	Operative procedure/Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

** Students should pass (secure 50% marks) separately in Part A

4. Final marking pattern

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

5. The decision related to passing marks:

- The student has to secure 50% marks in the internal examination to be eligible to appear for the final examination.
- In the final theory examination, a student should secure 50% marks (200 out of 400) to pass.
- In the final practical examination, a student has to secure 50% marks (100 out of 200) in part A of practical examination separately and overall 50% marks (200 out of 400).

6. Thesis Evaluation

- The student should submit the completed thesis 6 months before the final examination.
- Plagiarism check: If more than 20% plagiarism is detected, the student will be asked to re-write and re-submit. Plagiarism checking will be done through Turnitin Feedback Studio before the thesis is bound.
- The thesis will be sent to one external evaluator for approval.
- The external evaluator will be provided with an evaluation report form where the thesis will be evaluated as Accepted, Suggested modification and Rejected.
- If the thesis is accepted or some modifications are suggested, the comments of the evaluator will be intimated to the student and the guide for necessary correction/modifications. After modification, the thesis will be evaluated by an internal departmental committee for final approval.
- If the thesis is rejected, after necessary corrections, the thesis will be sent again to the evaluator for approval.
- Approval of the thesis is mandatory to appear for the final examination.

7. Eligibility for appearing in Final examination

Students will be allowed to appear in the final examination if

- Passed (secured 50% marks) in the examination on Research Methodology and biostatistics and

- Passed (secured 50% marks) in internal examinations and
- The thesis is submitted 6 months before final examination and
- The thesis is approved/accepted by an external evaluator.

8. Compulsory posting in the Emergency Medicine Department

All clinical departments will post their postgraduate students in the Department of Emergency Medicine.

9. Special training in other institutions

For special training, students may be sent to other institutions for training which is presently not available at AIIMS, Bhubaneswar. Depending on the type of training 1-2 months training may be undertaken without any financial implication (TA/DA/Training fee etc.) to the institute. The type of training and institute to be decided by the department after approval of the Director.

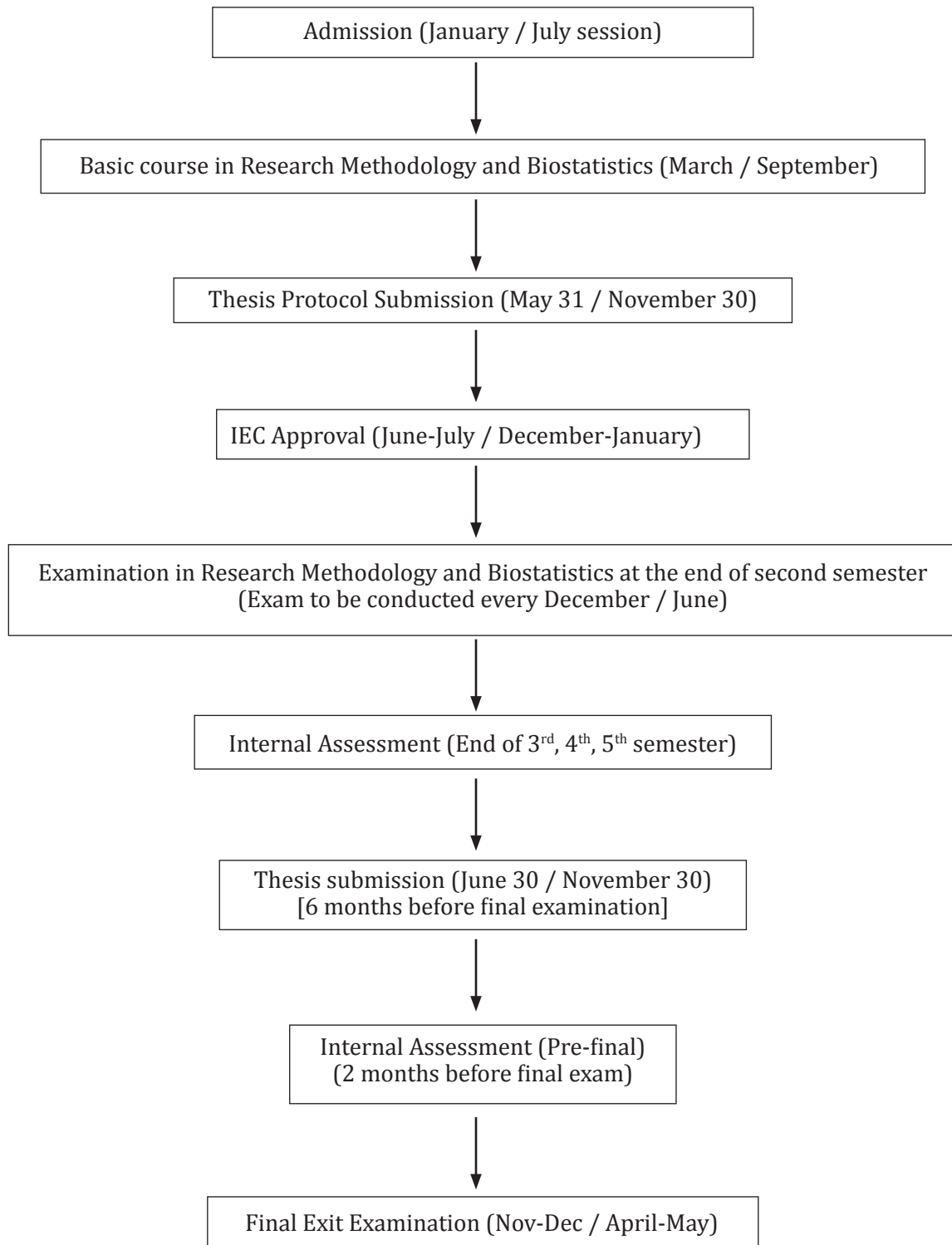
10. A period of 15 days sanctioned for attending academic activities

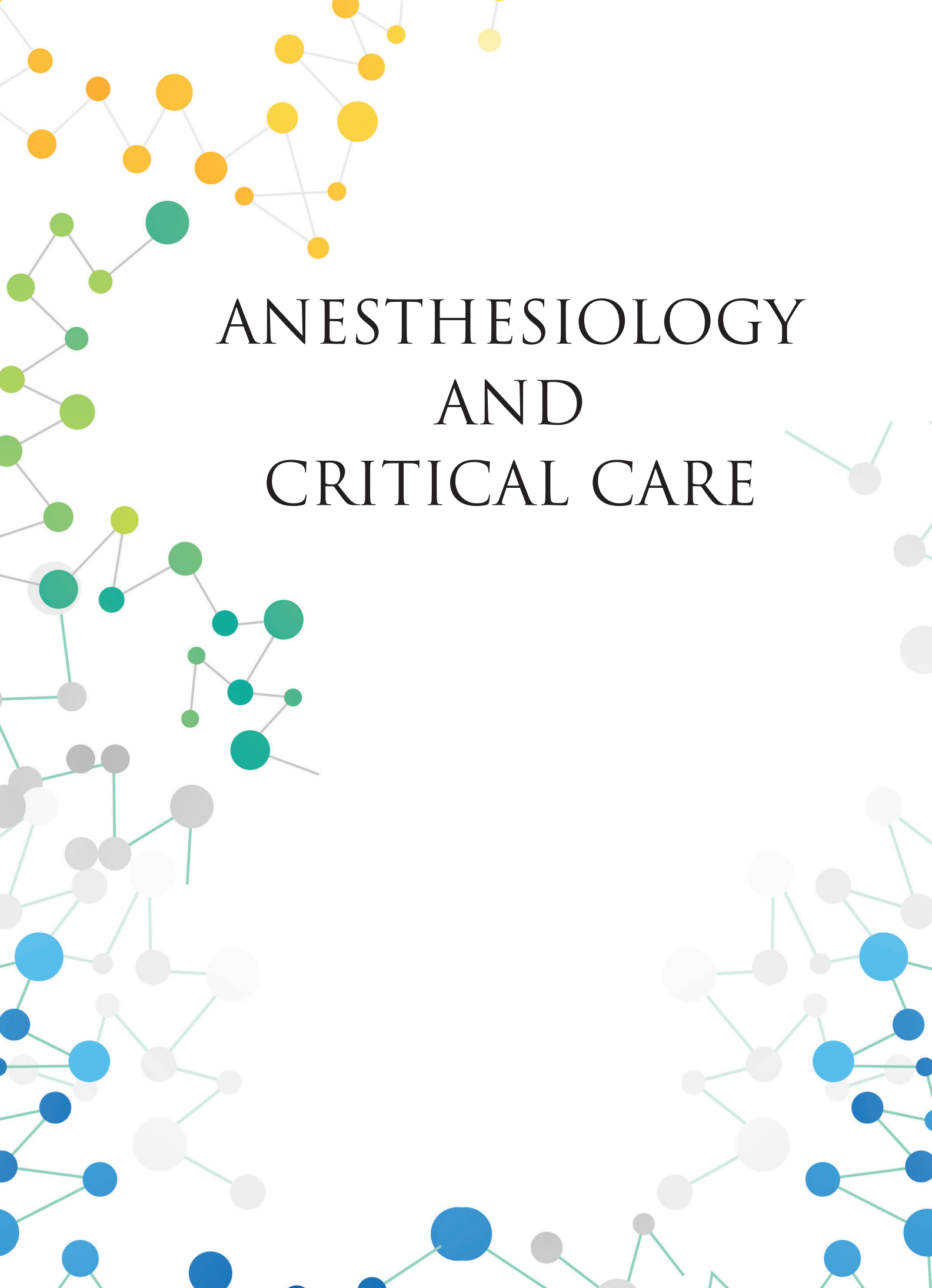
To promote research, improve networking and other academic competencies among postgraduate students, in addition to the existing leave (as per residency rule), all postgraduate students are allowed to attend conferences, workshops, any specialised training, CMEs etc., related to their fields for 15 days in the tenure of 3 years. These 15 days will be treated as on-duty and will be part of their postgraduate training. Prior permission has to be obtained.

11. Inclusion of Entrustable Professional Activities and skill assessment

To follow competency-based medical education, Entrustable Professional Activities (EPA) has been included in the curriculum and thus, the expected level of skills and supervision at a certain stage of training have been pre-defined. Some of the skills should be assessed on the patients and few on manikins during the internal examinations. EPA has been prepared by most of the departments by adaptation from the curriculum of MGM college and Research institute, Puducherry.

FLOW CHART FOR MD/MS/MDS COURSE





ANESTHESIOLOGY
AND
CRITICAL CARE

MD in Anesthesiology and Critical Care

COURSE NAME

MD in Anesthesiology and Critical Care

DURATION OF THE PROGRAMME

3 years

ELIGIBILITY CRITERIA

M.B.B.S.

PREAMBLE

An act of Parliament in 1956 established the All India Institute of Medical Sciences (AIIMS) as autonomous Institute of National importance at New Delhi. The act defined its objectives and functions. The subsequent amendment on 16th July 2012, established six new AIIMS in other states. The AIIMS, Bhubaneswar was established in 2012.

The prime goal of the Institute is to develop patterns of teaching in undergraduate and postgraduate medical education in all the branches of medicine so as to set a high standard of medical education and training in order to produce doctors who will practice medicine responsibly and ethically for the benefit of patients. This educational experience will be imparted in an atmosphere of research.

By virtue of the Act, all the Institutes grant their own medical degrees and other academic distinctions.

The degrees granted by the Institutes under the AIIMS Act are recognised medical qualifications for the purpose of the Indian Medical Council Act and, notwithstanding anything contained therein, are deemed to be included in the first schedule of that Act, entitling the holders to the same privileges as those attached to the equivalent awards from the recognized Universities of India respectively.

AIMS & OBJECTIVES

The aim of the programme is to create highly trained specialists endowed with knowledge and skills in the field of anaesthesia and perioperative medicine, pain and critical care.

At the end of successful completion of the programme, the trainee shall be able to practice anaesthesia independently, provide care to critically ill patients and manage acute and chronic pain.

The trainee shall have skills in teaching and training medical and paramedical students.

The trainee shall acquire knowledge of the basic principles of research methodology.

The trainee shall attend CMEs, conferences and workshops regularly and to update himself/herself on recent advances and developments in the field of Anaesthesia, perioperative medicine, pain and critical care.

The training programme shall have a special emphasis on attitude, empathy, behaviour, communication, presentation, audits, teaching and ethics.

The programme shall provide hands-on training in all fields of speciality and super speciality anaesthesia.

The trainees shall be supervised and guided by well-trained faculty throughout the programme.

The training programme shall focus on:

- a. Thorough knowledge of the pharmacokinetics and pharmacodynamics of anaesthetic drugs and adjuncts.
 - b. Knowledge of cardiovascular, respiratory, neurological, hepato-biliary, renal and endocrine homeostasis and related drugs as relevant to the patients undergoing anaesthesia.
 - c. Relevant anatomy and physiology.
 - d. A basic idea of the relevant physical principles involved in the construction and functioning of equipment used in anaesthesia and monitoring as well as knowledge of use of advanced monitoring as applied to perioperative and critical care.
 - e. Knowledge to attain expertise of the commonly used techniques in general, regional and local anaesthesia.
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- f. A clear-cut concept of unconsciousness and its implications.
 - g. Relevant knowledge about chronic intractable pain and its management.
 - h. Relevant knowledge to manage surgical and medical patients in the intensive therapy unit.
 - i. Relevant knowledge of medical statistics
 - j. Knowledge & expertise in cardiopulmonary resuscitation.

The trainee shall be encouraged to present his/her dissertation work in a national conference/CME and should aim for publication of the work after completion of the dissertation in a speciality journal of international repute.

M.D ANESTHESIOLOGY & CRITICAL CARE PROGRAMME (Contents of the Course)

THEORY

ANATOMY (including relevant developmental and applied anatomy)

Brain, cranial nerves, CSF, Meninges, blood supply and venous drainage

Orbit and its contents

Oral, nasal and pharyngeal anatomy

The Respiratory pathway

Mediastinum

- a. Pleura & lungs, tracheobronchial tree
- b. Pericardium & Heart
- c. Oesophagus
- d. Other relevant anatomy

Abdominal wall, cavity and peritoneum, hepatobiliary system, pancreas

Kidneys and the renal system

The vertebral column, spinal cord, sacrum, peripheral and spinal nerves and plexus

Autonomic and somatic nervous systems

Pain pathways (gate control theory and modulation of pain)

The thoracic inlet, the systemic venous system, aorta and its branches, diaphragm, intercostal spaces

PHYSIOLOGY

1. Respiratory physiology

- Oxygen transport
- Carbon-dioxide transport
- Alveolar diffusion
- Ventilation and dead space
- Static and dynamic lung volumes
- Spirometry
- Hypoxia and shunts
- Ventilation-perfusion relationships
- West zones of lungs
- Oxygen delivery and demand
- Alveolar gas equation
- Oxygen cascade
- Lung compliance
- Work of breathing
- Control of ventilation
- Pulmonary circulation
- Oxygen toxicity
- Ventilatory failure
- Airway reflexes
- Anaesthesia and the lungs

2. Cardiovascular physiology

- Cardiac cycle
- Cardiac muscle and action potential
- The electrocardiogram
- Cardiac output and its measurement
- Starling's law of the heart and its relevance in cardiac dysfunction
- Left ventricular pressure-volume loops
- Systemic circulation
- Arterial system
- Arterial pressure waveforms
- Capillaries and endothelium
- Venous system
- Venous pressure waveforms
- Lymphatic system
- Cardiovascular reflexes

-
- Valsalva manoeuvre
 - Exercise physiology

3. Neurophysiology

- Neuronal function
- Cerebrospinal fluid
- Blood-brain barrier
- Cerebral blood flow and venous drainage
- Intracranial pressure with relevance to Monroe-Kellie-doctrine
- Resting membrane potential
- Nerve action potential and propagation
- Synapses and the neuromuscular junction

4. Gastrointestinal physiology

- Swallowing reflex
- Stomach and vomiting
- Gastrointestinal digestion and absorption
- Liver anatomy and blood supply
- Pancreatic physiology and blood sugar homeostasis

5. Renal physiology

- Renal filtration and reabsorption
- Renal regulation of water and electrolyte balance
- Acid-base physiology

6. Blood and immune system

- Haemostasis & coagulation
- Anaemia and polycythaemia
- Reticuloendothelial system

7. Nervous system

- Autonomic and somatic nervous system
- Neuromuscular junction
- Spinal and peripheral nerves

8. Endocrine physiology

- Hypothalamus and pituitary
- Thyroid, parathyroid and adrenal
- Pancreatic physiology

- Maternal, fetal, neonatal, paediatric physiology
- Physiology of ageing

9. Environmental physiology

- Altitude
- Diving
- Temperature regulation and metabolism

10. Critical care physiology

- Starvation
- Stress response
- Health and the immune system
- Infection sepsis, deep vein thrombosis and pulmonary thrombo-embolism and concept of critical care bundles

PHYSICS

- Temperature and heat
- Pressure measurement
- Humidity and measurement of gas flow
- Oscillometry
- Principles of laminar and turbulent flows
- Bernoulli's principle
- Venturi and Coanda effect
- Gas laws
- Diffusion, osmosis and solubility
- Measuring gas and vapour concentrations
- Vaporizers
- Medical gas supplies
- Breathing systems and ventilation
- Optics and oximetry
- Capnometry
- Raman effect
- Spectrometry
- Blood flow measurement
- Equipment management
- Basics of Radiation, MRI, X-ray and Computed Tomography
- Cautery machine

- Defibrillators
- Heating devices
- Infusion pumps
- Pressure transducers
- Ultrasonography and echocardiography

PHARMACOLOGY

- Basic principles
- Drug passage across the cell membrane
- Absorption, distribution, metabolism and elimination
- Drug interaction
- Isomerism
- Pharmacokinetics & dynamics
- Core drugs in anesthetic and critical care practice
- General anaesthetic agents
- Intravenous induction agents
- Inhalational anaesthetics
- Analgesics (opioids, non-opioids)
- Local anaesthetics
- Muscle relaxants and anticholinesterases
- Vasopressors
- Vasodilators
- Adrenoceptor antagonists
- Anti-arrhythmic
- Antihypertensive
- Antiemetics & prokinetics
- Intravenous fluids (crystalloids, colloids)
- Diuretics
- Antimicrobials
- Drugs affecting coagulation (anticoagulants, antiplatelets and antifibrinolytics)
- Drugs used in Diabetes (OHA, INSULIN)
- Corticosteroids and other hormone preparations

STATISTICS

- Types of Data - Data Collection, Data Presentation

- Inferential Statistics
- Probability, odds ratio, risk ratio, hazard ratio, the relative risk
- Parametric vs. non-parametric data
- Normality of distribution
- Absolute and relative risk reduction
- The number needed to treat (NNT)
- Null and Alternate Hypothesis
- Statistical tests
- Methods for selecting appropriate statistical tests
- Randomisation (simple & block)
- Blinding
- Allocation concealment
- P VALUE
- Confidence interval
- Propensity Scores
- Logistic regression
- Meta-regression
- Variance and covariance
- PRISMA
- CONSORT
- GRADE
- Systematic reviews
- A meta-analysis (forest plot, funnel plot)
- Registration of trials

Patient assessment, preoperative preparation, and anaesthetic management

- Natural history, aetiology, diagnosis, treatment and management of complications of:
- COPD, Asthma, Pneumonia, ARDS, Respiratory failure
- Pulmonary hypertension
- Congestive heart failure
- Coronary artery disease
- Hypertensive, valvular, cyanotic heart diseases
- Arrhythmias

- Cardiomyopathies
- Coagulation disorders
- Thromboembolic diseases
- Cerebrovascular diseases
- Intracranial tumours
- Raised ICP
- Spinal cord injury
- Myasthenia gravis
- Epilepsy
- Renal failure (acute & chronic)
- Electrolyte imbalance
- Acid-base disorder
- Liver failure
- Portal hypertension
- Cirrhosis of liver
- Obesity and endocrine disorders
- Pregnancy
- Understanding of the disease process, natural evolution and knowledge of influence on the management in the preoperative period
- Effect of anaesthetic agents on the physiology of major systems
- Treatment of the above diseases in order to optimize the patient before Anaesthesia and surgery with proper consultation from different specialities
- Pharmacology and interaction of perioperative drugs
- Fasting guidelines
- Airway assessment

INTRAOPERATIVE PATIENT CARE AND ANAESTHESIA TECHNIQUES

- Physics and clinical measurement (Behaviour of fluids (gases and liquids); the flow of fluids; measurement of volumes, flows, and pressures; measurement of temperature; humidification; oximetry; analysis of gases; capnography; electrical safety; fires and explosions)
- Equipment and apparatus (Equipment design and standards; gas supply; anaesthesia delivery system, including pressure valves and regulator;

vaporizer; breathing system; devices to maintain the airway such as laryngoscopes, endotracheal tubes, tracheostomy tubes, face masks, airway devices; information systems)

- Minimum monitoring standards and additional monitoring when appropriate (including central venous pressure, invasive arterial pressure, cardiac output monitoring, cerebral function, coagulation, blood gas analyses, point-of-care ultrasound and urinary output)
- Planning and physical layout of operating rooms, post-anaesthesia recovery room and intensive care units; lighting; safety; infection and pollution control in operating rooms; sharps policies
- Principles of safety such as lifting and positioning patients
- Conduct and maintenance of anaesthesia
- Management of the airway and intraoperative complications
- Applied cardiac and respiratory physiology
- Routine inhalation and intravenous inductions
- Application of mechanical ventilation including one-lung ventilation
- Appropriate use of anaesthesia delivery systems
- Applied pharmacology and variability in drug response
- Appropriate use of muscle relaxants, neuromuscular blockade monitoring
- Application and interpretation of monitored variables
- Fluid management, including blood replacement therapy
- Common regional anaesthesia techniques (epidural and spinal anaesthesia and upper/lower limb blocks)
- Maintenance of accurate record

Postoperative patient care and acute pain management

Transport to PACU (Post Anaesthesia Care Unit) or ICU: a) Positioning/Transportation of the patient b) Oxygenation and ventilation c) Monitoring and care of venous and arterial lines d) Standard

PACU monitoring as well as other non-invasive and invasive modalities

PACU scoring systems for care and discharge e.g. Aldrete score, PADS.

Airway: a) Extubation- criteria for postoperative extubation b) Maintenance of patent oral and nasal airway c) Airway complications: stridor/laryngospasm, airway obstruction

Breathing: a) Postoperative respiratory physiology b) Residual neuro-muscular block c) Postoperative respiratory depression d) Modes of ventilation and weaning from the ventilator in the postoperative period when required e) Respiratory complications: hypoxia, hypercarbia, bronchospasm; atelectasis; aspiration pneumonia; pulmonary oedema, pneumothorax.

Circulation: a) Fluid and electrolyte management b) Arrhythmias c) Postoperative ischemia d) Hemodynamic complications: the shock of different aetiologies, sepsis, hypertension e) Resuscitation, transfusion and coagulation disorders f) Oliguria and renal failure

Postoperative pain treatment a) Pre-emptive multimodal analgesia b) Pain assessment: VAPS (Visual Analogue Pain Scale) c) Pharmacology of opioids, NSAIDs (Non Steroidal Anti-Inflammatory Drugs), local anaesthetics, alpha-2 agonists d) PCA (Patient Controlled Analgesia), advantages of one pain relief delivery system over another, of specific doses, rates and details of these delivery systems e) Regional anaesthesia and analgesia in pain management f) Paediatric postoperative pain treatment g) Knowledge of side-effects and complications of regional techniques (PDPH, nerve damage)

Postoperative Nausea and Vomiting (PONV) a) Physiology b) Management (Pharmacology- and treatment) Haemorrhage (Postoperative bleeding) Postoperative hypothermia, delirium and altered mental status, TURP syndrome

Hazards of patient positioning(nerve damage).

Care of critically ill Trauma and Burn Victims

- Epidemiology, diagnosis and treatment of pre and in-hospital critical medical emergencies
- Epidemiology, diagnosis and treatment of trauma patients Diagnostic/therapeutic principles in emergency medicine
- Algorithms in basic, advanced, trauma and pediatric life support
- Rapid Response Systems
- Pain therapy for emergency trauma victims e.g Flail chest.
- Basic and advanced treatment of acute poisonings and intoxications
- Basic and advanced treatment of burns, including advanced medications and pain management including recent concepts like virtual reality
- Pre and inter-hospital transport
- Code blue and other codes including for mass disasters and other hospital exigencies
- Hyperbaric treatment

Multidisciplinary intensive care

- Airway management and respiratory support including non-invasive techniques
- Hemodynamic management including advanced cardiovascular monitoring and inotropic and vasoactive therapy
- Fluid and electrolyte support including relevant aspects of blood product transfusion
- Renal replacement therapy
- Neurological management
- Enteral and parenteral nutritional support
- Infectious diseases and antibiotic therapy; antiviral therapy; rules for hospital hygiene
- Prevention of complications such as thromboembolism, ventilator associated injuries, stress ulceration, renal failure and nosocomial infection
- Transportation

-
- Sedation and pain management including treatment of delirium and anxiety of the critically ill patient using both pharmacologic and non-pharmacologic means
 - Appropriate knowledge and use of use scoring systems (SOFA; APACHE; SAPS; TISS; NEMS) Aetiology, pathophysiology, diagnosis and treatment plans according to international standards of specific critical conditions:
1. Acute circulatory failure
 2. Cardio-respiratory arrest
 3. Cardiac arrhythmias
 4. Ischemic heart disease
 5. Cardiomyopathy
 6. Valvular heart disease including endocarditis
 7. Pulmonary embolism
 8. Anaphylaxis
 9. Respiratory failure (ALI / ARDS)
 10. Pulmonary oedema
 11. Airway obstruction and stenosis
 12. Pneumothorax
 13. Aspiration pneumonia
 14. COPD and Asthma
 15. Renal failure Chronic and acute (RIFLE)
 16. Gastrointestinal failure
 17. Ileus
 18. The peritonitis of various aetiologies (including colitis and intestinal ischemic disease)
 19. Pancreatitis
 20. Liver failure
 21. Delirium and Coma
 22. Cerebro-vascular diseases
 23. Cerebral oedema
 24. Increased intracranial pressure
 25. Brain stem death
 26. Seizures
 27. Guillain Barré syndrome and Myasthenia gravis
 28. Trauma Head/Face injury and spine injury
 29. Airway and chest injuries
 30. Aortic injuries
 31. Abdominal trauma
 32. Pelvic and long bone injuries
 33. Massive transfusion
 34. Burns and electrocution
 35. Near-drowning
 36. Hyper- and hypothermia
 37. Inflammatory diseases
 38. SIRS/MODS
 39. Sepsis including sepsis bundle strategy
 40. Severe community-acquired infections (e.g. meningitis)
 41. Severe nosocomial infections (e.g. MRSA)
 42. Fungal infections
 43. Endocrine and metabolic disorders Diabetes mellitus and insipidus
 44. Thyroid disorder
 45. Pheochromocytoma
 46. Malnutrition
 47. Coagulation disorders DIC
 48. Transfusion reaction
 49. Obstetric complications: HELLP syndrome, Pre-eclampsia and eclampsia, Septic abortion, Amniotic fluid embolism
 50. Intoxications
- Obstetric Anesthesiology**
- Physiological and anatomical changes associated with a normal pregnancy
 - Physiology of labour and delivery
 - Foetal and placental physiology and pathophysiology
 - Placental transfer
 - Feto-maternal circulation
 - The effects of pharmacologic agents and anaesthetic techniques on uterine blood flow and foetal development (Embryology and teratogenicity)
 - Neonatal physiology and neonatal resuscitation
-

-
- Apgar score and neuro-adaptive scores and their prognostic significance
 - Obstetric management of labour (normal and abnormal)
 - The pain of labour and pain pathways
 - Tocolytic therapy
 - Indications and contra-indications of local anaesthetic use in obstetrics
 - Regional anaesthetic techniques in obstetrics: Neuraxial use of opioids in obstetrics
 - Methods of analgesia during labour: indications and contraindications (Psychological methods, complementary methods, systemic analgesia, epidural, combined spinal-epidural, paracervical and pudendal nerve blocks and continuous spinal anaesthesia)
 - Complications of central neuraxial anaesthesia - hypotension, post-dural puncture headache, total spinal block, neurological complications, backache, central nervous system infections, spinal and epidural hematomas
 - General anaesthesia in obstetrics
 - Airway management in the parturient
 - Medical disease and pregnancy: Pre-eclampsia/eclampsia, HELLP, Fatty liver of pregnancy and liver disease, Gestational diabetes, Heart disease, Neurological diseases, Obesity, Bleeding disorders, Thyroid diseases, Substance abuse, Immunological diseases, Renal diseases
Anaesthetic care of the high-risk obstetrical patient, including trauma
 - Anaesthetic management of complications: Obstetric haemorrhage: (Antepartum, peripartum and postpartum), pulmonary embolism, amniotic fluid embolism, foetal death
 - Cardiopulmonary resuscitation and advanced cardiac life support of the parturient
 - Post-operative pain management in obstetrics
 - Maternal medications and breastfeeding
 - Anaesthesia for non-obstetric surgery during pregnancy
 - Anaesthesia for assisted reproductive technologies Intrauterine and neonatal surgery
 - Maternal mortality
- ### **Pediatric Anesthesiology**
- Risk factors relevant to morbidity and mortality in paediatric anaesthesia e.g. prematurity
 - Anatomy relevant to airway management and breathing, circulation and regional anaesthesia
 - Physiology of respiration, circulation, fluid balance and thermoregulation
 - Pharmacology of anaesthetic agents, analgesics, neuromuscular blocking agents and common paediatric medications and their variations with the child's age
 - General principles of perioperative management relevant to children emphasizing: Common childhood illnesses and their influence on anaesthesia and surgery
 - Fasting guidelines
 - Fluid and electrolyte replacement
 - Temperature control
 - Laboratory issues (haemoglobin, blood glucose, coagulation testing)
 - Specialized equipment
 - Perioperative monitoring
 - Congenital and acquired bleeding disorders
 - Dosage and administration of emergency drugs
 - Postoperative apnoea detection and management
 - Recognition of postoperative problems (PONV, Emergence delirium, post-extubation stridor, hypothermia)
 - Acute and chronic pain management
-

- Important diseases and syndromes that may affect the management of anaesthesia, such as Respiratory infections, Asthma, Prematurity and its complications, Facial anomalies affecting the airway
- Neonatal emergencies (respiratory distress; tracheo-oesophageal fistula; congenital diaphragmatic hernia; abdominal wall defects)
- Cerebral palsy and seizures, muscular and neuromuscular diseases
- General principles of paediatric intensive care and paediatric emergency medicine, including resuscitation of the neonate, infant and child and general principles of the management of the neonate and the premature baby

Neuroanaesthesiology

- Neuroprotection
- Diuretics, hypotensive agents, corticosteroids, anticonvulsants
- Clinical measurement and monitoring: Cerebral blood flow, intracranial pressure and cerebral perfusion pressure, transcranial Doppler, BIS and other depth of anaesthesia monitoring
- Cerebral metabolism
- Electrophysiological monitoring (EEG and evoked potentials)
- Sedation and ventilatory support
- Management of intracranial hypertension
- Principles of anaesthesia and perioperative care of patients for Supratentorial surgery, Posterior fossa surgery, Pituitary Surgery, Epilepsy and movement disorder surgery, awake craniotomy, Craniofacial and craniofacial surgery, aneurysms and AVMs, spinal surgery, including emergency cord decompression
- Paediatric neurosurgery including ventriculoperitoneal shunts and Omayya reservoirs
- Anaesthesia for neuroimaging and interventional procedures
- Induced hypotension

- Hypothermia
- Sitting position and air embolism
- Anaesthesia and intensive care for patients with a head injury

Cardiothoracic Anesthesiology

- General principles of perioperative anaesthetic and surgical management relevant to cardiac surgery patients emphasizing: aetiology, pathophysiology and clinical presentation of cardiovascular diseases requiring cardiac surgery
- Hemodynamic monitoring including echocardiography, cardiac output measurement, ST-segment analysis, arrhythmia monitoring
- Specialized equipment such as cardiac pacemakers, defibrillators, mechanical assist devices for circulation (intra-aortic balloon pump), cardio-pulmonary bypass or extracorporeal membrane oxygenation
- Physiology of lung perfusion and ventilation in various patient positions (e.g., lateral decubitus) and principles of hypoxic pulmonary vasoconstriction
- Various techniques of lung isolation and methods of confirmation of isolation
- Anaesthetic management of thoracotomy, thoracoscopy, sternotomy, mini-sternotomy
- Postoperative pain control, including risk factor evaluation for post-thoracotomy pain (thoracic epidural analgesia and alternatives).
- Specific intra- and postoperative complications including management of CPB emergencies (air in inflow cannula, oxygenator failure, pump failure)
- Management of cardiopulmonary bypass including coagulation management, understanding of CPB and common diseases (CABG, Valve replacement/repair and congenital cyanotic and cyanotic heart diseases)
- Understanding the principles of Vascular surgery including aneurysms, dissections and open vs. endovascular repair principles

- Anesthesiology in remote locations / Ambulatory Anesthesiology
- Apart from knowledge, skills and attitudes required for anaesthesia practice, residents are expected to have additional specific knowledge in:
- Procedures requiring anaesthetic management outside the OT, e.g., radiology, nuclear medicine, endoscopy, cath labs, dentistry, ECT
- Pharmacology of anaesthetic agents suitable for short procedures (rapidly acting agents, including opioids, sedative-hypnotics, volatile anaesthetics and muscle relaxants)
- Safety standards required for the practice of anaesthesia in remote locations
- Safety standards required for transport of patients to and from remote locations
- Typical clinical and organizational problems associated with anaesthesia outside the OT: distant airway and vascular access
- Specific complications associated with sedation (airway obstruction, apnoea)
- Principles of safety during x-ray, nuclear medicine and MRI/CT procedures

Pain Management (Pharmacological & Non-Pharmacological methods)

- a. Pharmacological methods: Knowledge on the mechanisms, effects, clinical use, routes (non-invasive and invasive), doses, and drug interactions, of the following drugs and adjuvants: Opioids, Non-steroidal anti-inflammatory drugs (NSAIDs) and antipyretic analgesics, antidepressants and anticonvulsants, local anaesthetics and glucocorticoids, gabapentinoids and other miscellaneous agents
- b. Multimodal or balanced analgesia
- c. Patient-controlled analgesia
- d. Non-pharmacological methods: interventional procedures including nerve blocks and neurolysis

PRACTICAL/CLINICAL SKILLS

Patient assessment based on history and physical examination, use of appropriate examinations and laboratory tests

Evaluation of the preoperative ASA physical status

Interpretation of:

- a. Electrocardiogram, and other methods assessing cardiovascular function (echocardiography)
- b. Pulmonary function test and arterial blood gas analysis
- c. Common radiological testing with special emphasis on chest X-ray
- d. Coagulation testing
- e. Liver and renal function test
- f. Endocrine function
- g. Hematology
 - Selection and planning of the anaesthesia technique, including monitoring and other equipment required for the procedure
 - Accurate perioperative record keeping
 - Rapid sequence induction
 - Maintenance of adequate airway including learning the art and skills of endotracheal intubation and other airway management devices
 - Basic and advanced life support
 - Aseptic techniques
 - Peripheral and central venous access for volume resuscitation and central venous pressure monitoring, arterial catheterization for invasive arterial blood pressure monitoring and arterial blood gas analysis
 - Regional anaesthesia techniques: neuraxial and peripheral nerve blocks
 - Trouble-shooting and managing complications in the OTs, ICUs and remote areas, e.g management of intraoperative allergic reaction, hypotension, hypoxia, cardiac arrest, cannot intubate cannot ventilate scenarios etc.

Research

- Information search and literature review
- Proposing a hypothesis; research design, bias and appropriate methods of measurement; data collection and storage; good record keeping
- Common statistical tests and application of statistics relevant to the project; Interpretation of results
- Monitoring of studies and post-study surveillance
- Responsibilities of Institutional Review Board/independent ethics committee, and of the investigator to the ethics committee; ethical principles
- Principles of writing a scientific paper, and of oral or poster presentation of a paper
- Principles of evidence-based medicine (including levels of evidence)
- The process of obtaining funding and writing a basic grant application

ASSESSMENT

Examination on Research Methodology & Biostatistics

Timing: End of 2nd Semester

Total marks: 100

Will be considered as an internal examination

Candidate should pass to appear in Final examination

No marks will be added to final/summative examination

Will be conducted by Examination Cell in the month of June & December

Internal Examinations

Timeline: End of the 3rd, 4th and 5th semester, pre-final (2 months before final examination).

Marks distribution:

Theory 100 marks, and practical with viva and logbook will carry 100 marks

(Practical – 70, viva – 20, logbook – 10).

The marks of the 4 internal examinations will be averaged to 100 each for theory and practical.

Summative/Final Examinations:

a. Theory: 4 papers (100 marks each)

PAPER-1 Basic science as applied to Anaesthesia.

PAPER-2 Practice of Anaesthesia: Anaesthesia in relation to systemic and medical diseases.

PAPER-3 Sub specialities/Super specialities Anaesthesia

PAPER-4 Intensive care medicine, pain management, recent advances

b. Theory question paper format:

- One Long question – 20 marks
- Eight Short question/notes – 8 x 10 = 80 marks

c. Total marks in theory: 500 marks

- 4 papers in the final examination – 400 marks
- Average of 4 internal examination – 100 marks

d. Practical examination

- Practical examination: Total marks: 500 (Practical and viva in the final examination – 400 marks and an average of 4 internals- 100 marks).

Station 1- Anaesthesia drugs, emergency drugs, i.v. fluids

Station 2- ECG, CXR, ABG, PFT, Capnographs etc.

Station 3- Anaesthesia machine and Anaesthesia equipment

Station 4- Biostatistics, critical appraisal of a research paper published in the journal, research methodology, non-technical skills.

The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A* 200 marks	Long case (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

* Students should pass (secure 50% marks) separately in Part A

Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 months before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

THESIS

Every postgraduate student shall carry out an assigned research project under the guidance of eligible faculty of the Department of Anaesthesia.

The department thesis committee shall allot guide and co-guides to each postgraduate student within one month of joining of the trainee resident into the postgraduate programme at AIIMS, Bhubaneswar.

The thesis protocols should be submitted to the Research Cell and Institute Ethics Committee for approval, following which the postgraduate trainee should start the research assignment.

The assigned research project shall be written up and submitted in the form of a thesis.

The work for writing the thesis will be aimed at

contributing to the development of the spirit of enquiry, exposing the postgraduate trainees to research, critical analysis, and literature search and to get acquainted with research methodology and good clinical practices.

The thesis shall be submitted 6 months before final theory examination.

A post-graduate trainee shall be allowed to appear for final examination only after the acceptance of the thesis by the department and the external reviewer.

In case of rejection of the thesis, the candidate shall modify the thesis as per the instructions of the external reviewer and re-submit it for acceptance.

RECOMENDED BOOKS

1. Andrew J Davey LSIF, Ali Diba BMF. Ward's Anaesthetic Equipment: Elsevier Health Sciences; 2012.
2. Barash PG, Cullen BF, Stoelting RK, Cahalan M, Stock MC. Clinical Anesthesia: Wolters Kluwer Health; 2011.
3. Butterworth JF, Wasnick JD, Mackey DC. Morgan and Mikhail's Clinical Anesthesiology, 6th edition: McGraw-Hill Education; 2018.
4. Chang DW. Clinical Application of Mechanical Ventilation: Cengage Learning; 2013.
5. Chestnut DH, Wong CA, Tsen LC, Kee WDN, Beilin Y, Mhyre J. Chestnut's Obstetric Anesthesia: Principles and Practice E-Book: Elsevier Health Sciences; 2014.
6. Cottrell JE, Young WL. Cottrell and Young's Neuroanesthesia: Elsevier Health Sciences; 2016.
7. Davis PJ, Cladis FP. Smith's Anesthesia for Infants and Children E-Book: Elsevier Health Sciences; 2016.
8. Dorsch JA. Understanding Anesthesia Equipment: Wolters Kluwer Health; 2012.
9. Gropper MA, Miller RD, Eriksson LI, Fleisher LA, Wiener-Kronish JP, Cohen NH, et al. Miller's Anesthesia, 2-Volume Set E-Book: Elsevier Health Sciences; 2019.
10. Hennessey I, Japp A. Arterial Blood Gases Made Easy: Elsevier; 2016.
11. Hensley FA, Martin DE, Gravlee GP. A Practical Approach to Cardiac Anesthesia: Wolters Kluwer Health; 2012.
12. Hines RL, Marschall KE. Stoelting's Anesthesia and Co-existing Disease: Elsevier; 2018.
13. Irwin RS. Irwin and Rippe's Intensive Care Medicine: Wolters Kluwer Health; 2017.
14. Kaplan JA, Augoustides JGT, Manecke GR, Maus T, Reich DL. Kaplan's Cardiac Anesthesia: For Cardiac and Noncardiac Surgery: Elsevier; 2017.
15. Marino PL, Sutin KM. The ICU Book: Wolters Kluwer Health; 2012.
16. Neal JM, Salinas FV, Tran DQH, Mulroy MF. A Practical Approach to Regional Anesthesiology and Acute Pain Medicine: Wolters Kluwer; 2017.
17. Shafer SL, Rathmell JP, Flood P. Stoelting's Pharmacology and Physiology in Anesthetic Practice: Wolters Kluwer Health; 2015.
18. Thaler MS. Only EKG Book Ever Need: Wolters Kluwer Law & Business; 2018.
19. West JB, Luks A. West's Respiratory Physiology: The Essentials: Wolters Kluwer; 2016.
20. Yao FSF, Fontes ML, Malhotra V. Yao and Artusio's Anesthesiology: Problem-Oriented Patient Management: Wolters Kluwer Health; 2012.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASIC SCIENCE AS APPLIED TO ANESTHESIA

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe various physiological changes of pregnancy. (5)
Describe in detail about fetomaternal circulation. (5)
Mention about placental transfer of drugs and its implication for anesthesia. (10)
2. With the help of a diagram, discuss the physiology of neuromuscular junction. (10)
3. Describe the anatomy of the larynx. Describe with the help of diagram, various positions of vocal cords in recurrent laryngeal nerve injury. (5+5)
4. Describe the anatomy of coronary arteries. Mention the factors that influence coronary blood flow. (5+5)
5. With the help of the diagram describe the anatomy of brachial plexus. Describe the various techniques of brachial plexus block. (5+5)
6. Define intracranial pressure (ICP) and mention its normal value. What are the factors that affect ICP intracranial pressure and describe methods applied to control raised ICP? (3+7)
7. Describe end-tidal capnography. Describe its uses in anaesthesia and critical care. (5+5)
8. Discuss about evolution of anesthesia machines. Explain the basic design of a modern anesthesia machine with diagram. (3+7)
9. Describe the principle of plethysmography. Describe about Beer-Lambert law. (7+3)

PAPER 2

PRACTICE OF ANESTHESIA: ANESTHESIA IN RELATION TO SYSTEMIC AND MEDICAL DISEASES

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Classify types of heart block. (5)
Classify types of pacemakers. (5)
A 60-yr-year-old patient with DDD permanent pacemaker is posted for TURP surgery. Describe the anaesthetic management. (10)
2. Describe the various causes of perioperative hypoxemia. Describe about high oxygen flow devices and its use. (5+5)
3. 3year old child with respiratory distress and cough is scheduled for bronchoscopy for suspected foreign body aspiration .Discuss your anesthesia plan and post -operative concerns. (10)
4. 60year old man, known case of chronic obstructive lung disease presented with acute intestinal obstruction. Discuss the anesthetic management for emergency laparotomy. (10)

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5. 30 year old male with BMI of 35 is scheduled to undergo Laparoscopic cholecystectomy. Discuss your plan of anesthesia. (10)
 6. Describe the various air way management options for a patient with temporo mandibular joint (TMJ) ankylosis scheduled for condylectomy of the temporo mandibular joint. Mention about awake flexible bronchoscopy guided intubation and its role in anticipated difficult airway scenarios. (5+5)
 7. Describe perioperative fasting guideline. How will you modify your anesthesia plan for patient with full stomach? (3+7)
 8. 50yr male, known diabetic for 10 years on Insulin therapy is scheduled to undergo below knee amputation. Discuss about the various anesthetic options? How will you manage blood glucose preoperatively in this patient? (5+5)
 9. 32 year, female with mediastinal mass scheduled for thoracoscopic surgery. Mention about preoperative assessment, preparation and conduct of anesthesia for this patient. (10)

PAPER 3

SUB SPECIALITIES/SUPER SPECIALITIES ANESTHESIA

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. 7day old child is referred from a peripheral centre with complaints of choking on breast feeding. He is diagnosed to have tracheo esophageal fistula(TEF)
 - a) Classify types of Tracheo esophageal fistula. (5)
 - b) Discuss the role of bronchoscopic assessment in tracheo esophageal fistula. (5)
 - c) Describe in detail about anaesthetic management of this child posted for repair of the TEF. (10)
 2. 70 year old male, is found unresponsive after one episode of seizure in the post-operative care unit. He has undergone TURP under spinal anesthesia. How will you manage this patient? (10)
 3. 28 year old female has undergone elective Caesarean section. She is hypotensive and bleeding heavily per vagina. How will you manage this case? (10)
 4. 35 year old male with unsteady gait, head ache and vomiting is diagnosed to have a posterior fossa tumour. He is scheduled to undergo craniotomy in sitting position. Discuss in detail about the anesthetic management of this patient. (10)
 5. Discuss the anaesthetic management of a 2-year-old child for cleft lip& palate repair. (10)
 6. 65 year old chronic smoker, posted for thoracoscopic emphysematous bullectomy. Discuss the perioperative preparation and intra operative management. (10)
 7. With the help of diagram, explain the basic design of cardiopulmonary bypass (CPB) circuit. Mention the complications of cardiopulmonary bypass. (5+5)
 8. Describe the Glasgow Coma scale. Describe anaesthetic considerations for the patient with traumatic brain injury for an emergency craniotomy. (3+7)
 9. 68 year old male diagnosed to have cancer colon. He is anaemic and cachectic. He is scheduled to undergo laparoscopic hemi colectomy. How will you prehabilitate this patient? Describe ERAS and plan of anesthesia for this patient. (3+7)
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PAPER 4

INTENSIVE CARE MEDICINE, PAIN MANAGEMENT & RECENT ADVANCES

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Plan total parenteral nutrition for a 60 kg patient with extensive resection of the small bowel. (10)
Discuss about the role of micronutrients in critically ill patients. (5)
What modification in diet you will suggest for a difficult to wean patient? (5)
2. What is the role of hypertonic saline in head injury? Compare it with Mannitol for management of raised intracranial pressure. (5+5)
3. Describe various modes of ventilation for a patient with acute respiratory distress syndrome. (10)
4. 45 year old female is diagnosed with cancer gall bladder. She is in severe pain and referred to you for pain management. Discuss your plan of action. (10)
5. Describe in brief about continuous renal replacement therapy (CRRT).Mention various types of CRRT and its use in critically ill patients. (5+5)
6. Describe spinal cord stimulation for chronic back pain. Mention its indications and complications. (5+5)
7. Write a short note on left ventricular assist device (LVAD). What are the perioperative concerns for patient with LVAD? (5+5)
8. Describe the neurocognitive impacts of anesthesia on children. Mention in brief about few important trials on the above subject. (5+5)
9. Write a note on anesthetic considerations for telerobotic surgery. (10)

YEAR-WISE ENTRUSTABLE PROFESSIONAL ACTIVITIES

S. NO	EPA	COMPETENCY DOMAINS							LEVEL OF COMPETENCY					MSF
		MK	PC	PBLI	SBP	P	ICS	DAY1 OF RESIDENCY	END OF 1 ST YR	END OF 2 ND YR	END OF 3 RD YR			
1	History taking and general physical examination	+	+	+	+	+	+	II	III	IV	IV	IV	S,P,I,PG	
2	Formulating a differential diagnosis based on history and examination	+		+				II	III	IV	IV	IV	S,I	
3	Ordering and interpretation of common diagnostic tests	+	+		+			II	III	IV	IV	IV	S,I	
4	Entering and discussing orders and prescriptions and giving necessary instructions to the patients	+	+				+	I	III	IV	IV	IV	S, I, P	
5	Document clinical detail in the patient records		+		+			II	III	IV	IV	IV	S, I, PG	
6	Clinical presentation of a case	+		+		+	+	II	III	IV	IV	IV	S, I	
7	Using evidence-based medicine to improve patient care	+		+				I	II	III	IV	IV	S, I, PG	
8	Give or receive a patient handover to transition care responsibility	+			+			I	II	III	IV	IV	S, I, PG, H	
9	Participating efficiently as a member of an inter professional team				+		+	I	III	IV	IV	IV	S,I,PG,H	
10	Diagnosing conditions requiring emergency care and providing primary care	+	+	+	+			I	II	III	IV	IV	S, I	
11	Obtain informed consent for test and/or procedures	+	+			+	+	I	III	IV	IV	IV	S,I,P	
12	Performing general medical/ surgical procedures	+	+	+		+	+	I	II	III	IV	IV	S, I	
13	Identifying system failure and taking appropriate corrective measures	+	+	+	+	+	+	I	II	III	IV	IV	S, I	

S. No.	EPA	COMPETENCY DOMAINS						EXPECTED LEVEL OF COMPETENCY					MSF
		MK	PC	PBLI	SBP	P	ICS	DAY 1 OF RESIDENCY	END OF 1 ST YEAR	END OF 2 ND YEAR	END OF 3 RD YEAR		
PREOPERATIVE													
14	Pre-operative assessment, Preparation and Anaesthesia care plan for ASA I and II patients	+	+	+	+	+	+	I	III	IV	IV	IV	S,I
15	Pre-operative assessment, Preparation and Anaesthesia care plan for ASA III and IV patients.	+	+	+	+	+	+	I	II	III	IV	IV	S,I
16	Take an informed written consent		+	+	+	+	+	I	III	IV	IV	IV	S,I
.INTRAOPERATIVE													
REGIONAL ANAESTHESIA													
17	Spinal anaesthesia	+	+	+				I	II	IV	IV	IV	S,PG,H
18	Epidural anaesthesia	+	+	+				I	II	III	IV	IV	S,PG,H,I
19	Peripheral nerve blocks	+	+	+				I	II	III	III	III	S,PG,H
GENERAL ANAESTHESIA													
20	Management of a normal airway (mask ventilation & intubation)	+	+	+				I	II	IV	IV	IV	S,PG,I
21	Management of an anticipated difficult airway	+	+	+				I	II	III	III/IV	III/IV	S,I
22	Conduct of general anaesthesia in ASA I patient.	+	+	+	+		+	I	II	IV	IV	IV	S,I,PG
23	Fluid balance	+	+	+				I	II	III	IV	IV	S
24	Monitoring	+	+	+				I	II	III	IV	IV	S,PG,I,H
25	Conduct procedural sedation	+	+	+				I	II	IV	IV	IV	S,I

S. No.	EPA	COMPETENCY DOMAINS						LEVEL OF COMPETENCY				MSF
		MK	PC	PBLI	SBP	P	ICS	DAY1 OF RESIDENCY	END OF 1 ST YR	END OF 2 ND YR	END OF 3 RD YR	
VASCULAR ACCESS												
26	Cannulation of a central venous catheter	+	+	+				I	II	IV	III	S,I
27	Cannulation of an intra-arterial catheter	+	+	+				I	II	III	IV	S,I
POSTOPERATIVE												
28	Assessment and discharge from PACU	+	+				+	I	III	IV	IV	S,I,H
29	Planning and execution of postoperative pain management	+	+		+		+	I	II	IV	IV	S, I, PG
CRITICAL CARE												
30	Assessment and Resuscitation of a critically ill patient.	+	+		+		+	I	II	III	IV	S,I
31	Defining a care plan for a critically ill patient.	+	+		+			I	II	III	III	S,I, PG
32	Initiation of mechanical ventilation	+	+	+				I	II	III	IV	S,I
33	Care of patient on mechanical ventilation	+	+	+	+		+	I	II	IV	IV	S,I,PG,H

Competency Domains:

MK: Medical Knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I

The background features a complex network of interconnected nodes and lines, resembling a molecular or biological structure. The nodes are represented by circles of various sizes and colors, including yellow, green, teal, grey, and blue. The lines connecting them are thin and light grey or teal. The overall composition is abstract and scientific, with the central text 'ANATOMY' prominently displayed in a black serif font.

ANATOMY

MD in Anatomy

COURSE NAME

MD in Anatomy

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

GOAL

The broad goal of the MD Anatomy course aims at preparing postgraduate students by providing comprehensive training in to equip them for teaching Anatomy and carrying out related research.

Competencies: At the end of the three years post-graduate training Programme in Anatomy the student should be able to:

1. Demonstrate in-depth knowledge of the structure of the human body from the gross to the molecular level and correlate it with the functions.
2. Elucidate the principles underlying the structural organization of the body and provide anatomical explanations for disturbed functions.
3. Express adequate knowledge of basic principles of normal growth and differentiation. Explain critical periods of human growth and development as well as ontogeny of all the organ systems of the body. Analyse the congenital malformations; describe the etiological factors including genetic mechanisms involved in abnormal development and their effects on functions.
4. Demonstrate comprehensive knowledge of the basic structure and correlate functions of the nervous system in order to understand the altered state in the various disease processes.
5. Plan and implement teaching programmes for undergraduate medical students. Be familiar with and be able to use different teaching

methods and modern learning resources for under-graduate teaching. Plan and conduct evaluation of undergraduate teaching.

6. Demonstrate an attitude of scientific enquiry and explain contemporary research techniques. Be familiar with recent scientific advances, identify lacunae in the existing knowledge in a given area and be able to plan investigative procedures for research, analyse data critically and derive logical conclusions.

TEACHING & LEARNING METHODS

During the course, students have formal teaching and are trained for teaching and research.

I. DIDACTIC TEACHING

Topics in gross anatomy, microanatomy, embryology, neuroanatomy, histochemistry and genetics, along with related practical sessions.

II. TRAINING

Communication skills – Journal club, seminars and micro-teaching.

Hands-on experience-Techniques in microanatomy, neurohistology, gross anatomy, embryology, histochemistry, genetics, and microscopy.

Teaching experience- Taking undergraduate classes, demonstrations and practicals.

Educational technology- Preparation of AV aids for teaching, posters/manuscripts for presentation in conferences/workshops and publication in journals.

Setting questions – SAQs, MCQs & OSPE.

Prepare teaching modules & museum specimens, casts. Participation in organizations of symposia/workshops.

III. RESEARCH

Thesis – progress monitoring every semester, work presentation and submission at the end of 2 ½ years.

Presenting a paper/poster at conferences/
Preparing manuscripts for documentation/
publication.

IV. EVALUATION OF TRAINING

Written exam (Theory) /practical assessment
every semester. Feedback on teaching/training
programmes.

COURSE CONTENT

SECTION – 1

Gross Anatomy, History of Anatomy, Comparative
Anatomy & Evolution.

COURSE CONTENT

Anatomy of the entire body – Structure in detail
and its functional correlation.

Seminars, written assignments, group discussions
on selected topics on regional anatomy.

PRACTICALS

1. Dissection of the entire body.
2. Anatomical techniques: Fixation and
preservation of dead bodies, preparation of
museum specimens, preparation of bones,
preparation of corrosion casts and plastination.

SECTION – 2

Developmental Anatomy, Histology, Immunology
and Genetics

A. DEVELOPMENTAL ANATOMY

COURSE CONTENT

Gametogenesis, fertilization, implantation and
placenta, early human embryonic development,
general embryology, development of organ
systems and associated common congenital
abnormalities, physiological correlations of
congenital anomalies.

PRACTICAL

Models, specimens as well as ultrasonography
features of human development and slides of
embryos to correlate avian and mammalian

early development with human development.
Specimens of congenital malformations.

B. HISTOLOGY AND HISTOCHEMISTRY

COURSE CONTENT

1. Cell Biology:
 - a. Cytoplasm – Cytoplasmic matrix, cell
membrane, cell organelles, cytoskeleton,
cell inclusions, cilia and flagella.
 - b. Nucleus – nuclear envelope, nuclear
matrix, DNA and other components of
chromatin, protein synthesis, nucleolus,
nuclear changes indicating cell death.
 - c. Cell cycle, mitosis, meiosis, cell renewal.
Cellular differentiation and proliferation.
2. Tissues of Body: Light and electron
microscopic details and structural basis of
function, regeneration and degeneration.
3. The systems/organs of the body – Cellular
organization, light and electron microscopic
features, structure-function correlations
and cellular organization.

PRACTICAL

Preparation of tissues for histological
sections, light microscopy and its application,
histological staining-routine & special, electron
microscopy and its applications, identification
of normal and abnormal organelles in electron
micrographs, three-dimensional interpretation
and artefact identification.

C. IMMUNOLOGY

COURSE CONTENT

Immune system and the cell types involved
in the defence mechanism of the body.
Gross features, cytoarchitecture, function,
development and histogenesis of various
primary and secondary lymphoid organs in
the body. Biological and clinical significance
of the major histocompatibility testing.
Molecular hybridization and PCR technology in
immunology research particularly mechanism
of antigen presentation, structural and

functional relevance of the T cell receptor, genetic control of the immune response, the molecular basis of susceptibility to disease.

PRACTICAL

Techniques of DNA preparation, electrophoresis and Southern blot hybridization.

D. GENETICS

COURSE CONTENT

1. Human Chromosomes – Structure, number and classification, methods of chromosome preparation, banding patterns. Chromosome abnormalities, Autosomal & Sex chromosomal abnormalities and syndromes, Molecular genetics and Cytogenetics.
2. Single gene pattern of inheritance: Autosomal & Sex chromosomal pattern of inheritance, Intermediate pattern and multiple alleles, Mutations, Non-Mendelian inheritance, Mitochondrial inheritance, Genomic imprinting, parental disomy.
3. The multifactorial pattern of inheritance: Criteria for a multifactorial inheritance, Teratology, Structure of gene, Molecular Screening, Cancer Genetics and Pharmacogenetics.
4. Reproductive Genetics – Male and Female Infertility, Abortuses, assisted reproduction, Preimplantation genetics, Prenatal diagnosis, Genetic Counselling, Ethics and Eugenics.

PRACTICALS

DNA Isolation from peripheral blood lymphocytes, Polymerase Chain Reaction (PCR), Fluorescence in -situ Hybridization (FISH), Chromosomal Analysis.

SECTION – 3

Neuroanatomy and Recent Advances.

COURSE CONTENT

Structural and functional organisation of the nervous system and development of the nervous system. Neurons and neuroglia, Somatic

sensory system, olfactory and optic pathways, Cochleovestibular and gustatory pathways, Motor pathways, Central autonomic pathways, Hypothalamo-hypophyseal system, cross-sectional anatomy of the brain and spinal cord.

Recent advances in medical sciences which facilitate comprehension of structure-function correlation and applications in clinical problem-solving.

PRACTICALS

Identification of structures in sections of the brain stem and spinal cord at different levels. Staining nervous tissue using Nissl's staining. Discussions on clinical problems related to neurological disorders and anatomical explanation for the same.

SECTION - 4

Applied Anatomy, Biostatistics and Research Methodologies.

COURSE CONTENT

Clinical correlation of structure and function of the human body. Anatomical basis and explanations for clinical problems. Application of knowledge of human development, microanatomy, neuroanatomy to comprehend deviations from normal.

A. BIOSTATISTICS

- Basic principles and concepts of biostatistics applied to health sciences.
- Parametric and non-parametric data.
- Mean, median, mode, standard deviation, standard error, analysis of variance, correlation coefficient, Chi-square tests and t-tests.

B. RESEARCH METHODOLOGIES

- Categories of Research
- Classification of studies:
- Observational studies: Descriptive, Analytical (Case-control, Cohort etc.)
- Experimental or interventional studies (Randomised controlled trials or clinical trials, Community interventional studies or Field trials)

- Advantages and disadvantages of each study
- Determination of sample size, selection of cases and matching
- Data Analysis
- Hypothesis testing
- Interpretation of data
- Ethics in research

Entrustable Professional Activities (Year wise)

An Entrustable Professional Activity is a key task of discipline (i.e. speciality or subspecialty) that an individual can be trusted to perform in a given health care context, once sufficient competence has been demonstrated. (Vide Page No. 39)

Departmental Training schedule & posting of residents:

Parent Department: 2 years 9 months

Dissection skills in whole-body dissection and Foetal Autopsy	All through the course
Museum and other preservation techniques (Preparation of Bone, Museum specimens, plastination and embalming)	6 Months
Microscopy (Histology slides staining by H/E and other special) stains, interpretation	6 Months
IHC Lab (IHC technique)	6 Months
Anthropometry	6 Months
Radiology (Interpret basic X-ray, USG, CT, MRI)	5 Months
Embryology (Embryology models and slides) and Genetics	5 Months

Teaching: Independently taking lectures class, Dissection Practical, Demonstration, Tutorial

Presenting Paper in Seminar and Conferences

Design a project for research

Logbook to be maintained and monitored periodically

Allied departments- If required: 3months

Pathology	1 Month
Radiology	1 Month
FMT (autopsy)	1 Month

ASSESSMENT

MD ANATOMY EXAMINATIONS

Final examination at the end of the course has a theory, practical and viva-voce.

THEORY

Paper-I: Gross Anatomy with evolution and Comparative Anatomy. Gross Anatomy with its functional Anatomy.

Paper-II: Microscopic Anatomy, Developmental Anatomy and Genetics.

Paper-III: Neuroanatomy including development and microscopic structure

Paper-IV: Applied Anatomy.

PRACTICAL AND VIVA

1. Histological techniques, identification and interpretation of microscopic structure in tissues of the body.
2. Slides, specimens of developmental anatomy, genetics, neuroanatomy to assess comprehensive knowledge in these areas.
3. Viva-voce on gross anatomy, living anatomy, sectional anatomy and neuroanatomy, developmental anatomy.

Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

Internal Examinations

- Examination on Research Methodology & Biostatistics at the end of the 2nd semester.
- Internal examination at end of 3rd, 4th & 5th semester and 2 months before the final examination.

Summative Examination

- a. Theory – Paper I-IV, Question paper format given below
- b. Theory question paper format:
 - One Long question – 20 marks
 - Eight Short question/notes – 8 x 10 = 80 marks

c. Total marks in theory: 500 marks

- 4 papers in the final examination – 400 marks
- Average of 4 internal examination – 100 marks

d. Practical examination

- Practical examination: Total marks: 500 (Practical and viva in the final examination – 400 marks and an average of 4 internals-100 marks)
- The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A** 200 marks	Longcase (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

** Students should pass (secure 50% marks) separately in Part A

RECOMMENDED BOOKS

1. Cunningham DJ, Robinson A. Cunningham's Manual of Practical Anatomy: Creative Media Partners, LLC; 2018.
2. Decker G, Du Plessis D. Lee McGregor's Synopsis of Surgical Anatomy, 12Ed: Taylor & Francis; 1986.
3. Eroschenko VP, di Fiore MSH. DiFiore's Atlas of Histology with Functional Correlations: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2013.
4. Grant JCB, Basmajian JV, Slonecker CE. Grant's Method of Anatomy: A Clinical Problem-solving Approach: Williams & Wilkins; 1989.
5. Ham AW, Cormack DH. Ham's histology: Lippincott; 1987.
6. Hollinshead WH. Anatomy for Surgeons: Head and neck: Hoeber-Harper; 1954.
7. Jorde LB, John C. Carey MDMPH, Bamshad MJ. Medical Genetics: Elsevier Health Sciences; 2015.
8. Junqueira LC, Carneiro J. Basic Histology: McGraw-Hill; 2002.
9. Kierszenbaum AL, Tres L. Histology and Cell Biology: An Introduction to Pathology : Elsevier Health Sciences; 2019.
10. Moore KL, Dalley AF, Agur AMR. Clinically Oriented Anatomy: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2013.
11. Moore KL, Persaud TVN. The Developing Human: Clinically Oriented Embryology: Saunders; 2003.
12. Moore KL, Persaud TVN, Torchia MG. Before We Are Born: Essentials of Embryology and Birth Defects: Elsevier Health Sciences; 2015.
13. Mueller RF, Young ID, Emery AEH. Emery's Elements of Medical Genetics: Churchill Livingstone; 2001.
14. Parent A. Carpenter's Human Neuroanatomy: Williams & Wilkins; 1996.
15. Robert L. Nussbaum MDFF, McInnes RR, Willard HF. Thompson & Thompson Genetics in Medicine: Elsevier Health Sciences; 2015.
16. Sadler TW. Langman's Medical Embryology: Wolters Kluwer; 2015.
17. Sinnatamby CS. Last's Anatomy: Regional and Applied: Churchill Livingstone/Elsevier; 2011.
18. Snell RS. Clinical Neuroanatomy: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2010.
19. Standring S. Gray's Anatomy: The Anatomical Basis of Clinical Practice: Elsevier Health Sciences; 2015.
20. Wineski LE. Snell's Clinical Anatomy by Regions: Wolters Kluwer Health; 2018.
21. Young B, Woodford P, O'Dowd G. Wheater's Functional Histology: A Text and Colour Atlas: Elsevier Health Sciences; 2013.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

GROSS ANATOMY WITH EVOLUTION AND COMPARATIVE ANATOMY & FUNCTIONAL ANATOMY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the fibrous skeleton of heart and discuss its applied importance. (20)
2. Write briefly on: (8 x 10 = 80)
 - a) Describe the mechanism of Scapulo-humeral rhythm.
 - b) Describe the surgical anatomy of vascular segmentation of liver.
 - c) Describe the constrictors of pharynx and write a note on mechanism of deglutition.
 - d) Discuss the blood supply of femur with its clinical importance.
 - e) Discuss the peritoneal recesses in abdominal cavity with its clinical significance.
 - f) Describe the menisci of knee joint with its applied anatomy.
 - g) Describe the evolutionary adaptation of human hand.
 - h) Discuss the anatomy of urogenital diaphragm including its clinical significance.

PAPER 2

MICROSCOPIC ANATOMY, DEVELOPMENTAL ANATOMY AND GENETICS

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the process of formation and sequential development of the heart tube. Add a note on the genes controlling cardiac development. (20)
2. Write briefly on: (8 x 10 = 80)
 - a) Describe the microstructure of developing bone.
 - b) Discuss the contractile mechanism of smooth muscle.
 - c) Discuss the microstructure Portal acinus (Rappaport's lobule).
 - d) Discuss the principles of Tissue fixation in microscopy.
 - e) Fluorescence In situ hybridisation (FISH) technique.
 - f) Discuss the Feto-placental unit and add a note on its clinical significance.
 - g) Describe the microstructure of thymus and add a note on Blood thymic barrier.
 - h) Discuss the Epidermal proliferative unit with its clinical significance.

PAPER 3

NEUROANATOMY INCLUDING DEVELOPMENT AND MICROSCOPIC STRUCTURE

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Give the functional classification of cranial nerve nuclei. Mention the afferent & efferent connections of the nuclei of the vagus nerve. (20)
2. Write briefly on: (8 x 10 = 80)
 - a) Discuss the White fibres of the cerebrum and add a note on its functions.
 - b) Discuss the molecular regulation of Neural tube development and add a note on neural tube defects.
 - c) Describe the mechanism of neural control of urinary bladder with applied anatomy.
 - d) Describe the various connections of the nucleus of tractus solitarius
 - e) Discuss the course and branches of posterior inferior cerebellar artery (PICA) and add a note on PICA thrombosis.
 - f) Describe the mechanism of Hydrocephalus and add a note on its consequences.
 - g) Discuss the Cerebellar circuit and add a note on its applied importance.
 - h) Draw and discuss the ascending and descending tracts of the spinal cord.

PAPER 4

APPLIED ANATOMY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Define and classify stem cell and discuss their clinical applications. (20)
2. Write briefly on: (8 x 10 = 80)
 - a) Discuss the walking cycle and add a note on gait disturbances.
 - b) Discuss the applied anatomy of hepatic segmentation.
 - c) Describe the supports of uterus and add a note on prolapse of uterus.
 - d) Discuss the surgical anatomy of inguinal canal and add a note on types of Inguinal hernia.
 - e) Discuss the Portocaval anastomosis and add a note on portal hypertension.
 - f) Discuss the Bursae around the knee joint add a note on its clinical significance.
 - g) Discuss the anatomy of Brachial plexus and add a note on brachial plexus injuries
 - h) Scalenus anterior syndrome-its anatomical basis.

DEPARTMENT OF ANATOMY, AIIMS, BHUBANESWAR.
ENTRUSTABLE PROFESSIONAL ACTIVITIES (EPA) FOR M.D. ANATOMY

S. No.	EPA	Competency Domain				Level of Competency			MSF
		MK	PBLI	P	ISC	End of I year	End of II year	End of III year	
1	Perform whole body dissection.	*	*	*	*	L II	L IV	L V	S, PG, I
2	Identify human bones and demonstrate knowledge of age and sex in the medicolegal application of Anatomy.	*	*	*	*	LII	L IV	L V	S, PG, I
3	Perform embalming of a cadaver and handle cold storage facilities.	*	*	*	*	LII	L IV	L V	S, PG, I
4	Prepare museum specimens and be familiar with other preservation techniques including plastination etc.	*	*	*	*	LII	L IV	L V	S, PG, I
5	Retrieve and prepare bones from cadavers.	*	*	*	*	LII	L III	L IV	I, PG, S
6	Perform tissue processing for histological study.	*	*	*	*	L I, II	L III	L IV	S, PG, I, H
7	Perform section cutting on a microtome and be familiar with stropping/honing of microtome knives.	*	*	*	*	L I, II	L III	L IV	S, PG, I, H
8	Perform routine Haematoxylin and Eosin staining.	*	*	*	*	LI	LII	LIII	S, PG, I, H
9	Perform special staining of tissues of the body for histological studies.	*	*	*	*	LI	LII	LIII	S, PG, I, H
10	Perform immuno-histochemistry techniques.	*	*	*	*	LI	LII	LIII	S, PG, I
11	Conduct small groups sessions for undergraduate students (MBBS, BSc - Nursing and Paramedical)	*	*	*	*	L I, II	LIII,	L IV	S, PG, I, UG

S. No.	EPA	Competency Domain					Level of Competency			MSF
		MK	PBLI	P	ISC	End of I year	End of II year	End of III year		
12	Conduct large groups sessions for undergraduate BSc (Hon) Nursing and Paramedical students	*	*	*	*	L I	L I	L II	S, PG, I, UG	
13	Do critical appraisal of journal articles.	*	*	*	*	L II	L III	L IV	S, PG, I	
14	Be familiar with indications and interpretation of ancillary techniques like Karyotyping, FISH, PCR, electron microscopy.	*	*	*	*	L I, II	L III	L IV, V	I, PG, S, H	
15	Use Anthropometry tools for research and be familiar with anthropological traits.	*	*	*	*	L I, II	L III	L IV, V	I, PG, S	
16	Interpret radiology images including basic X-rays, USG, CT, and MRI.	*	*	*	*	L I, II	L III	L IV, V	I, PG, S, H	
17	Interpret Embryology models, charts and slides.	*	*	*	*	L I, II	L III	L IV, V	I, PG, S	
18	Interpret Genetic and pedigree charts for the pattern of inheritance.	*	*	*	*	L I, II	L III	L IV, V	I, PG, S	
19	Demonstrate thorough knowledge of Biomedical Waste disposal.	*	*	*	*	L IV	L IV	L IV	S	
20	Demonstrate knowledge of surface Anatomy of important structures and correlate with living Anatomy.	*	*	*	*	L II	L IV	L V	S, PG, I	
21	Present a paper in seminar or conference.	*	*	*	*	L I, II	L III	L IV	I, PG, S	
22	Discuss research methodology, data interpretation and calculation.	*	*	*	*	L I, II	L II	L II	S	
23	Demonstrate the use of multimedia for teaching/ learning in Anatomy.	*	*	*	*	L I, II	L II	L II	S	
24	Be familiar with the basics principles of teaching-learning methodology like learning objectives, TL activity and assessment.	*	*	*	*	L I, II	L II	L II	S	

Competency Domains:

MK: Medical Knowledge

PBLI: Practice-Based Learning
and Improvement

P: Professionalism

ICS: Interpersonal &
Communication Skills

**: applicable*

Levels of competence:

Level I: Knowledge only; can
observe

Level II: Can do under strict
supervision

Level III: Can do under loose
supervision

Level IV: Can do independently

Level V: Has expertise to teach
others

Multisource feedback (MSF):

Supervisor: S

Undergraduate students: UG

Self: I

Peers: PG

Other health professionals: H

The background features a complex network of interconnected nodes and lines, resembling a molecular structure or a data network. The nodes are represented by circles of various sizes and colors, including yellow, green, teal, grey, and blue. The lines connecting them are thin and light grey. The overall composition is abstract and scientific, with the nodes and lines scattered across the page, creating a sense of depth and connectivity.

BIOCHEMISTRY

MD in Biochemistry

COURSE NAME

MD Biochemistry

DURATION OF THE COURSE

3 years

ELIGIBILITY

MBBS

PREAMBLE AND GOAL

The MD Biochemistry degree students should have the basic concepts and recent advancements in the subjects along with skills and expertise in various laboratory techniques pertaining to metabolic and molecular aspects of medicine. Training in research methodology shall be the basic integral component. The MD degree training shall endow the skills to plan and implement teaching methodologies for medical and allied health science courses, to become an effective teacher. He/she should be equipped to set up / manage a diagnostic laboratory, generate, evaluate and interpret diagnostic laboratory data to contribute to patient care and apply this knowledge in solving various clinical problems. The MD course should impart the skills to plan and carry out research projects and publish the results.

OBJECTIVE

MD training programme in Biochemistry should impart competencies in the following areas, as detailed below :

- 1. Acquisition of Knowledge:** Understand the concepts and principles of Biochemistry and apply this knowledge to explain molecular processes in health and disease states as well as demonstrate his/her understanding of principles of various laboratory estimations, instrumentations and rationale underlying biochemical laboratory investigations. Apply basic principles of Biostatistics for research work
- 2. Acquisition of skills:** The student should acquire skills of biochemical laboratory

investigations with basic concepts of quality control to ensure reliable diagnostic facilities by delivering optimum investigative support for patient care services. The student should be able to provide clinicians with consultation services for diagnostic tests in biochemistry and in the interpretation of laboratory results.

- 3. Teaching:** The student should acquire skills pertaining to teaching undergraduate students in medicine and allied health science courses so that he/she becomes a competent healthcare professional, an effective teacher and is able to contribute to both undergraduate teaching and postgraduate training.
- 4. Research:** The student should be able to carry out a research project from planning to publication applying the basic concepts of research methodology, biostatistics, with sound knowledge of scientific writing and publication ethics.

SUBJECT-SPECIFIC COMPETENCIES

Cognitive domain

1. Describe and apply biochemical principles to explain the normal state, abnormal disease conditions and mechanism of action used in the perception, diagnosis, and treatment of diseases.
 2. Explain energy transactions in a living system, and describe the importance of biomolecules in sustaining the life process.
 3. Describe pathways of the intermediary metabolism along with their individual and integrated regulation and apply that in understanding the functioning of the body.
 4. Describe and apply the concept of nutrition in health and disease, micro- and macro nutrition and essential nutrients, and interlinks of nutrients with metabolism and functions of a living system.
 5. Apply and integrate the knowledge of molecular and metabolic conditions in normal and disease states for clinical problem solving and research.
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6. Acquire knowledge on the application of various aspects of genetic engineering in medicine.
 7. Acquire knowledge and apply the principle of statistics, biostatistics, and epidemiology to the evaluation and interpretation of molecular and metabolic disease states.
 8. Evaluate, analyze and monitor disease states by applying relevant biochemical investigations and interpreting the clinical and laboratory data.
 9. Able to integrate principles of immunology in biochemistry.
 10. Demonstrate knowledge of basics of research methodology, develop a research protocol, analyze data using currently available statistical software, interpret results and disseminate these results (through peer-reviewed publications in scientific journals)
 11. Describe the principles of teaching-learning technology towards application and take interactive classroom lectures, prepare modules for problem-based learning (PBL), organize and conduct PBL sessions, case discussions, small group discussions, seminars, journal club, and research presentations
 12. Demonstrate knowledge of principles of instrumentation.
 13. Demonstrate knowledge about recent advances and trends in research in the field of biochemistry.
3. Demonstrate empathy and respect towards all patients and their families
 4. Demonstrate respect in interactions with peers, and other healthcare professionals.
 5. Demonstrate ethical behaviour and integrity in one's work.
 6. Demonstrate effective use of nutrition, lifestyle and genetic counselling.
 7. Be aware of the cost of diagnostic tests and the economic status of patients.
 8. Acquire skills for self-directed learning to keep up with developments in the field and to continuously build to improve on skills and expertise.

Psychomotor domain

1. Able to select, justify, and interpret the results of clinical tests in biochemistry.
2. Develop a differential diagnosis for molecular and metabolic causes of diseases based on the results of laboratory investigations and clinical presentations
3. Perform important and basic biochemical, immunological and molecular biology techniques.
4. Demonstrate the ability to develop standard operating procedures for methods and techniques routinely done in a clinical biochemistry laboratory.
5. Demonstrate skills in the presentation of a research paper at journal clubs and conferences.
6. Demonstrate the ability to adequately document all routine activities in a biochemistry laboratory as per the requirements and standards of the National Accreditation Board for Testing & Calibration Laboratories (NABL).
7. Demonstrate adequate pedagogical skills for lectures, small-group discussions, and seminars
8. Demonstrate skills to search the scientific literature to obtain accurate, reliable and up-

Affective domain

1. Demonstrate an understanding of the role of biochemical testing and diagnostic service in the management of disease conditions Ability to effectively explain to patients, from a variety of backgrounds, the molecular and metabolic basis of disease states and lifestyle modifications.
2. Communicate biochemical reasoning effectively with peers, staff and faculty, and other members of the health care team.

to-date information using PubMed or any other software to search scientific literature.

9. Demonstrate skills to write a research proposal, dissertation and/or a manuscript for publication of research findings in peer-reviewed scientific journals.
10. Demonstrate an ability for ethical scientific writing without indulging in plagiarism.

COURSE CONTENT

- General biochemistry, General Principles of biochemical techniques .
- Enzymology, Bioenergetics, Metabolism, Human nutrition. Macro and Micronutrients and Hormones.
- Molecular biology, Immunology and Cancer.
- Clinical Biochemistry, Laboratory management and Recent advances in Biochemistry
- Biostatistics, epidemiology and research methodology

Basic principles and concepts of biostatistics as applied in research and clinical chemistry: basic concepts of probability, mean, standard deviation, binomial expression, sensitivity, specificity, positive and negative predictive value.

Types of study design, calculation of adequate sample size for various study designs

Data analysis: Parametric and non-parametric data, correlation and agreement analysis, risk analysis,

Appropriate use of basic statistical tests: students 't' test, paired 't' test, analysis of variance (ANOVA), coefficient of correlation, chi-square test, regression analysis, ROC curve, evaluation of a new diagnostic procedure etc.

Paper I

General Biochemistry, General principles of Biochemical Techniques

General Biochemistry:

1. Cell structure, its biochemical make up: structure and function of cellular organelles (nucleus, mitochondria, endoplasmic reticulum, Golgi apparatus, lysosomes, peroxisomes, proteasomes and ribosomes), plasma membrane structure and function, mechanisms of transport across biological membranes and membrane transport proteins, cytoskeleton, biochemistry of blood clotting, composition and function of different body fluids and their importance in clinical biochemistry
2. Electrolytic dissociation, the law of mass action, acids, bases, indicators, pH, Buffers, Acid-base balance, Acidosis, and Alkalosis.
3. Properties of water, surface tension, osmosis, viscosity, diffusion, colloidal system, membrane phenomena, adsorption, Gibbs-Donnan equilibrium and their applications in the biological system.
4. Principles of isolation and purification of biomolecules.
5. Chemistry of carbohydrates: Structure and function of common carbohydrates, such as glucose, mannose, galactose, fructose, lactose, maltose, sucrose, ribose, xylose, deoxy sugars, amino sugars, uronic acids, starch, glycogen, cellulose, inulin, glycosaminoglycans, blood group antigens. Isomerism of sugars
6. Chemistry of lipids: Saturated and unsaturated fatty acids, their derivatives, triacylglycerols, phospholipids, glycolipids, sterols, lipoproteins, sphingolipids
7. Chemistry of proteins and amino acids: Amino acids, peptides, polypeptides, haemoglobin, immunoglobins, collagen, and proteoglycans. Levels of organization of proteins. Structure-function relationships in insulin, haemoglobin, and collagen. Determination of the primary structure of a protein.

-
8. Chemistry of nucleic acids and nucleotides: purines, pyrimidines, their derivatives, nucleic acids, nucleotides, and polynucleotides.
 3. Enzyme kinetics: Michaelis-Menten and Hill's equation, concepts of K_m and V_{max} .

General principles of biochemical techniques

1. Principles, types, and applications of photometry- colorimetry, spectrophotometry, reflectance, flame photometry, atomic absorption spectroscopy Spectrofluorimetry, flow cytometry, and chemiluminescence, spectroscopy etc.
2. Ion-selective electrodes. pH meter and analytical balances,
3. Principles, types, and applications of centrifugation with the application of each type. Sub-cellular fractionation by differential centrifugation.
4. Principles, types, and applications of electrophoresis and their applications
5. Radioactivity, isotopes, their application in biomedical research and clinical diagnosis, detection and measurement of radioactivity, tracer techniques. Beta and gamma counters, radiation hazards and their prevention, radioimmunoassay, radiation in food preservation.
6. Principles and applications of different types of chromatography.
7. Mass spectrometry
8. Various types of immunoassays: principles and applications.
4. Factors influencing enzyme kinetics,
5. Various types and examples of enzyme inhibition,
6. Regulation of enzyme action
7. Clinical and diagnostic enzymology (including isoenzymes)
8. Therapeutic uses of enzymes

Bioenergetics:

Biological oxidation, Electron transport chain, Oxidative phosphorylation, and Bioenergetics.

Metabolism:

1. Digestion and absorption of food and other nutrients.
2. Methods of studying intermediary metabolism.
3. Intermediary metabolism:
 - Metabolism of carbohydrates,
 - Metabolism of lipids
 - Metabolism of proteins and amino acids,
 - Heme metabolism (synthesis of porphyrins and degradation of heme)
 - Metabolism of nucleotides
4. Integration of metabolism:
 - Metabolism in starvation and well-fed state,
 - Role of hormones in the regulation of metabolism.
 - Metabolic alterations that characterize diabetes mellitus and its acute and chronic complications.
5. Muscular contraction, nerve conduction, coagulation of blood.
6. Metabolism in specialized tissues like erythrocytes, lens, nervous tissue etc.
7. Metabolism of Xenobiotics, Free Radical Biology, Environmental Biochemistry

Paper II

Enzymology, Bioenergetics, Metabolism, Nutrition, Vitamins, Hormones

Enzyme:

1. General properties, classification, and nomenclature of enzymes, coenzymes,
2. Mechanisms of enzyme activity and thermodynamics of enzyme-catalyzed reactions

Inborn Errors of Metabolism:

Biochemical basis, clinical manifestation, diagnosis and management of inborn errors of carbohydrate, lipid, amino acid, and nucleic acid metabolism.

Nutrition:

1. Principal food constituents, general nutritional requirements, energy requirements
2. A balanced diet, diet formulation in health and disease, mixed diet, nutritional supplements, food toxins, and additives, parenteral nutrition
3. Disorders of nutrition: obesity, protein, and protein-energy malnutrition,
4. Laboratory diagnosis of nutritional disorders.
5. Quality of dietary proteins, dietary fibres, and its importance

Vitamins and minerals:

1. Fat- and water-soluble Vitamins - structure, sources, metabolism, biochemical role, RDA, deficiency manifestations of vitamins, hypervitaminoses, and antivitamin.
2. Mineral metabolism: Sources, Metabolism, Functions, Daily requirement / RDA, deficiency manifestation, the toxicity of minerals and macro and micro (trace) elements,

Hormones:

Classification and general mechanism of action of hormones and their role in the regulation of metabolism Biogenesis, secretion, regulation, transport, mode of action and disorders of the following – hypothalamic peptides, anterior and posterior pituitary hormones, thyroid hormones, parathyroid hormones, calcitonin, pancreatic hormones, adrenocortical and medullary hormones, gonadal hormones, gastrointestinal hormones, opioid peptides, endorphins, and enkephalins. Adipose tissue as an endocrine organ and adipokines.

Others:

1. Biochemistry of conception, reproduction, and contraception
2. Cellular signalling pathways and signal transduction.
3. Environmental pollution and biohazards

Paper-III**Molecular biology, Immunology, Cancer****Molecular Biology:**

1. Cell cycle, mitosis, and meiosis
2. Structure of DNA and various types of RNA,
3. Structural organization of chromosomes, chromatin structure, karyotyping and basics of cytogenetics
4. Replication of DNA,
5. Mechanisms of DNA repair,
6. Transcription, its regulation, and post-transcriptional processing,
7. Genetic code and translation, its regulation and posttranslational modifications;
8. Mutations and single nucleotide polymorphisms
9. Various mechanisms involved in the regulation of expression of genes
10. Recombinant DNA technology and its applications in medicine
11. Techniques in molecular biology and their applications: Blotting techniques, polymerase chain reaction (PCR), DNA sequencing, cloning, monoclonal antibodies, restriction fragment length polymorphism, DNA fingerprinting, CRISPR-Cas9 gene-editing technology, fluorescent in situ hybridization (FISH), generation of transgenic animals
12. Concepts of genomics, proteomics, and array techniques,
13. The concept of gene therapy and its applications
14. Basics of inheritance of genetic disorders and population genetics
15. Basic concepts in bioinformatics.
16. Mechanism of action of cytotoxic drugs and antibiotics.
17. The concept of genetic counselling,
18. Types of cell death and their mechanism: necrosis and apoptosis

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19. Intracellular protein sorting and trafficking
 20. Extracellular matrix
 21. Biochemistry of ageing

Immunology:

1. Concepts, mechanisms, and role of innate and acquired immunity,
2. Humoral and cell-mediated immunity,
3. Antigen and antibodies,
4. Structure, function, classification, and synthesis of immunoglobulins,
5. Class-switching in immunoglobulins
6. Antigen-antibody reactions
7. Polyclonal and monoclonal antibodies (including hybridoma technology)
8. Major histocompatibility complex (MHC) and its role in the immune response
9. Recognition of antigens: Primary interaction, antigen processing, and presentation
10. Cell-mediated immune response: Lymphocyte maturation, activation of T and B lymphocytes, Cytokines and their role in the immune response
11. Regulation of immune response, immunologic tolerance,
12. Hypersensitivity
13. Autoimmunity and autoimmune diseases,
14. Immunodeficiency: congenital and acquired
15. Tumour immunity,
16. Transplantation
17. Immunosuppression and immunopotentiality including vaccination, the Complement system
18. Immunodiagnostics

Cancer:

1. Biochemistry and molecular biology of cancer
2. Mechanisms of carcinogenesis and carcinogens: the role of radiation, viruses, mutagens, and mutation in carcinogenesis
3. Initiation and progression of cancer
4. Oncogenes and tumour suppressor genes

5. Metastasis
6. Tumour markers,
7. Radiation and chemotherapy
8. Newer methods to treat cancer: immunotherapy, monoclonal antibodies etc.
9. Apoptosis, telomeres, telomerase

Paper IV

Clinical Biochemistry, Laboratory management and Recent Advances In Biochemistry.

Clinical Biochemistry

1. Analysis and significance of clinically important analytes in blood, urine, CSF,
2. Validation of diagnostic kits
3. Instrumentation in clinical biochemistry
4. Diagnostic enzymology
5. Function tests: Liver, kidney, gastric-intestinal, adrenal, thyroid, pituitary and gonadal function tests
6. Disorders of acid-base balance
7. Disorders of fluid and electrolyte balance and related disorders,
8. CSF in health and disease.
9. Pleural and peritoneal fluid analysis.
10. Laboratory workup of a patient with any organ disease.

General lab techniques and procedures:

1. **METHOD EVALUATION:** Analytical goals, precision, and accuracy, bias, sensitivity and specificity, selection of method and evaluation.
2. **TOTAL QUALITY MANAGEMENT:** Fundamental concepts, control of preanalytical, analytical and post-analytical variables, internal and external quality control programs, Accreditation programmes.
3. **AUTOMATION:** Definition, instrumental concepts, types of analyzers, Trends in automation in Biochemistry laboratory, Laboratory information systems.

Recent advances in biochemistry:

Recent biochemical concepts in health and disease and newer analytical methods etc. as discussed in recent/current medical/biochemical journals and recent editions of textbooks of biochemistry.

PRACTICALS (Course content)

Planning and organization of biochemical experiments in the laboratory.

Different types of glassware and reagents available in the laboratory

Grades of purity of commercially available chemicals used in the laboratory

Different grades of water used in the laboratory

General principles involved in the use of a spectrophotometer, pH meter, centrifuges, and analytical balances

Preparation of reagents of known concentration including familiarity with calculations involved.

Laboratory safety and hazards, including precautions to be employed while working in the laboratory

Fire safety

Biomedical waste disposal regulations

Interpretation of laboratory data on biochemical parameters and correlations with the clinical profile.

1. General reactions of carbohydrates, lipids, proteins, and amino acids Identification of unknown carbohydrate or amino acids using colour reactions followed by confirmation using paper chromatography Haemoglobin and its derivatives.
2. Paper chromatography: separation of mixtures of sugars and amino acids
3. Estimation of blood glucose (GOD-POD method) & GTT
4. Lipid profile: Estimation of total cholesterol, HDL and LDL cholesterol, and triacylglycerol in plasma (by routine assays used in the clinical biochemistry laboratory)

5. Estimation of calcium, inorganic phosphate
6. Estimation of electrolytes by ion-selective electrode
7. Blood gas analysis.
8. Renal function tests: Estimation of urea, creatinine, uric acid and clearance tests.
9. Liver function tests: Estimation of bilirubin, total proteins, albumin, serum enzymes like AST, ALT, Alkaline phosphatase,
10. Thyroid function test: estimation of free T3, T4, and TSH (by routine assays used in the clinical biochemistry laboratory)10. Complete urinalysis for physical and chemical characteristics
11. Detection of normal and abnormal constituents of urine
12. Estimation of amylase, lipase, and activities in serum (by routine assays used in the clinical biochemistry laboratory)
13. Separation of isoenzymes of lactate dehydrogenase (LDH) electrophoresis.
14. Electrophoretic separation of serum total proteins
15. CSF analysis and analyses of pleural and peritoneal fluids
16. Estimation of glycated haemoglobin (by routine assays used in the clinical biochemistry laboratory)
17. Estimation of prolactin, cortisol, LH, FSH, Ferritin (by routine assays used in the clinical biochemistry laboratory)
18. Tumour markers (markers are routinely done in the clinical biochemistry laboratory)
19. Observation or hands-on training in techniques/instruments available in the laboratory such as:- ELISA, HPLC, Flow cytometry, Spectrophotometry, PCR, Automated Clinical Chemistry Analysers, Immunoassay Analysers
20. Cell culture (optional)

TEACHING AND LEARNING METHODS

Teaching methodology

Active and interactive learning should be the mainstay of the program. The following methods are to be used to facilitate learning by and training of MD students.

1. Interactive lectures, tutorials, problem-based learning, case discussions, seminars, guest lectures

The above teaching-learning methods should be employed for the postgraduate students to acquire updated knowledge on various aspects of basic and clinical biochemistry, immunology and molecular biology, and their application in modern medicine and also to learn to communicate effectively.

2. Teaching of undergraduates

Postgraduate students in Biochemistry shall be required to participate in teaching and training programmes of undergraduate students. They should learn how to organize, conduct and coordinate UG laboratory teaching in practical classes, to participate in clinical case-based teaching sessions and small group discussions (as part of a team that includes faculty members and senior residents of the department), to develop skills of self-directed learning, effective communication and leadership. They should learn how to work as part of a team and to facilitate learning by students.

The MD trainees will sit-in on all the lectures taken by the faculty for an undergraduate course.

The MD trainees will be allotted simple topics for teaching the undergraduate medical and/or allied health courses. These sessions will be monitored by a faculty member in order to provide feedback to the MD trainee.

The MD trainee will be a facilitator in PBL sessions, initially as an assistant to an experienced faculty member and then as the senior facilitator

The MD trainee will lead small group discussions for undergraduate students

The MD trainee will be involved in the preparation of reagents for undergraduate practical sessions. He/she will be involved in the planning and coordination of these sessions under the supervision of a faculty member

3. Journal club and seminars

Journal club sessions should be used by postgraduate students to learn to search medical literature, to learn how scientific data is to be disseminated, to develop skills in presentation of research papers, to critically analyze and evaluate data, to become familiar with research methodologies, to keep oneself updated on new developments/emerging trends in biochemistry and to learn to communicate effectively.

Each MD trainee should present at least one journal club every month. He/she will be evaluated by the faculty at these sessions and given feedback.

Seminars

MD trainee will present at least one seminar on the alternate week. The seminar schedule will cover the entire syllabus (to the maximum possible extent) over the 3-year duration of the course. The seminars will be evaluated by the faculty members and the student will be given feedback regarding the same.

4. Practical exercises

These exercises should be used by postgraduate students to equip themselves with knowledge and hands-on skills in various techniques used for laboratory bench-work in biochemistry and molecular biology and in a diagnostic laboratory and to learn to analyze and interpret data obtained.

The MD trainee will have a practical manual containing all the experiments he/she has to complete during the course. The performance of these experiments will be supervised by a senior member of the faculty.

5. Thesis

Under the supervision of a Professor / Additional Professor/ Associate Professor/ Asst. Professor with 2 years of regular service in the Department of Biochemistry, each PG

student is expected to generate a hypothesis/ research question and design a research protocol to test/answer it. The protocol should have clearly defined objectives and a work plan. The postgraduate student will obtain ethical clearance (as appropriate), carry out the experimental research work proposed, analyze data, interpret results and write a thesis/dissertation based on the work done and results obtained.

6. Presentation of work done on the thesis to peers

An MD trainee would be required to present one poster presentation, to read one paper at a national/state conference and to present one research paper /send for publication during the period of his postgraduate studies

7. Horizontal and vertical integration of the teaching of Biochemistry with other preclinical,para-clinical and clinical departments

The MD trainees should take part in integrated teaching of undergraduates by participation in joint teaching sessions and seminars with different departments, participation in clinical rounds for discussing cases of interest and by small group discussions of case-based problems.

8. Training in the basics of medical education and technology and research methodology

The MD trainees may be provided with training in the basics of medical education

and technology through workshops at the departmental and/or institutional level.

The MD trainee will have to attend a course on research methodology prior to starting work on his/her thesis.

9. Training in clinical Biochemistry

The MD trainee will be posted in the Clinical Biochemistry laboratory and will be involved in all routine activities of the lab including quality management and documentation.

The MD trainees should receive hands-on training in a diagnostic laboratory in Biochemistry; such training should be extensive and rigorous enough for each MD trainee to acquire adequate skills and expertise to manage and supervise such a laboratory. The MD trainees should be posted in all sections of the laboratory in the institution, starting from sample collection and processing. They should become proficient in working with the autoanalysers in the laboratory, in quality control methods, setting up a clinical biochemistry laboratory, specialized assays and statistical analysis of data. It would also be desirable for them to acquire experience in running a 24-hours diagnostic laboratory; towards this end, it would help if they are posted in the laboratory out of regular hours as well. Taking any one parameter, students should prepare a Levy Jennings chart and plot, inter-assay and intra-assay variation for the laboratory. Implementation of West gard rules, Six Sigma components.

The MD trainee will be posted in various clinical and para clinical (laboratory) departments for the following duration:

Sl No	Department	Duration of posting
1	Clinical posting in the department of Endocrinology	1 week
2	Medical oncology	1 week
3	Dept. of Ayush(Nutrition)	1 week
4	Elective (as per academic interest)	1 week
5	Dept. of Microbiology (Biochemical Characterization of Bacteria, Immunological diagnostic techniques)	2 weeks
6	Dept. of Pathology (Hb Electrophoresis and immuno-histochemistry)	2 weeks

10. Training in the Molecular Biology, Cell Culture and Proteomics Laboratory

The MD trainees will be posted on a rotation basis at different research laboratories like Molecular Biology Unit, Cell Culture Lab and Proteomics Laboratory of the department so as to acquire skills in different techniques. It would be desirable to have wholesome exposure in different aspects and prospects research in Biochemistry.

11. Log Book

All MD trainees should maintain a logbook that documents all the work that they have done during their years of training. This logbook should be checked and assessed periodically (every month) by the faculty members involved in the training programme.

12. Patient Safety

During the training programme, patient safety is of paramount importance, therefore skills are to be learned initially on the models and later to be performed under supervision.

PG TEACHING SCHEDULE

The minimum teaching schedule for PGs shall incorporate the following:

1. Seminars
 - a. At least one per week.
 - b. Minimum of 48 in a year
2. Journal Clubs
 - a. At least one per week
 - b. Minimum of 48 in a year

3. Clinical Meetings
 - a. Attendance in Clinical Society Meeting & Mortality meeting is a must for PGs as and when the department is involved in the discussions.
4. Lectures
Attend all lectures taken by the faculty for undergraduate students (during first year).
5. Guest lectures
Minimum of 6 in a year. This shall be persons from outside our college.
6. Clinical case discussion: Once per month

Sample time table:

	Week 1	Week 2	Week3	Week4
Monday (FN) (AN)	PG practical /Lab posting	PG practical /Lab posting	PG practical /Lab posting	PG practica/Lab posting
Tuesday (FN) (AN)	PG practical/ Seminar UG practical/ Lab posting	PG practical/ Microteaching UG practical/ Lab posting	PG practical/Case presentation UG practical/Lab posting	PG practical/ seminar UG practical/Lab posting
Wednesday(FN) (AN)	PG practical UG Tutorial/Lab posting	PG practical UG Tutorial/Lab posting	PG practical UG Tutorial/Lab posting	PG practical UG Tutorial/Lab posting
Thursday (FN) (AN)	PG practical /lab posting	PG practical /lab posting	PG practical /Lab posting	PG practical /Lab posting
Friday (FN) (AN)	Thesis work Thesis work/Lab posting	Thesis work Thesis work/Lab posting	Thesis work Thesis work/Lab posting	Thesis work Thesis work/Lab posting
Saturday (FN)	Journal club/Lab posting.	Journal club/lab posting	Journal club/lab posting/ Monthly Mortality meeting	Clinical case discussion*/lab posting

* Clinical case discussion will be on 4th Saturday of every month.

Seminars

Objective: To ensure that students are well versed in the various aspects of a topic including recent advances and to improve their communication skills.

S. No.	Step	Responsibility	Document/Record
1.	The schedule for the seminar is prepared and shall incorporate the name (s) of the student (s), the topic and the moderator (faculty).	HOD/Coordinator	Time table
2.	The student (s) shall meet the concerned faculty at least 10 days in advance of the seminar and seek their guidance.	Student (s) and faculty	
3.	The draft of the seminar is prepared incorporating the usage of AV aids where required.	Student(s)	
4.	In consultation with the moderator (faculty) changes if any are made and the seminar presentation is finalized.	Student (s) and faculty	
5.	Where necessary the hand-outs are prepared.	Student (s)	Hand-out
6.	On the designated day the student (s) present the seminar under the guidance of the moderator (faculty)	Student(s)	
7.	Attendance is taken of all present	Clerk	Attendance register (s)
8.	The seminar is evaluated based on pre-determined criteria determined criteria.	Moderator	Logbook

Journal club

Objective: To improving the analytical skills of Post-graduates and also ensure that they keep themselves abreast of the latest happenings and ensure that they have in-depth knowledge of a disease/concept.

Procedure:

S.No.	Step	Responsibility	Document/Record
1.	The schedule for the journal club is prepared and shall incorporate the name (s) of the student (s), the coordinator (faculty). The journal club shall necessarily have one original research paper or landmark article appraised critically. It is desirable that it also includes one review article and a series of brief summaries which concentrate on the latest happenings in the field. The co-ordinator shall necessarily be a person trained in the conduct of the journal club and shall be rotated at regular intervals (as decided by the department).	HOD	Timetable
2.	The staff coordinator selects the paper (s). The article shall be selected as per pre-determined criteria.	Staff co-ordinator	Checklist
3.	The selected paper under the original article the section is circulated among staff and fellow students at least 10 days before the presentation.	Student	
4.	The student prepares a presentation using appropriate AV aids and as per the checklist which is attached as annexure.	Student	Checklist for journal club signed by staff coordinator
5.	The original article is presented and discussed under the supervision of the staff co-ordinator as per the checklist. This shall preferably not be more than 30 minutes.	Student	
6.	At the end of the presentation, the group comes to a consensus opinion about the study.	Student	Checklist
7.	It is preferable that a review article be presented and discussed as per the checklist and the time for this is 20 minutes.	Student	
8.	It is also preferable that brief summaries of recent advances be presented and the time for this is 10 minutes.	Resident	
9.	Attendance is taken of all present.	Clerk	Attendance register (s)
10.	The journal club is evaluated based on pre-determined criteria.	Moderator	Logbook

ASSESSMENT

Examination on Research Methodology & Biostatistics

- Timing: End of 2nd Semester
- Total marks: 100
- Will be considered as an internal examination
- Candidate should pass to appear in Final examination
- No marks will be added to the final/summative examination
- Will be conducted by Examination Cell in the month of June & December.

Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

Internal Examinations Timeline:

- End of the 3rd, 4th and 5th semester, pre-final (2 months before final examination).
- Marks distribution: Theory 100 marks.
- Practical with viva and logbook (Practical – 70, viva – 20, logbook – 10).
- The marks of the 4 internal examinations will be averaged to 100 each for theory and practical.
- Students have to secure 50% marks in internal marks (in both theory and practical) to be eligible to appear for the final examination.

Summative/Final Examinations :

Theory 4 papers (100 marks each).

Question Paper Format:

- One Long question – 20 marks
- Eight Short question/notes – 8 x 10 = 80 marks
- Total marks in theory: 500 marks

(Theory papers in the final examination – 400 marks, Average of 4 internal examination – 100 marks)

Practical examination: Total marks: 500 (Practical and viva in the final examination – 400 marks and an average of 4 internals- 100 marks).

- The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A** 200 marks	Longcase (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/ Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

** Students should pass (secure 50% marks) separately in Part A

Practical examination

Practical examination will be held over two days and the total marks will be 400. Practical examination will be on

- (a) case-oriented and clinical investigative approach;
- (b) general aspects of biochemistry techniques.

Long experiment: This includes a clinical exercise on presentation of a case history and general examination of a patient, for a provisional diagnosis of the case and to suggest relevant laboratory investigations to diagnose the disease for a therapeutic approach.

The candidate will be asked to perform laboratory experiments and estimations and report results. This will be followed by a detailed discussion on the results, procedures and biochemical aspects of the disease, rationale of therapy, interpretation of values and other related matters.

The topics for long experiment may include Chromatography of sugar and amino acids, electrophoresis of protein, DNA extraction, Polymerase Chain reaction, ELISA-estimation of hormones, Hb electrophoresis.

Short experiment: The topics for short experiment includes: Standard curve of Glucose/creatinine by chemical methods, Enzyme estimation by Semi autoanalyzer, GTT, ADA estimation, HbA1C estimation, CSF analysis, Control run in autoanalyzer, DNA quantification in a spectrophotometer, GFR estimation, Case report analysis by estimation in autoanalyzer.

OSPE Topics: Benedict test, Standardization of Colorimeter, Charging of chromatography, DNA sample loading in Agarose gel electrophoresis, Gel spread and dye-binding in electrophoresis.

Viva-voce shall comprise theoretical and practical knowledge of the candidate related to biochemistry, wherein in-depth knowledge can be assessed. This includes the discussion on case presentation as well as the dissertation work carried out by the candidate.

Pedagogy: The candidate will be given a choice of at least two topics in Biochemistry on day one of the examinations of which one topic will have to be presented by the candidate to the examiners in the form of classroom teaching for a period of 10 – 15 minutes only.

RECOMMENDED BOOKS

1. Textbook of Biochemistry with Clinical Correlations 6E with Wiley Plus Set: John Wiley & Sons, Incorporated; 2007.
2. Berg JM, Stryer L, Tymoczko JL, Gatto GJ. Biochemistry: Macmillan Learning; 2015.
3. Burtis CA, Ashwood ER, Bruns DE. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics - E-Book: Elsevier Health Sciences; 2012.
4. Cooper GM, Hausman RE. The Cell: A Molecular Approach: ASM Press; 2007.
5. Kasper DL, Fauci AS, Hauser SL, Longo DL, Jameson JL, Loscalzo J. Harrison's Principles of Internal Medicine 19/E (Vol.1 & Vol.2) (ebook): McGraw-Hill Education; 2015.
6. Kindt TJ, Goldsby RA, Osborne BA, Kuby J. Kuby Immunology: W. H. Freeman; 2007.
7. Larsen PR. Williams Textbook of Endocrinology, 10/E and Comprehensive Clinical Endocrinology, 3/E: Elsevier - Health Sciences Division; 2002.
8. Lodish HF. Molecular Cell Biology: Freeman; 2012.
9. Mahajan B. Methods in Biostatistics: For Medical Students and Research Workers: Jaypee Brothers, Medical Publishers Pvt. Limited; 2008.
10. Nelson DL, Cox MM. Lehninger Principles of Biochemistry: WH Freeman; 2017.
11. Rodwell VW, Bender D, Botham KM, Kennelly

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- PJ, Weil PA. Harper's Illustrated Biochemistry Thirty-First Edition: McGraw-Hill Education; 2018.
12. Scriver CR. The Metabolic & Molecular Bases of Inherited Disease: McGraw-Hill; 2001.
13. Varley H, Gowenlock AH, McMurray JR, McLauchlan DM. Varley's Practical Clinical Biochemistry: CRC Press; 1988.
14. Voet D, Voet JG. Biochemistry, 4th Edition: W. Ross MacDonald School Resource Services Library; 2010.
15. Wilson K, Walker J. Principles and Techniques of Biochemistry and Molecular Biology: Cambridge University Press; 2010.
16. Harvey RA, Karandish S, Ferrier DR. Lippincott's Illustrated Reviews: Biochemistry, Fifth Ed. and Biochemistry Map (Medmaps) Bundle: Lippincott Williams & Wilkins; 2010.
17. Meisenberg G, Simmons WH. Principles of Medical Biochemistry: Elsevier Health Sciences; 2011.
18. Hofmann A, Clokie S. Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology: Cambridge University Press; 2018.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

GENERAL BIOCHEMISTRY, GENERAL PRINCIPLES OF BIOCHEMICAL TECHNIQUES

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe various levels of organization of adult hemoglobin at the molecular level. Explain the molecular events taking place during oxygenation. How HbA is better suited than HbF for oxygen transport after birth? Justify that hypoxia precipitates sickling with HbS (5+5+5+5 = 20)
2. Write briefly on : (8 X 10=80)
 - a) Write briefly on principles and applications of affinity chromatography. [10]
 - b) Classify Lipoproteins on the basis of electrophoresis. Give in details the functions of apolipoproteins in each as an integral component with respect to disorders. [10]
 - c) Write about the principle and procedure regarding isolation and purification of proteins. [10]
 - d) Illustrate with diagram the Fluid Mosaic Model of cell membrane. Enumerate 2 specialized cell membrane structures with components and functions. [10]
 - e) Briefly write about the components, linkage and organization of acidic proteoglycans. [10]
 - f) Diagrammatically represent the mechanism of facilitated diffusion with 2 examples. [10]
 - g) Outline functions of Na- K ATPase in relation to effect of Dogoxin on cardiac muscle.
 - h) Write short notes on [10]
 - a. Structure and function of ω 3 fatty acids.
 - b. Biologically important short peptides (any 4)

PAPER 2

ENZYMES, BIOENERGETICS, METABOLISM, NUTRITION, ENDOCRINOLOGY

Max. Marks: 100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Organize the components of the respiratory chain with the transport of electrons across them. Explain in brief the molecular events taking place with ATP synthase. Mention about the inhibitors of oxidative phosphorylation at different locations. (10+5+5=20)
2. Write briefly on: (8X 10=80)
 - a) Anabolic role of insulin on lipid metabolism highlighting the signal pathways involved. [10]
 - b) Signal transduction in visual cycle is sodium channel dependent- explain.
 - c) Write about the neurological manifestations taking place in Phenylketonuria, highlighting the biochemical basis of this inborn error. [10]
 - d) Mention about types, mechanism of action and diseases related to G proteins. [10]
 - e) Give in brief about the K_m and V_{max} of different types of Enzyme Inhibition with help of Line weaver Burk plot. [10]
 - f) Highlight the regulation of blood sugar with involvement of tissues, enzymes, and hormones. [10]
 - g) Delineate the steps of fatty acid synthesis. Give in brief about additional steps requires for synthesis of unsaturated fatty acids. [10]
 - h) Justify with suitable examples [10]
 - a. Multienzyme complexes increases metabolic efficiency
 - b. Eicosanoids are of immense biological importance

PAPER 3

MOLECULAR BIOLOGY, IMMUNOLOGY, CANCER

Max. Marks: 100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the mechanisms involved in the regulation of eukaryotic gene expression with suitable examples. Mention about the regulators of transcription. How prokaryotic gene expression is different from Eukaryotic expression? (10+5+5=20)
2. Write briefly on: (8 X 10=80)
 - a) Four different mechanisms of activation of oncogenes with suitable diagram. [10]
 - b) Blot techniques are important in diagnosis of diseases as well as in forensic laboratories Justify. [10]

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- c) Diagrammatically represent the complement cascade activated by exogenous and endogenous routes. [10]
 - d) Represent with diagram the Class switching of Immunoglobulin taking place during bacterial infection. [10]
 - e) Diagrammatically represent the type1 and type-4 hypersensitivity reactions with mediators. [10]
 - f) Enlist the genetic elements used as tumour markers. Write its applications [10]
 - g) RNA editing differs from RNA silencing. Justify with diagram. [10]
 - h) Write short notes on [10]
 - a. Structure and function of Spliceosome
 - b. Mismatch DNA repair.

PAPER 4

CLINICAL BIOCHEMISTRY, RECENT ADVANCES, AND NEWER TECHNOLOGY IN BIOCHEMISTRY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the clinical manifestations, diagnostic tests , therapeutic approach of different types of Porphyria. (5+10+5=20)
2. Write briefly on: (8 x10=80)
 - a) CSF Analysis in clinical practice (Method and application) [10]
 - b) Molecular basis and clinical manifestation of Prion disease. [10]
 - c) Illustrate with diagram the process of Autophagy and Regulated Protein Degradation. [10]
 - d) Write briefly about processing of various Stem cell and applications. [10]
 - e) What is peptide based Nanotechnology. Write about its importance in clinical diagnosis. [10]
 - f) Give in brief the mechanism of action of Telomerase with respect to health and disease. [10]
 - g) Write about Engineering of Riboswitches and Applications. [10]
 - h) Write short notes on [10]
 - a. Microalbuminuria in clinical diagnosis
 - b. Eukaryotic ribosome assembly

ENTRUSTABLE PROFESSIONAL ACTIVITIES [EPA] FOR MD(BIOCHEMISTRY) COURSE

AIIMS BHUBANESWAR

S. No.	Entrustable Professional Activities	Competencies						Expected Level Competencies		
		MK	PC	ISC	P	PBLI	1 st year	2 nd year	3 rd Year	
1	Should be able to perform accurate pipetting using glass pipette and Auto pipettes	◊	◊		◊		III	IV	IV	
2	Should be able to Prepare solutions of desired Concentration, Normality, Molarity, PH	◊	◊		◊		IV	IV	V	
3	Should be able to standardize a diagnostic protocol using a standard curve	◊	◊	◊	◊	◊	III	IV	V	
4	Should have skills and expertise to perform the experiments conducted for UG students	◊	◊	◊	◊	◊	III	IV	V	
5	Should be able to perform and interpret Urine Analysis	◊	◊		◊	◊	III	IV	V	
6	Should be able to set up and standardize different MD short experiments.	◊	◊		◊	◊	II	III	IV	
7	Should be able to register the patients, generate Lab ID and barcode in the hospital laboratory	◊	◊	◊	◊	◊	II	III	IV	
8	Should be able to centrifuge and organize the samples as per requirement	◊	◊		◊	◊	III	IV	V	
9	Should be able to process the samples in the semi-auto analyzer, auto analyzer, Immunoassay, and electrolyte analyzer	◊	◊	◊	◊	◊	III	IV	V	
10	Should be able to conduct small group teaching for undergraduate practical and tutorial sessions	◊	◊	◊	◊	◊	II	III	IV	
11	Should be familiar with indications and interpretation of biochemical patient data	◊	◊	◊	◊	◊	II	III	IV	
12	Should have sound knowledge on research methodology and biostatistics	◊	◊		◊	◊	II	III	IV	
13	Should have skills for literature search, analysis, framing a research question and writing the thesis synopsis	◊	◊		◊	◊	II	III	IV	

S. No.	Entrustable Professional Activities	Competencies						Expected Level Competencies		
		MK	PC	ISC	P	PBLI	1 st year	2 nd year	3 rd Year	
27	Should be able to take pre-practical session under the guidance	◊	◊	◊	◊	◊	III	IV	IV	
28	Should be able to evaluate and assess the practical skills of the UG students	◊	◊	◊	◊	◊	III	IV	IV	
29	Clinical posting in Dept. Of Ayush(Nutrition) and Elective 1 week each as per academic interest.	◊	◊	◊	◊	◊	IV	IV	IV	
30	Should be able to interpret and validate biochemical and hormonal reports with through clinical correlation.	◊	◊	◊	◊	◊	I	II	III	
31	Should have sound knowledge on troubleshooting, biomedical waste management, quality assurance and patient safety related to the hospital biochemistry laboratory	◊	◊	◊	◊	◊	II	III	IV	
32	Should have knowledge and skill to demonstrate all the short and long experiment(MD) to the junior colleagues	◊	◊	◊	◊	◊	II	III	IV	
33	Should be able to manage tutorial and practical classes for Allied Medical science courses --- BSc (Nursing), BSc (MLT), BSc (Radiology), etc.	◊	◊	◊	◊	◊	II	III	IV	
34	Should be familiar with NABL, NABH accreditation, and documentation of data, errors in the laboratory	◊	◊	◊	◊	◊	I	II	III	
35	Should be able to supervise and guide the technicians	◊	◊	◊	◊	◊	I	II	III	
36	Should be able to compile the data, interpret and write the thesis.	◊	◊	◊	◊	◊	II	III	IV	
37	Should be able to participate and present the research work in various national meetings/conferences	◊	◊	◊	◊	◊	I	II	III	
38	Should be able to present oral and poster presentations in conferences	◊	◊	◊	◊	◊	I	II	III	

Levels of competence:

- Level 1: Knowledge only; can observe
- Level 2: Can do under strict supervision
- Level 3: Can do under loose supervision
- Level 4: Can do independently
- Level 5: Has the expertise to teach others

Competency Domains:

- MK: Medical Knowledge
- PC: Patient Care
- PBLI: Problem Based Learning and Improvement
- SBP: Systems-Based Practice
- P: Professionalism
- ISC: Interpersonal and Communication Skills

A background network diagram consisting of interconnected nodes and edges. The nodes are represented by circles of various colors: yellow, green, teal, blue, and grey. The edges are thin grey lines connecting the nodes. The network is distributed across the page, with a higher density of nodes in the corners and along the left and right edges, leaving a clear space in the center for the text.

COMMUNITY MEDICINE

MD in Community Medicine

COURSE NAME

MD in Community Medicine

DURATION OF COURSE

3 year

ELIGIBILITY

M.B.B.S

PREAMBLE

Health care has attained wider connotations than merely caring during illness. Community Medicine deals with promotion of health and prevention, control and treatment of diseases using optimal public health management and leadership skills with community participation.

Thus, as a post-graduate in community medicine, he/she should be equipped with the knowledge, skills, competencies in primary, secondary & tertiary care, control and prevention of outbreaks/epidemics, community diagnosis, health needs assessment, epidemiological assessment, research and planning evidence-based health policies and programmes.

The Guidelines for teaching Community Medicine, therefore, should be designed to create a cadre of professionals who are competent to meaningfully contribute their expertise in planning, implementation, coordination, monitoring, evaluation of Primary Health Care Programs based on scientific evidence. The competencies must cover a wide spectrum of skills viz., technical, managerial, administrative, organizational skills applied skills in Health Information Management, software application and soft skills of communication, motivation, decision-making, team building, training in scientific communication and medical writing.

After acquiring the required training in MD (Community Medicine), the specialist should have more versatility, focus and commitment in helping to reach the goal.

OBJECTIVES

Cognitive domain

- Analyse public health problems with a conceptual and applied understanding of Public Health and Community Medicine utilizing comprehensive health care approach.
- Have knowledge about communicable and non-communicable diseases, emerging and re-emerging diseases, their epidemiology, control and prevention and related health programmes.
- Describe the nutritional problems of the country, the role of nutrition in health and disease and to describe common nutritional disorders
- Describe the concept of environmental and occupational health and understand the principles of environmental assessment and its impact on health using relevant tools.
- Define and identify vulnerable, under-privileged high-risk communities and their special needs including a maternal, child, and geriatric health
- To describe the principles of health economics and apply it in various public health settings
- Have knowledge of health care administration, health management, health policy planning, public health legislation and public health leadership.
- To keep abreast of recent advances in Public Health & formulate feasible, optimal, sustainable, cost-effective strategies in response to the advances in public health & development.

Psychomotor domain

- Conduct community surveys for assessment of health & morbidity profile, epidemiological determinants, assessment of health needs, and community diagnosis.
- Conduct disease surveillance and epidemic/outbreak investigations, develop spot maps and prepare a report of epidemic/outbreak investigation.

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- Diagnose and manage the majority of the health conditions in the community based on clinical assessment and appropriate investigations.
 - Organize and supervise the chosen/assigned health care services and special activities (e.g. Health camp, camp during disasters) for the vulnerable population, demonstrating adequate managerial skills in the clinic/hospital or field situation.
 - Conduct a nutritional assessment of Individual, family or a community and prepare a nutrition development plan based on the assessment and local context.
 - Develop appropriate IEC Material, assessment of community communication needs, training skills, counselling skills, conduct health education Programmes in urban and rural settings.
 - Conduct community need assessment and develop action plans under the purview of existing national health programmes.
 - Implement national health programmes and conduct monitoring, evaluation and supervision of health programme/schemes at block/district level.
 - Conduct evaluation of health facilities by either developing a relevant or using an existing tool.
 - Utilize the skills of public health management to conduct inventory management, human resource management, financial and purchase management etc.
 - Conduct epidemiological studies, qualitative studies and community based interventional research by designing a study, collect data, analyse it with appropriate statistical tests (basic and advanced) and prepare a report by demonstrating competence in basic and advanced concepts of research methodology, biostatistics and epidemiology.
 - Do a critical analysis of relevant published research literature.

Affective domain

- Should be able to function as a part of a team and build capacity, develop an attitude of cooperation with colleagues, and interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.
- Adopt ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel and to respect the rights of the patient including the right to information and second opinion.
- Develop communication skills to word reports and make a professional opinion as well as to interact with patients, relatives, peers and paramedical staff, and for effective teaching.
- Develop skills as a self-directed learner, recognize continuing educational needs and select & use appropriate learning resources.
- Develop skills in developing and using educational methods and techniques as applicable to the teaching of medical/nursing students, general physicians and paramedical health workers.

SYLLABUS

Concept of Health & Disease

- History of medicine, the evolution of public health, alternative systems of medicine
- Definition of health, holistic concepts of health including the concept of spiritual health, appreciation of health as a relative concept, determinants of health
- Characteristics of agent, host and environmental factors in health and disease and the multifactorial aetiology of the disease
- Understanding the natural history of disease and application of interventions at various levels of prevention
- Indices used in the measurement of health.
- Screening and its application (selection criteria, validity including likelihood ratios and ROC

curve, evaluation, predictive accuracy, Screening programmes and their evaluation)

- The health situation in India: demography, mortality and morbidity profile and the existing health facilities in health services.

General Epidemiology

- Evolution of epidemiology
- Epidemiology: definition, concepts and its role in health & disease
- Measurement of disease frequency
- Use of basic epidemiological tools to make a community diagnosis of the health situation, to formulate appropriate intervention measures
- Sample size calculation and sampling techniques
- Formulation, testing of hypothesis and errors in hypothesis testing
- Descriptive and analytical epidemiology (cross-sectional study, case-control study and cohort study)
- Experimental epidemiology (randomized and non-randomized controlled trials)
- Diagnostic studies and its applications
- Rapid assessment techniques
- Cause and effect relationship: the concept of association, causation, correlation
- Concepts of confounding, bias and interaction
- A systematic review and meta-analysis
- Use of constructs/scales and their validity in research
- Concepts and techniques of qualitative research
- Genetic Epidemiology

Biostatistics

- Basic Statistics
 - Introduction
 - Role of statistics in Public Health
 - Collection of data
 - Sampling in Public Health
 - Statistical classification of health data
 - Handling and processing of statistical information

- Analysis of demographic data
- Measurement of morbidity, mortality and fertility
- Standardization of rates and standard indices
- Life tables
- Statistical techniques of evaluation in Public Health
- Descriptive Statistics
 - Introduction to biostatistics- aim and scope
 - Collection of data- basic ideas
 - Presentation of data- tabulation, diagram and graphs
 - Measures of central tendency and dispersion
 - Normal distribution
 - Elementary idea of skewness
 - Concepts of correlation and regression
- Statistical inferences
 - Elementary idea of probability
 - Sampling techniques
 - Test of Significance-Chi Square, t-test, z-test, ANOVA
 - The basic idea of testing of hypothesis
 - Advanced statistical techniques, multivariate regression analysis, statistical models.
 - Use of Epi info, SPSS/ other computer software
- Special Topics in Biostatistics
 - Clinical trials-Aim and scope, general principles, use of controls, placebos and dummies, final presentation of results-discussion of some well-known clinical trials
 - Prophylactic trials-Assessment by time trends and geographical comparison, controlled prophylactic trials, discussion of some well-known clinical trials
 - Retrospective and prospective studies and follow up studies, discussion of important studies
 - Field studies, prevalence surveys, guiding principles for data collection
 - Controls in field studies & hospital studies

Demography and Vital Statistics

- Concepts of demography, demographic cycle, vital statistics
- Definition, calculation and interpretation of various demographic indices
- Declining sex ratio and its social implication
- Population explosion, population dynamics of India
- Population control
- National population policy

Public health nutrition

- Nutrients, common sources and their requirement according to age, sex, activity and physiological conditions
- A balanced diet, Prudent diet
- Techniques of nutritional assessment of the individual, family and the community
- Plan and recommend a suitable diet for the individuals and families as per local availability of foods and economic status etc.
- Common nutritional disorders, specific nutrient deficiency disorders, disorders related to toxins in food; their control and management
- Food fortification, additives and adulteration, food hygiene
- Social and cultural factors in nutrition and health
- Food and economics
- Important National nutritional programmes
- National Nutrition Policy
- Nutritional surveillance, education and rehabilitation
- Role of diet in specific diseases like coronary heart disease, diabetes, obesity etc.
- Food and legislation
- Future trends in nutrition

Social and Behavioural Sciences

- Clinical- social, cultural and demographic evolution of the individual, family and community

- Humanities and Community Medicine
- Social organizations with special reference to family
- Religion, its evolution as a special instance of the evolution of social institutions
- Major tenets of the common religions in India & their influence on health & disease
- Assessment of barriers to good health and health-seeking behaviour
- Methodology in social research (Attitude surveys, Questionnaires, Interviews)
- Social security in India
- Culture and its impact on health
- Customs, taboos and mores
- Doctor-patient relationship
- Social problems e.g. child abuse, juvenile delinquency, drug addiction, alcoholism, marital maladjustment, domestic violence, suicide and attempted suicide, problems of the old, caste system
- Psychology and its concept
- The Psychoanalytic theory
- Human personality, its foundations, development and organization
- Development of child and its impact on its personality
- Psychological tests-personality tests, intelligence tests
- Group dynamics
- Hospital psychology

Environmental and occupational health

- **Environmental health**
 - Water: concepts of safe and wholesome water, sanitary sources of water, water-borne diseases, water purification processes
 - Physical and chemical standards of drinking water quality and tests for assessing bacteriological quality of water
 - National rural water supply and sanitation programme
 - Concepts of water conservation and rainwater harvesting

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- Health hazards of air, water, noise, radiation pollution and their prevention & control including indoor air pollution
 - Rural and Urban sanitation
 - Concepts of solid waste / human excreta/ sewage disposal
 - Awareness of standards of housing and the effect of housing on health
 - Aerospace medicine
 - Health hazards related to climate, altitude, and depth
 - Human health in a changing world
- **Occupational Health**
 - Relate the history of symptoms with specific occupations including agriculture-related occupation
 - Asbestos and other fibers, coal worker's lung diseases, silicosis, health significance of metal exposures, diseases associated with exposure to chemical substances, multiple chemical sensitivities, pulmonary responses to gases and particles, pesticides, illness due to thermal extremes, ionizing radiations, non-ionizing radiations, effects of physical environment- noise, vibration, work-related musculoskeletal disorders
 - Employees State Insurance (ESI) scheme
 - Concepts of ergonomics
 - Diagnostic criteria of various occupation-related diseases
 - Industrial hygiene
 - Surveillance, monitoring and screening in occupational health
 - Occupational safety and health standards
 - Legislations related to occupational health
 - **Medical Entomology**
 - Role of vectors in the causation of diseases
 - Identifying features of vectors and their control measures
 - Life cycles of vectors and advantages and limitations of various vector control measures
- Mode of action, application cycle of commonly used insecticides and rodenticides
 - Integrated vector control
 - Entomological survey techniques
 - **Biomedical Waste & its disposal**
 - Classification/categories, sources, health hazards and treatment of biomedical waste as per current regulations (2016 guidelines)
 - Application of principles of biomedical waste management in different settings of the health care delivery system
 - Management of electronic waste
- **Disease-specific epidemiology**
 - The extent of the problem, epidemiology and natural history of the disease.
 - Relative public health importance of a particular disease in a given area.
 - Influence of social, cultural and ecological factors on the epidemiology of the disease.
 - Control of communicable and non-communicable disease by Diagnosing and treating a case and in doing so demonstrate skills in:
 - i) Clinical methods
 - ii) Use of essential laboratory techniques
 - iii) Selection of appropriate treatment regimes.
 - iv) Follow-up of cases.
 - Principles of planning, implementing and evaluating control measures for the diseases at the community level bearing in mind the relative importance of the disease.
 - Institution of programmes for the education of individuals and communities.
 - Investigating a disease epidemic.
 - Knowledge of the National Health Disease Control Programmes.
 - Infectious disease epidemiology: Study of all infectious diseases in the following context
 - Investigation of an epidemic of communicable diseases and to understand principles of control measures
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- Definition of the terms used in describing disease transmission and control
- Modes of transmission and general principles of prevention and control of communicable, and other health conditions of public health importance
- Concept of disease eradication/ elimination, review of the smallpox eradication strategy
- Epidemiological intelligence, forecasting and modelling
- Principal sources of epidemiological data at global and Indian level
- Definition, calculation and interpretation of morbidity and mortality rates
- Geographical information system (GIS) and remote sensing
- Non-communicable disease epidemiology: Study of Coronary artery disease, hypertension, stroke, obesity, diabetes, rheumatic heart disease, blindness, cancers, accidents, oral health etc. in the following context
 - Risk factors assessment
 - Prevention and control of chronic diseases
 - Public mental health
 - Injury epidemiology

Community and family medicine practice

As a Community Physician

- Ability to identify local health needs of the community.
- Ability to demonstrate leadership qualities & function as an effective team leader
- Ability to make community diagnosis including the application of Rapid assessment techniques
- Ability to organize health camps
- Ability to organize health surveys & ongoing comprehensive health delivery programme.
- The ability for effective liaison with PRIs & local opinion leaders, mustering of local resources, advocacy & mobilization of administration & political will for health care programmes.

As a Family Physician

- Diagnosis & management of common illness
- Diagnosis & management of chronic diseases & disabilities including rehabilitation
- Nutritional assessment & nutritional therapy.
- Family planning practices
- Diagnosis & management of Paediatric, Geriatric, Gynaecological illness with special emphasis on RCH & integrated management of childhood illness.
- Perform all immunization procedures.
- Ability to organize & conduct MCH services including antenatal clinic, intranatal & postnatal care, care of new-born, growth monitoring & care of the toddler.
- Ability to manage cases of injury and trauma

Reproductive and Child Health

- Status of reproductive and child health
- Screening of high-risk groups and common health problems
- Local customs and practices during pregnancy, lactation, child-rearing, child feeding practices including complementary feeding
- Breastfeeding and its importance
- Indicators of RCH
- Causes of perinatal/infant/maternal mortality and measures for the reduction of the same
- Essential obstetric care, emergency obstetric care
- Essential newborn care
- Reproductive child health (RCH) components, including child survival and safe motherhood, universal immunization programme, integrated child development services scheme (ICDS), integrated management of neonatal and childhood illness (IMNCI) and other existing programmes
- Organization, implementation and evaluation of reproductive and child health program components

- Various family planning methods, their advantages and shortcomings
- Medical termination of pregnancy and Act (MTP Act)
- Adolescent health
- Handicapped child
- Gender issues and women empowerment
- Organizations, technical and operational aspects of the National Family Welfare Programme

School Health

- Objectives and components of the school health programme
- Activities of the programme
- Periodic medical examination of the children and the teachers
- Immunization of the children in the school
- Health promotion and education
- Mid-day meal programme
- Healthful school environment

Health Care of the Elderly

- Size of the elderly population, their common health problems and justification of their special care
- Screening procedures for early detection of various diseases and disabilities of elderly
- Comprehensive health care aspects of elderly
- National policy for the care of the elderly

Urban Health

- Common health problems (Medical, social, environmental, economic, psychological) of urban slum dwellers
- Organization of health services for and in urban areas and slums
- National policy on urban health
- National Urban Health Mission (NUHM)
- Health issues of migrant populations

Mental Health

- Importance of mental health care in primary care settings
- Common psychiatric/ neurotic/ other mental health disorders, mental retardation
- Comprehensive mental health care at primary care settings
- Psychotherapy, its place in mental health
- Psychology and field research

Health care delivery system in India

- Concepts of primary health care and comprehensive health care.
- Health profile of India
- Evolution of the health care delivery system in India
- Health care delivery in India and infrastructure at primary, secondary and tertiary care level
- Job responsibilities of different categories of workers in the health system
- Voluntary health agencies working in India
- The pattern of health care services in certain south Asian and western countries
- Health insurance

Public Health planning, management and administration

- Concepts of planning, management, public health administration
- Components of planning a healthy activity
- Classification and understanding of various qualitative and quantitative health management techniques
- Overview of administration at village, block, district, state and central level in India
- Organizational concept and behaviour
- Time, material and personnel management
- Integrated disease surveillance project (IDSP)
- Health-related Sustainable Development Goals
- Operational research

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- National Health Policy and the National Rural Health Mission
 - Concepts of health economics in health planning and management
 - Concepts, scope and methods of Health Audit
 - Role of Planning Commission and five year plans in the development of the health sector in India
 - Various health committees of Govt. of India and their important recommendations
 - Public health administration of the future
 - Research in administration, operational & action-oriented research
 - New concepts in public health administration
 - Principles of hospital administration
 - Medical audit, quality assurance, quality improvement and client satisfaction
 - Alternative approaches to planning
 - Importance of hospital records, their retrieval, International classification of diseases, medical certification of death
 - Disaster management: Principles of disaster preparedness and application of these in disaster management
 - Principles & methods of health promotion and education
 - Barriers to effective communication and methods to overcome them.
 - Process of learning and its principles
 - Various methods of health education with their advantages and limitations
 - Aids for imparting health education
 - Organizing health promotion and education activities at individual, family and community settings
 - Evaluation of health promotion and education programme
 - Pedagogical methods: introduction, elements and techniques.

Public Health Legislation

- Birth and death registration act, PFA act, MTP act, CPA, Child labour act, PNDDT act, Transplantation of human organ act in India etc.
- Other public health legislation.

International Health

- Role of various multilateral, bilateral international health organizations like WHO, UNICEF, UNDP, World Bank etc.
- Organization structure of these organizations
- International Health Regulations (IHR)

Information, Education, Communication & Health Promotion

- Understand the concepts of health promotion and education, IEC, behavioural change communication

TEACHING AND LEARNING METHODS

Teaching Programme

S. No.	Teaching activity	Duration (Hours/Year)
I.	Departmental	
1.	Lecture and Interactive tutorials	96 (Every Tuesday 2-4 PM)
2.	Seminars	96 (Every Thursday 2-4 PM)
3.	Journal Club/Research Club	24 (Every alternate Thursday 4-5 PM)
4.	Public health updates	12 (Once/month Thursday 4-5 PM)
5.	Faculty/SR seminar presentation	12 (Once/month Thursday 4-5 PM)
6.	Public health case studies (family/case presentation)	24 (Every alternate Tuesday 4-5 PM)
7.	Thesis related presentation/Clinic updates/Any other departmental activity	12 (Every alternate Tuesday 4-5 PM)
8.	Participation in UG teaching activity including practical	80 (based on UG teaching programme)
II.	Interdepartmental (only during the first year)	
1.	Case presentation	10
2.	Seminars (while clinical posting in different departments; see 4.2.2)	10
III.	Institutional	
1.	Institutional teaching activity	15
2.	Research Methodology course (first year)	30
3.	CME/Workshop/Guest lectures	15

Theory classes and interactive tutorials

S. No.	Content	Teaching hours
1	Epidemiology (covering all aspects of basic and advanced epidemiology)	30
2	Biostatistics (covering all the aspects of biostatistics)	20
3	Public health concepts and practice (covering demography, health promotion, public health legislation, social determinants of health)	20
4	Health system and primary health care (including international health system)	20
5	Social and behavioural sciences	12
6	Public health planning, management and administration	16
7	Reproductive and Child Health (RCH)	16
8	Environmental and occupational health	16
9	Infectious disease epidemiology	12
10	Chronic disease epidemiology	12
11	Public health nutrition	12
12	Health economics	10
13	Information, Education, Communication & Health Promotion	10

Seminars

- National Health and related Policies (5 sessions)

- National Population policy
- National Health Policy
- National Nutrition Policy
- Millennium and Sustainable Development Goals
- 12th Five Year Plan and Health

- National Health Programmes (20 session)

- National Vector Borne Disease Control Programme – I and II
- Revised National Tuberculosis Control Programme – I and II
- National AIDS Control Programme – I and II
- National Programme for Control of Blindness
- National Health Mission
- Rationale and background of NRHM

Components under NRHM

District Health Action Plan

Monitoring and evaluation of NRHM

National Urban Health Mission – I and II

- Reproductive Maternal Neonatal Child Health Plus A
- Integrated Management of Neonatal and Childhood Illness and Integrated Approaches for Prevention and Control of Pneumonia and Diarrhoea.
- Indian New-born Action Plan
- Other schemes related to maternal and child health
- Integrated Child Development Scheme
- National Programme for Control of Diabetes, CVD, Stroke
- National Mental Health Programme
- National Polio Surveillance Project
- Integrated Disease Surveillance Project

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- Epidemiology of Communicable and non-communicable diseases (20 sessions)
 - Epidemiology of Communicable diseases (15 session)
 - Epidemiology of NCDs (5 session)

Journal Club

- Trainees would have to present the findings of a recently published relevant research article, do a critical appraisal of the article and present the findings in national context
- Journal club is aimed to enhance the understanding of trainees in epidemiology and biostatistics and enable them to critically read and understand research
- The articles should be preferably presented in the increasing level of difficulty.
- It is mandatory for the Junior Resident to present at least one article from each type of study design. This will ensure a good representation of studies and cover all major study designs and epidemiological issues.
- Following the type of study can be presented for the journal club; Cross-sectional study/survey, Evaluation of a diagnostic test, Cohort Study, Case-control study, Clinical trial, Community trial, Economic evaluation, Public health classics, Meta-analysis
- In discussion with the faculty preceptor, the JR will select articles titles in a field of interest 2 months prior to the date of presentation. Some suggestions for journals to search are BMJ, NEJM, AJPH, AJE, IJE, BMC Public Health, Lancet, JECH, Nutrition, WHO Bulletin, AJE, EJE, and PLoS One etc. In a stepwise fashion, the JR will narrow down on the final article to be presented. Exhaustive discussion with the faculty preceptor should go into a making a final presentation.
- A standard format for critical appraisal of studies should be used. Junior Residents are encouraged to write a selected summary/review article based on the article presented in the Journal Club.

Public Health Updates

There would be a monthly presentation on public health news and updates to abreast the trainees with current concepts and knowledge.

Public Health Case Studies (Family/Case/CPSCR)

Trainees will present public health case studies which will be like Clinico Psycho-Social Case Review (CPSCR) along with understanding of health system issues. Thus, identification of cause of illness would be at individual level, family level and community level encompassing clinical details, psycho-social, economic and health system determinants of health and disease

Thesis

PG Trainees are supposed to complete and submit a thesis to the dean office for partial fulfilment of their MD degree

- Timelines (may be modified as per information from dean's office):
 - Allotment of the guide: within one month of joining
 - Submission of thesis protocol: within 4 months of joining
 - Submission of thesis: 6 months before the final MD examination
- Things to be noted while choosing a topic:
 - The scope of the study should be limited so that it is possible to conduct it within the resources and time available to the student
 - The emphasis should be on the process of research rather than the results
- Steps in doing thesis work
 - Step 1 Discussion with allotted guide
 - Step 2 Review of available literature
 - Step 3 Shortlisting of topic of interest
 - Step 4 Workup in detail on a few topics keeping in mind the feasibility and discussion at the department level, followed by presentation and faculty approval

- Step 5 Selection and finalization of the topic
- Step 6 Preparation and submission of protocol, within four months after the date of admission after faculty approval
- Step 7 Preparation of study instrument
- Step 8 Pilot survey
- Step 9 Finalizing the study
- Step 10 Data collection
- Step 11 Data entry, compilation and processing
- Step 12 Analysis and interpretation
- Step 13 Presentation and Discussion at the Department level
- Step 14 Preparation and submission of Thesis to Registrar (Academics), six months prior to MD examination after faculty approval
- Step 15 Publication of Thesis work in reputed journals

DEPARTMENTAL TRAINING SCHEDULE

Schedule of clinical and field postings

S. No.	Domain	Place of Posting	Duration
I	Orientation posting	In various clinics and centres of the department	1 month
II	Clinical posting in the department of CM and FM	1. Non-Communicable disease clinic/ Preventive oncology/ EHC	2 months
		2. Immunization/Yellow fever	1.5 months
		3. ICTC and DSRC	7 days
		4. DOTS Clinic	7 days
III	Clinical posting in other departments	1. Medicine	1 month
		2. Obstetrics and Gynaecology including labour room	1 month
		3. Pediatrics and NICU	1 month
		4. Trauma and emergency medicine	15 days
		5. Any other department as per the choice of PG	15 days
IV	Posting with undergraduate students in RHTC and UHTC posting		2.5 months
V	Hospital and health care administration	MRD, BMW management, CSSD, Dietetics, HR management, Pharmacy etc.	1 month
VI	Community health posting	1. Rural Health Training Centre	12 months
		2. Urban Health Training Centre	6 months
VII		3. District Head Quarter Hospital (DHH) and District Program Management Unit (DPMU)	1 month
VIII		4. State Programme Unit/NHM	1 month
IX	Elective Posting	1. Visit institutes of community health practice and research	1 month
X	Thesis	Data Collection	2 months
XI	Examination	Theory and Practical	1 month

Activities during clinical and field posting

Students must know/must do the following activities and acquire below-mentioned skills and competencies during their clinical and field postings

General knowledge and skill

- Demonstrate communication skills of a high order in explaining management and prognosis, providing counselling so as to establish a healthy doctor-patient relationship by maintaining a sympathetic attitude and upholding the dignity of the patient and giving health education messages to patients and families.
- Identify social, economic, environmental, biological and emotional determinants of health, and provide rehabilitative, preventive and promotive measures to provide holistic care to adult and elderly patients.
- Skill and competence to work cohesively in a team of medical and paramedical personnel and maintain discipline and healthy interaction with the colleagues.
- Skill and competence to communicate clearly and consciously, and teach other junior residents, medical students, nurses and other paramedical staff, the theory as well as the practical clinical skills required for the practice of medicine.
- Thorough knowledge of epidemiology, natural history, pathological abnormalities, clinical manifestations, and principles of management of a large variety of systemic medical disorders of adults and elderly, affecting any organ system.
- A thorough knowledge of the practical aspects and methods of prevention and protection against nosocomial infections from (i) patient-to-patient (ii) patient-to-health care worker HCW (iii) HCW-to-patient; in any health care setting.
- Thorough knowledge, skill and competence to diagnose correctly a wide range of commonly seen clinical problems of concerned speciality by

- Using traditional methods of recording an accurate and thorough history and performing a detailed physical examination
- Rationally prescribing and correctly interpreting diagnostic tests
- Performing commonly used diagnostic procedures
- Using diagnostic algorithms for the line of management of common conditions.
- Thorough knowledge, skill and competence to provide rational drug therapy for a wide range of commonly seen clinical problems in concerned speciality using standard treatment protocol and evidence-based clinical practice
- Proficiency in selecting correct drug combinations for different clinical problems with thorough knowledge of their pharmacological effects, side-effects, interactions with the other drugs, alteration of their metabolism in different clinical situations, including that in the elderly.

Specific Knowledge and skills (Posting wise)

1. Rural and Urban health centres:

- Organize and supervise Family health clinics
 - Family health care: Comprehensive health care with yearly follow-up to 20 families in each health post.
 - Learn to communicate effectively with the families in the community
 - Study the family structure and health status of the individual members over a period of one year with specific reference to acute and chronic morbidity
 - Determine the factors responsible for the health problems of the families and learn the coping mechanisms
 - Concurrently advise the families appropriately to tackle the health problems thus identified
 - Trainees are expected to compile the data collected within the follow-up period and submit a report at the end of follow up period.

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- Family Health Survey: Trainees along with health worker would undertake family health survey, identify important clinical and social issues and prepare a report of identified families with Significant issues which require health system interventions
 - Reproductive and child health care: Provide comprehensive reproductive and child health care as detailed in the course content under reproductive and child health heading. Complete follow-up and comprehensive maternity care to at least 20 cases in each health post (ante-, intra-, and post-natal care).
 - Family welfare: Counselling of at least 2 couples in each health post. Follow up of at least 10 cases of oral pill users, copper-T users, and sterilization.
 - Health education: Participate in at least 5 health education sessions in each health post. Independently conduct at least one session in each health post. Plan and design health education materials
 - School health: Participate in at least 10 sessions in each health post. Organize & conduct at least one session independently.
 - Immunization: Participate in at least 10 immunisation sessions in each health post. Independently manage and organize at least one session in each health post. Acquire the necessary skills to organize and supervise immunization sessions
 - Training of health workforce (Birth Attendants, Anganwadi workers, Health Workers): Participate in at least 3 training session of each category of workers in each health post. Independently conduct at least one session of each kind.
 - Verbal autopsy: Investigate the medical and social cause of death in at least one adult death and all maternal /infant deaths in each of the health posts.
 - Record analysis: Analyse and interpret the monthly report of sub-centre, primary health centre, community health centre and district for at least 6 months & compare with that of last year and make a presentation of at least one health programme
 - Public health laboratory: Independently analyse and interpret at least 10 samples each of water, air, sputum, stool, blood and urine in each health post. Perform food testing for adulterants, and water testing at designated centres
 - Laboratory activities at Health Centres: Peripheral blood examination of Thick and Thin Smears and Reporting, Collection and Dispatch of Samples to Laboratory, Experience in the collection, examination and interpretation of simple laboratory tests on blood, stool and urine. Interpretation of commonly used serological tests such as Widal / HIV / Hepatitis B / VDRL / Viral antibody titres, preparation of slides for microbiological examination
 - Occupational health: Participate in the inspection of at least 5 factories and study occupational health status and prevention measures undertaken in these factories.
 - Environmental Health: Study water supply, effluent treatment plant, sewerage system and solid municipal waste disposal at least in one health centre posting.
 - Health Program: Plan and evaluate at least one health program based on existing monitoring and evaluation framework, to develop own M and E framework, provide supportive supervision and mentoring based on the findings in each of the health posts and participate in at least one health survey in each of the health posts and make a presentation.
 - Public Health Management and administration: Planning Exercises, Vital Essential Desirable (VED) Analysis, Beneficiary Need Analysis, Preparation of Annual Plan, Budgeting at the PHC level, Supervision of a PHC/SC, Requirement of Vaccines, Medicines, Stationary at the PHC level and inventory management,
-

Organisation of a Family Welfare Camp, Conduction of an Immunization Camp. To make a presentation of at least one managerial activity during each posting

- Epidemiological surveillance and investigation of outbreaks: Participate and review the surveillance activities in each health post. As and when an outbreak occurs, the trainee must participate in the investigation. If no such outbreak occurs, simulation exercises will be conducted.
- Visit to following places: District Health Office, District Hospital, Taluka Hospital, Sub-Centre/Primary Health Centre/Community Health Centre, Integrated Child Development Services (ICDS) office / Anganwadi Centre, Public Health Laboratory, Sewage Treatment Plant, Visit to Local Ward Office, Infectious disease Hospital, District Tuberculosis Centre, Malaria/ Filaria units, Visit to factory/ Inspectorate of factories/ visit to Industry, Home for the aged, Blindness Rehabilitation schools, Deaf and Dumb schools, Milk Dairy, Food and Beverages Processing Units

2. Non-Communicable Disease clinic

- Assessment & Management of Chronic NCDs and Common Risk Factors
- Assessment of Hyperglycaemia
- Assessment of Hypertension
- Assessment of Dyslipidaemia
- Assessment of COPD
- Assessment of Hypothyroidism
- Non-pharmacological measures for the management of NCD
- Health education for prevention and control
- Screening for depression (using a standard scale)
- Screening for dependence (using a standard scale)

3. Preventive Oncology clinic

- Counselling regarding preventable cancers and early diagnosis of cancer

- Screening of common cancers
 - Breast examination
 - Oral examination
 - Cervical cancer: VIA

4. Immunization and yellow fever vaccination clinic

- Perform vaccination under the National Immunization program
- Give 4 key messages of immunization
- Growth monitoring by anthropometry
- Monitoring of Cold chain
- Calculate the wastage factor of vaccines
- Recording, reporting and management of AEFI
- Yellow fever vaccination & documentation
- Counselling regarding optional & travel-related vaccines
- Counselling regarding breastfeeding, family planning, Infant and Young Child Feeding (IYCF) Practices, Kangaroo Mother Care, Nutritional interventions, Diarrhoea, ARI

5. Integrated Counselling and Testing Centre/ Designated STI/RTI Clinic

- Understand the mechanism and concept of pre-test and post-test counselling of clients and provide counselling
- Acquire knowledge and provide syndromic management of STI/RTI
- Acquire knowledge regarding testing strategy for HIV in a different scenario

6. Other Clinical Departments:

- General principles outlined at the start of this section must be followed for posting in all the clinical departments. The trainee should acquire knowledge and skill to diagnose and manage common conditions presenting in different speciality and to understand approach to patients presenting with common symptoms in a speciality. This would enable them to use this knowledge and skills during rural and urban health centre

postings. In addition, trainees should acquire these procedural skills during their posting

- Administration of fluid and blood components and managing complications
- Establishing venous and central line access
- Nasogastric feeding
- Gastric Lavage
- Ryle's tube insertion
- Urethral Catheterization
- Endo tracheal intubation
- Cardio Pulmonary resuscitation
- Incision and drainage, Suturing, Debridement
- Other minor surgical procedures as provided during trauma and emergency care
- Nebulization procedure/ Inhalation drug therapy via a spacer
- Normal newborn care and neonatal resuscitation
- Conduct normal and assisted labour including episiotomy
- Manage common complications during pregnancy and childbirth
- IUCD insertions
- Learn a reference range of common laboratory tests Interpretation of diagnostic tests such as laboratory tests (biochemical, microbiology and pathology),
- Interpretation of X-ray, USG, CT and MRI scan, Barium studies, etc.
- ECG tracing and its interpretation
- Pleural tap, Ascetic tap, Bone marrow aspiration, Lumbar puncture
- Common gynaecological procedures like per vaginum, per speculum examination

Distribution of paper wise topics

Paper	Topics
First	Basics sciences as applied in community medicine (<i>the concept of health and disease, epidemiology, Behavioural sciences, Population sciences & Demography, Biostatistics, Environmental Health, occupational health, including health education and health promotion</i>)
Second	Disease-specific epidemiology and recent updates in its relation (<i>Epidemiology, prevention and control of communicable and non-communicable diseases</i>)
Third	Community Medicine & Family Practice and medical education (<i>Nutrition, reproductive and child health, health care of other special groups, occupational health, Primary health care, Family Medicine, school health, mental health</i>)
Fourth	The public health system, administration and management (<i>Health care delivery system, health management and administration, National Health Programmes, International Health, Public Health legislation</i>)

ASSESSMENT

Internal assessment:

- Research Methodology examination: at the end of the 2nd semester
- End semester examination: 3rd, 4th, 5th semester
 - Theory: 100 marks
 - Practical (Case/Family presentation-50 marks, Academic presentation- 20 marks, viva – 20 marks, logbook-10)
- Pre-final examination(2months before final)
 - Theory: 100 marks
 - Practical (Case/Family presentation-50 marks, OSCE/OSPE -10 marks, Epidemiological Exercises -10 marks, Management exercise – 10 marks, viva – 20 marks)

Marks of four internal assessment will be averaged to 100 each for theory and practical.

Summative Assessment

- Theory (Four papers of 100 marks each. Maximum marks = 400)
- Practical (Maximum marks = 400)
- The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A** 200 marks	Long case/CPSCR Presentation (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/Department specific activity (Public health management, Epidemiology and biostatistics exercises)	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

** Students should pass (secure 50% marks) separately in Part A

Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

RECOMMENDED READING AND RESOURCE MATERIALS

Mandatory reading during the first six months

- Beaglehole R, Bonita R, Kjellström T. Basic Epidemiology. 2nd ed. Geneva: World Health Organization; 2006.
- Abramson JH, Abramson ZH. Survey methods in community medicine, 5th ed. Edinburgh, Churchill Livingstone; 1999.
- Gordis, L. Epidemiology, 2nd ed. Philadelphia, Saunders; 2000.
- Park K. Park's textbook of preventive and social medicine. 22rd ed. Jabalpur. Banarsidas Bhanot; 2013.
- Textbook of Public Health and Community Medicine by Rajvir Bhalvar

Mandatory reading during the remaining period

- Dietary Guidelines for Indians - A Manual. ICMR publications; 2003.
- Nutrient Requirements & Recommended Dietary Allowances for Indians, ICMR publications; 2010.
- Holland Detels R, Beaglehole R, Lansang MA, Gulliford M. Oxford Textbook of Public Health. 5th ed. Oxford. Oxford university press; 2011.
- U.S. Department of Health And Human Services. Principles of Epidemiology in Public Health Practice. 3rd ed. Atlanta. Centres for Disease Control and Prevention (CDC); 2006.
- Daly L, Bourke G J. Interpretation and Uses of Medical Statistics. 5th ed. Oxford. Blackwell science ltd; 2000.
- McMahon, Barton R, R Elizabeth, Felton. On being in charge: a guide to management in primary health. 2nd ed. Geneva, World Health Organization; 1992.
- Sathe P V. Epidemiology and Management for Health Care for all. 3rd ed. Mumbai. Vora medical publisher. 2009.

- Plotkin SA, Orenstein WA. Vaccines. Philadelphia: WB Saunders, 2004.
- Chatterjee K D. Medical Parasitology. New Delhi. CBS Publishers & Distributors. 2009.
- Last J M. A Dictionary of Epidemiology. 4th ed. New York, NY: Oxford University Press; 2001.
- Babbie E R. The Basics of Social Research. 6th ed. Belmont. Wadsworth Publishing. 2013.
- Bechhofer F, Paterson L. Principles of Research Design in the Social Sciences. London. Routledge. 2000.

Additional reading

- Katz DL, Elmore J G, Wild D. Epidemiology, Biostatistics, Preventive Medicine and Public Health. 4th Ed. Philadelphia. W.B. Saunders Company. 2013.
- Taneja D K. Health policies and programmes in India. 11th Ed. New Delhi. Doctors Publication. 2013.
- Glynn M, Drake W. Hutchison's Clinical Methods: An Integrated Approach to Clinical Practice. Philadelphia Elsevier; 2012.
- Ghai O P, Paul V K, Bagga A. OP Ghai's Essential Pediatrics. 7th Ed. CBS Publishers and Distributors. 2010.
- Agrawal S P, Chauhan L S. Tuberculosis control in India. New Delhi. Elsevier. 2005.
- Hubley J. Communicating Health: An Action Guide to Health Education and Health Promotion. 2nd Ed. Oxford. Macmillan. 2004.
- Drummond MF, Sculpher MJ, Torrance GT, O'Brien B J, Stoddart G L. Methods for the Economic Evaluation of Health Care Programmes. 3rd Ed. Oxford University Press. 2005.
- Wingo, Phyllis A. An Epidemiologic approach to reproductive health. Atlanta. Centres for Disease Control and Prevention. 1994.
- Hobson, W. The theory and practice of public health. Oxford. Oxford university press. 1969.
- Barker DJP. Practical Epidemiology. London.

Churchill Livingstone.1991.

- Gupta MC, Mahajan BK. Textbook of Preventive and Social Medicine. 3rd Ed. New Delhi. Jaypee. 2003.
- Hill AB, Hill I D. Bradford Hill's Principles of Medical Statistics. Ed.12. Hodder Education Publishers; 1991.
- MacMahon B, Pugh T F. Epidemiology: Principles and Methods. New York. Little, Brown Book Group Limited, 1970.
- Hati A K. Medical Entomology. New Delhi. Allied Book Agency; 1979.
- Wallace R B, Kohatsu N, Last J M. Wallace/Maxcy-Rosenau-Last Public Health & Preventive Medicine. New York. The McGraw-Hill Companies. 2008.
- Sharma R K. Urban Sociology. New Delhi.1997

Reports and Documents

- Annual Reports of the Ministry of Health and Family Welfare.
- World Health Statistics
- The State of the World's Children
- Bhore Committee Report (1946) Health Survey and Development Committee, Govt. of India, Delhi.
- Mudaliar Committee Report (1961) Health Survey and Planning Committee, Govt. of India, Delhi
- Shrivastav Report (1974), Health Services and Medical Education – A programme for immediate action. Group on Medical Education and Support Manpower, Ministry of Health and Family Welfare, Govt. of India, New Delhi.
- ICSSR/ICMR (1981), Health for All- An alternative strategy – Report of a Joint study group of ICSSR/ICMR, Indian Institute of Education, Pune.
- National Health Policy, (1982) Ministry of Health and Family Welfare, Government of India, New Delhi.

- All technical and operational guidelines of National Programmes published from the Ministry of Health and Family Welfare.
- Bajaj, J.S. et al (1990) Draft National Education Policy for Health Sciences, I.J.M.E. Vol.29, No.1 & 2 (Jan-August 1990)
- International Committee of Medical Journal Editors, Uniform requirements for manuscripts submitted to biomedical journals, N Engl J Med 1991; 424-8.
- Reports of NCMH (National Commission on Macroeconomics and Health)
- Health for all: An alternative strategy. ICSSR/ICMR report; FRCH. Publication, 1981
- People's Health in People's Hands – A Model of Panchayati Raj, FRCH Publication, 1993.
- Advocacy, communication and social mobilization for TB control: a guide to developing knowledge, attitude and practice surveys. WHO Publication
- Immunization Handbook for Medical Officer/Health Worker: MOHFW, GOI
- Educational Handbook for Health Personnel, Sixth Edition Updated 1998 WHO Publication
- Reports - NFHS, DLHS, SRS
- UNICEF, World Bank and UNFPA reports
- Reports of Voluntary Health Association of India (VHAI)

Acknowledgement

This MD Community Medicine curriculum of All India Institute of Medical Sciences, Bhubaneswar has been developed after referring to curriculum of various reputed institutes such as All India Institute of Medical Sciences (New Delhi), Post Graduate Institute of Medical Education and Research (Chandigarh), Jawaharlal Institute of Post Graduate Medical Education and Research (Puducherry), Mahatma Gandhi Institute of Medical Sciences (Wardha), Baba Farid University of Health Sciences (Faridkot), Mahatma Gandhi Medical College and Research Institute (MGMCRI) and Medical Council of India curriculum.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASICS SCIENCES AS APPLIED IN COMMUNITY MEDICINE

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Measles has been a key contributor to under-5 mortality. The Measles & Rubella Initiative, a broad consortium of global health agencies, has provided support to measles-burdened countries, focusing on sustaining high coverage of routine immunization of children and supplementing it with a second dose opportunity for measles vaccine through supplemental immunization activities (SIAs). Explain how Mathematical modelling can enable policymakers to adopt the optimal strategies that can be implemented in order to control measles in high burden countries and to determine the appropriate use and frequency of periodic SIAs in these countries (scheduling of SIAs to achieve measles control). 20
2. Discuss the importance of Disability-adjusted life years in public health. 10
3. Health belief model: Explain in context of control of non-communicable diseases. 10
4. Enlist and describe steps of environmental impact assessment. 10
5. Demonstrate by developing an evaluation framework of a disease screening program. 10
6. Write salient differences between Information Education Communication and Behaviour Change Communication. Develop a BCC strategy for vector control. 10
7. What is a public health intervention? Use the PRECEDE/PROCEED model to design public health intervention to decrease the suicide rate among medical students in Odisha. 10
8. Discuss key steps in designing a randomized controlled trials and possibility of bias at each step. 10
9. Enumerate and discuss strategies for prevention and control of air pollution. 10

PAPER 2

DISEASE-SPECIFIC EPIDEMIOLOGY AND RECENT UPDATES IN ITS RELATION

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Enumerate stages of a pandemic. Enlist the criteria to define Public Health Emergency of International Concern (PHEIC). Discuss outbreak response and impact mitigation efforts in context of Ebola 20
2. Component of vector surveillance for control of dengue. 10
3. Discuss control, elimination and eradication with respect to malaria. 10
4. What are the epidemiological factors responsible for cancers? What steps can be taken to prevent and control cancers in the community. 10
5. Write briefly on epidemiology and control of trachoma. 10
6. Strategies for environmental and case surveillance for polio. 10
7. The recent update in modalities for diagnosis of tuberculosis and drug resistance in tuberculosis. 10
8. Write briefly on transmission dynamics in the spread of HIV. 10
9. Critically appraise various strategies under polio end game strategy. 10

PAPER 3

COMMUNITY MEDICINE & FAMILY PRACTICE AND MEDICAL EDUCATION

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. What is the difference between maternal Mortality Ratio and Maternal Mortality Rate and explain with an example. Discuss the various determinants affecting the Maternal Mortality in India and its relation to three delay model. Mention and critically appraise various strategies initiated by Government of India in last one decade to reduce Maternal mortality? 20
2. Rationale and strategy under syndromic management of STI and RTI. 10
3. Post-exposure prophylaxis against rabies. 10
4. Community-based rehabilitation of differently-abled child. 10
5. Discuss various components of essential obstetric care. 10
6. Enumerate Health care problems in the elderly population and challenges in geriatric care. 10
7. Advantages and disadvantages of micro-teaching. 10
8. Discuss Rational use of drugs and its implications. 10
9. Management of diarrhoea using IMNCI protocol. 10

PAPER 4

PUBLIC HEALTH SYSTEM, ADMINISTRATION AND MANAGEMENT

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. What is the WHO definition of public health policy? What can an explicit public health policy achieve? Write steps and describe the steps to develop a public health policy to improve health of the tribal health community in India. 20
2. Discuss different techniques of inventory management. 10
3. Write briefly on the different mechanism of community-based health insurance. 10
4. Discuss Total Quality Management in Health care facility with respect to various standards for a CHC 10
5. As a medical officer of PHC, discuss the steps taken to undertake for outbreak investigation of mumps 10
6. Critically appraise National Health Policy 2017 10
7. Prepare a monitoring and evaluation framework for the malaria control programme. 10
8. Enumerate briefly the steps involved in supportive supervision of a sub-centre. 10
9. Discuss the role of community participation in disease control. Write briefly about the mechanism of community participation in National Health Mission. 10

ENTRUSTABLE PROFESSIONAL ACTIVITIES (EPAs)

S. No.	EPA	Competency Domains								Level of competency				MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of I year	End of II year	End of III year			
1	History taking and general physical examination	*	*	*	*	*	*	II	III	IV	IV	IV	S, P, PG, I	
2	Formulating a differential diagnosis based on history and examination	*		*			*	I	II	III	IV	IV	S, PG, I	
3	Ordering and interpretation of common diagnostic tests	*	*	*	*	*		II	III	IV	IV	IV	S, I	
4	Entering and discussing orders and prescriptions and giving the necessary instructions to the patients	*	*	*	*	*	*	I	II	III	IV	IV	S, P, PG, I	
5	Document clinical details in the patient record		*		*	*		I	II	III	IV	IV	S, PG, I	
6	Clinical presentation of a case	*		*	*	*	*	II	III	IV	IV	IV	S, PG, H	
7	Using evidence-based medicine to improve patient care	*		*				I	II	III	IV	IV	S, I	
8	Give or receive a patient handover to transition care responsibility	*	*		*	*	*	I	II	III	IV	IV	S, PG, H, I	
9	Participating efficiently as a member of an inter-professional team	*						I	II	III	IV	IV	S, PG, H, I	
10	Diagnosing conditions requiring emergency care and providing primary care	*	*	*	*	*	*	I	II	III	IV	IV	S, PG, H, P, I	
11	Obtain informed consent for tests and/or procedures	*	*		*	*	*	II	III	IV	IV	IV	S, P, PG	
12	Performing general medical and surgical procedures	*	*	*	*	*	*	I	II	III	IV	IV	S, PG, I	
13	Identifying system failures and taking appropriate corrective measures	*	*	*	*	*	*	I	II	III	IV	IV	S, PG, I	
14	Clinical management of diseases of public health importance within the broader context of environmental, family, society as per national policies	*	*	*	*	*	*	I	II	III	IV	IV	S, P, PG, H, I	

S. No.	EPA	Competency Domains							Level of competency				MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of I year	End of II year	End of III year		
15	Assess the needs of the community (including vulnerable groups) for organizing health services	*		*	*	*	*	I	II	III	IV	S, PG, H, I	
16	Organize Health Education activities in the community	*		*	*	*	*	I	II	III	IV	S, PG, C, H, I	
17	Training health workers in public health activities	*		*	*	*	*	I	II	II	III	S, PG, H, I	
18	Collect, Analyze data and Present	*		*	*	*	*	I	II	III	IV	S, PG, I	
19	Critical Appraisal of journal articles	*		*	*	*	*	I	II	III	IV	S, PG, I	
20	Plan and organize epidemiological studies	*	*	*	*	*	*	I	II	III	IV	S, PG, I	
21	Descriptive Epidemiology: Characterize the health of a community	*		*		*	*	I	II	III	IV	S, PG, I	
22	Investigate and respond to an outbreak or epidemic	*	*	*	*	*	*	I	II	II	III	S, PG, C, H, I	
23	Critically appraise health programmes, policies and legislations	*		*	*	*	*	I	II	II	III	S, PG, C, I	
24	Use of basic concepts of health economics	*		*	*	*	*	I	II	II	III	S, PG, I	
25	Analyze and interpret the budget of a health project.	*		*		*	*	I	II	II	III	S, I	
26	Develop a budget for a research study/proposal	*		*		*	*	I	II	II	III	S, I	
27	Conduct small groups sessions for undergraduate medical students	*		*		*	*	I	II	III	IV	S, PG, I, UG	
28	Conduct large groups sessions for undergraduate medical students	*		*		*	*	I	II	II	III	S, PG, I, UG	
29	Conduct a Family Health Appraisal,	*	*	*		*	*	I	II	III	IV	S, PG, C, H, I	
30	Emergency preparedness and response	*	*	*	*	*	*	I	I	II	III	S, PG, H, C, I	

S. No.	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of I year	End of II year	End of III year	
31	Identify, assess and suggest preventive and control measures for common occupational diseases	*	*	*	*	*	*	I	II	II	III	S, PG, I
32	Observe various legislations and laws pertaining to health	*		*	*	*		I	I	II	III	S, PG, H, I
33	Choose and perform appropriate statistical tests for a given situation	*		*	*	*	*	I	II	III	IV	S, I
34	Use statistical software packages (online and offline) efficiently.	*		*	*	*		I	II	III	IV	S, I
35	Organize community health services including camps	*	*	*	*	*	*	I	II	III	IV	S, PG, H, C, I
36	Locate, appraise, and assimilate evidence from scientific studies related to health problems	*		*	*			I	II	II	III	S, PG, I
37	Participate in the various disease surveillance systems of the government.	*		*	*	*	*	I	II	II	III	S, PG, I
38	Notification of diseases	*		*	*	*	*	I	II	II	III	S, I
39	Coordinate team-based health activities	*	*	*	*	*	*	I	II	III	IV	S, PG, UG, H, C, I
40	Testing of water samples	*		*				I	II	II	III	S, H, I
41	Review and comment on ongoing health programmes and schemes	*		*	*	*	*	I	II	III	IV	S, I
42	Develop linkages with the local health governance	*		*	*	*	*	I	II	III	IV	S, H, I
43	Develop linkages with local NGOs and grassroots agencies	*		*	*	*	*	I	II	III	IV	S, C, H, I
44	Use of ICT tools for classroom teaching	*		*	*	*	*	I	II	III	IV	S, UG, PG, I
45	Use of ICT tools for health education campaigns	*		*	*	*	*	I	II	III	IV	S, PG, C, I

S. No.	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of I year	End of II year	End of III year	
46	Nutritional status assessment of family's communities	*		*	*	*	*	I	II	III	IV	S, PG, I
47	Plan and implement nutritional interventions	*		*	*	*	*	I	II	II	III	S, PG, I
48	Implement vector control strategies	*		*	*	*	*	I	II	II	III	S, I
49	Implement biomedical waste management	*		*	*	*	*	I	II	II	III	S, I

Competency Domains:

MK: Medical Knowledge

PC: Patient Care

PBLI: Practice-Based Learning and Improvement

SBP: System Based Practice

P: Professionalism

ISC: Interpersonal & Communication Skills

Levels of competence:

Level I: Knowledge only; can observe

Level II: Can do under strict supervision

Level III: Can do under loose supervision

Level IV: Can do independently

Level V: Has expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I



DERMATOLOGY
&
VENEREOLOGY

MD in Dermatology & Venereology

COURSE NAME

MD in Dermatology & Venereology

DURATION OF COURSE

3 years

ELIGIBILITY

M.B.B.S

OBJECTIVES

At the end of the MD course in Dermatology & Venereology, the student should be proficient in knowledge, develop skills, inculcate ethical practice, develop communication skills and respect human values.

KNOWLEDGE

- Understanding of relevant basic sciences.
- In-depth knowledge of history, epidemiology, aetiology, pathogenesis, histopathology, differential diagnosis, general principles of diagnosis and management, control and prevention of dermatological conditions including leprosy, sexually transmitted infections and malignancies in adults and children.
- Pharmacology of topical preparations and systemic drugs used in Dermatology, Venereology and Leprosy.
- Various therapeutic options (both medical and surgical) available for a given disease and selection of appropriate therapy (considering the socio-economic, environmental and emotional determinants of the patients & family).
- Recognition of skin signs of systemic diseases and appropriate referral.
- Knowledge of information technology tools, research methodology and techniques.

SKILLS

- Elicitation of relevant and correct clinical history and presenting it in chronological order.
- Complete clinical examination and demonstration of diagnostic clinical signs or tests that will help in arriving at the correct diagnosis of dermatoses and emergencies.
- Write a complete case record with meaningful progress notes, a proper discharge summary with relevant details, and an appropriate referral note to other specialists or other health care centres.
- Informing efficiently and quickly, the relevant details of an emergency case to seniors or other specialists.
- Simple side-laboratory procedures or tests necessary to make bedside diagnosis.
- Appropriate and judicious use of laboratory tests to confirm the diagnosis.
- Method of application of various topical preparations and compresses used in the treatment of common dermatoses.
- Fluid and electrolyte replacement therapy, and blood transfusion.
- Emergency procedures like securing airway (intubation), intravenous access (IV cannula/ Venesection/ Central line), basic and advanced life supports.
- Clinical and laboratory monitoring of patients for the progress of disease, response to therapy and adverse effects of therapy.
- Common dermato-surgical and cosmetic dermatological procedures.

ETHICAL PRACTICE

- Delivery of health care irrespective of socio-economic status, race, religion or caste of the patient.
- Preservation of professional dignity, honesty and integrity.

- The practice of ethical principles in all aspects of profession.
- Follow high moral and ethical standards while carrying out research on humans or animals.
- Develop a humble attitude to accept the limitations of own knowledge and skills, and ask for help from colleagues when needed.

COMMUNICATION SKILLS

- Develop communication skills to convince the patients and/or their relatives regarding the prognosis of the disease, available treatment options, and their outcome.
- Communicate efficiently about bad news to the patient or family members.
- Listen and respond patiently to all the queries of patients regarding the disease and its management.
- Develop leadership qualities to provide a congenial working environment and get the best out of team.

RESPECT HUMAN VALUES

- Exercise empathy towards patients and their relatives, and behave appropriately.
- Respect the rights and privileges of patients including right to information and right to seek the second opinion.

SYLLABUS

THEORY: four papers

PAPER I

- Basic anatomy of the skin, appendages, mucous membranes, nerves, vasculature, human genitalia
- Basic physiology of the skin, thermoregulation, keratinocyte kinetics, glandular secretion, hair cycle
- Basic pathology
- Basic dermatopathology including special stains and immunohistochemistry

- Basic microbiology
- Basic pharmacology, formulations.
- Basic immunology
- Basic genetics, genetic counselling, prenatal diagnosis
- Basic physics involved in ultraviolet rays, laser therapy, cryotherapy, radiofrequency therapy
- History of dermatology
- Epidemiology of skin diseases
- Embryology of skin and its appendages
- Basic skin lesions and general principles of diagnosis of skin diseases

PAPER II

- Eczemas
- Papulosquamous disorders and other disorders of keratinization
- Vesiculobullous disorders including EM, SJS and TEN
- Pigmentary disorders
- Photodermatoses
- Genodermatoses
- Nevi and other developmental defects
- Disorders of hair
- Disorders of nail
- Disorders of eccrine sweat glands
- Disorders of apocrine glands
- Disorders of sebaceous glands including rosacea, flushing and perioral dermatitis
- Disorders of connective tissue
- Inflammatory and neoplastic disorders of the dermis
- Disorders of subcutaneous tissue
- Disorders of oral and anogenital mucosa
- Vascular anomalies and tumours of skin and subcutaneous tissues
- Benign and malignant tumours of epidermis and appendages
- Pathophysiology and management of pruritus
- Infections, Infestations, bites and stings

- Emerging infectious diseases (Chikungunya, Dengue and Rickettsial fever)
- Occupational and environmental dermatoses
- Skin changes due to chemical agents, drugs and transplantation
- Skin changes due to mechanical and physical factors
- Urticaria and angioedema
- Neonatal, pediatric, adolescent and geriatric dermatology
- Racial and ethnic skin diseases
- Cutaneous manifestations in pregnancy
- Cutaneous manifestations of nutritional and metabolic disorders
- Cutaneous infiltration of bone marrow and blood cells
- Cutaneous manifestations of disorders of organ systems
- Cutaneous manifestations of multisystem diseases
- Evidence-based dermatology

PAPER III

Leprosy

- History of Leprosy
- Epidemiology of Leprosy
- Microbiology of Mycobacterium leprae
- Pathogenesis of Leprosy
- Pathology of Leprosy
- Classification of Leprosy
- Clinical Leprosy
- Diagnosis of Leprosy
- Differential diagnosis of Leprosy
- Management of Leprosy
- Deformities and Disabilities in Leprosy
- Rehabilitation of Leprosy patients
- Control of Leprosy and National Leprosy Programs
- Experimental Leprosy including Vaccines

Sexually transmitted diseases and HIV/ AIDS

- History of Sexually Transmitted Diseases
- Epidemiology of Sexually Transmitted Diseases
- Sexually Transmitted Diseases and Reproductive Health
- Interaction between Sexually Transmitted Diseases and HIV infection
- Syphilis
- Gonorrhoea
- Lymphogranuloma venereum
- Granuloma Inguinale
- Herpes Genitalis
- Genital Warts
- Non-gonococcal urethritis
- Differential diagnosis of Vaginal discharge
- Syndromic management of Sexually Transmitted Diseases
- HIV/ AIDS- History, Epidemiology, Etiology, Pathogenesis, Mucocutaneous manifestations, Systemic involvement, HIV counselling, Laboratory investigations and Management
- Sexually Transmitted Diseases and HIV/ AIDS in children
- Control of Sexually Transmitted Diseases and HIV/ AIDS including Vaccines
- Human sexuality

PAPER IV

Basics of Dermoscopy and its application in dermatology

Recent advances in dermatology

Skin and systemic diseases

Metabolic disorders and skin

Dermatoses of specific body sites (eyes, ears, male & female genitalia)

Dermatotherapeutics

Topical therapy

- Topical formulations
- Principles of topical therapy
- Topical antibiotics

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- Topical antifungals
 - Topical antivirals
 - Topical antiparasitics
 - Topical steroids
 - Topical retinoids
 - Topical calcineurin inhibitors
 - Topical Vitamin D3 analogues
 - Topical contact allergens
 - Sunscreens
 - Keratolytic and comedolytics
 - Insect repellants
 - Therapeutic shampoos
 - Miscellaneous topical agents
 - Intralesional therapy

Systemic therapy

- Systemic antibiotics including antileprosy and antituberculous agents
- Systemic antifungals
- Systemic antivirals
- Systemic antiparasitic agents
- Systemic corticosteroids
- Systemic immunosuppressants and Chemotherapeutics
- Systemic retinoids
- Antimalarials
- Antihistamines
- Antiandrogens and Androgen inhibitors
- Psychotropic agents
- Intravenous immunoglobulins
- Interferons
- Biological agents
- Vasoactive and Antiplatelet agents
- Small molecules in the treatment of dermatological conditions
- Miscellaneous systemic drugs

Phototherapy

- Narrow Band UVB/ UVB/ UVA therapy and Photochemotherapy

- Extracorporeal photochemotherapy
- Photodynamic therapy

Others

- Dermatologic drug therapy in pregnancy and lactation
- Dermatologic drug therapy in infants and children

Dermatosurgery

- Local anaesthesia and Nerve blocks
- Electrosurgery
- Vitiligo surgery
- Iontophoresis
- Excision cysts
- Dermabrasion
- Nail Surgery

Cosmetic dermatology

- Chemical peels
- Lasers in dermatology
- Botulinum toxin injections

PRACTICAL

- Side laboratory procedures (Tzanck smear, KOH preparation, Slit Skin Smear, Gram stain, Z-N stain, Giemsa stain, Wet mount preparation)
- Dermatopathology
- Interpretation of radiological plates
- Wood's lamp examination
- Iontophoresis
- Dermoscopy
- Dermatological procedures
- Recognition and use of surgical instruments
- Chemical cautery
- Electrocautery & Radiofrequency cautery
- Cryotherapy
- Chemical peeling
- Laser therapy
- Phototherapy

TEACHING & LEARNING METHODS

The postgraduate students are abided by the following rules of departmental academic activities:

- Should attend teaching and learning activities as per the schedule prescribed by the department.
- Should not remain absent from academic teaching and learning activities without a valid reason and in such case, should take prior permission.
- Should have 80% or more attendance during each year to be eligible for university examination.
- Mannerisms, decorum and atmosphere of mutual respect to be maintained with teachers, senior and junior colleagues.
- The time table for the teaching schedule will be displayed every 3 monthly.
- All presentations are to be evaluated using a student-evaluation list
- All teaching and learning activities must be entered in PG student log-book

Teaching and learning activities are to be undertaken by the following methods:

Integrated lectures:

These lectures, on common systemic disorders relevant to Dermatology, Venereology and Leprosy, are conducted by departmental faculties or multidisciplinary team.

Subject seminar:

- The subjects for the seminar are chosen in a way to cover all the topics of syllabus. Scheduled time for each subject seminar is 40 minutes.
- In-depth study and literature search must be done to prepare on the topic.
- To be moderated by a teacher.
- The postgraduate student must prepare the seminar in close association and suggestions from the moderator

Journal club:

- Preferably original articles or studies are selected.
- The articles are chosen from the Dermatology, Venereology and Leprosy journals and journals of allied sciences.
- Critical appraisal of the components of an article, such as the title of the article, aims and objectives, material and methods, statistical methods, results, discussion, and conclusion are to be done.
- A conclusion of the article is drawn.
- Any reportable criticism should generate an item of communication.

Clinical case presentation

The case has to be allotted to the student 2-3 days earlier for a complete workup.

Bed-side teachings / Weekly grand rounds

Postgraduate students should work up the newly admitted patients and present to the teacher. The details of case like, diagnosis, management and monitoring are discussed.

Clinico-pathological correlation

The histopathology of common dermatoses and also dermatoses with specific histopathological features are discussed, if necessary, in association with faculties from pathology.

Interdepartmental meetings

- Pathology
- Microbiology
- Radiology
- Plastic surgery

Rotatory postings

- General Medicine: 15 days
 - a. Management of shock
 - b. Fluid and electrolyte therapy, and Blood transfusion

- c. Management of common emergencies, status epilepticus, status asthmaticus
- d. Management of collagen vascular disorders
- Pathology: 15 days
 - a. Specimen processing, Hematoxyline and Eosin staining
 - b. Special staining methods for structures/ components of skin and its appendages
 - c. Normal histopathology of skin and its appendages
 - d. Recognition of basic histopathological reactive patterns of structures/ components of skin and its appendages in various disorders
 - e. Identification of normal and abnormal cells in the skin and its appendages
 - f. Immunofluorescence technique
- Microbiology: 15 days
 - a. Collection and Transportation of clinical specimen
 - b. Staining Techniques
 - c. Culture methods
 - d. Serology techniques
 - e. Sterilization and antiseptic methods
 - f. Universal precaution and Disposal of Bio-medical wastes
- Pediatrics: 7 days
 - a. Examination of a child
 - b. Fluid and Electrolyte therapy, and blood transfusion
 - c. Nutritional supplementation
- Plastic Surgery: 7 days
 - a. Cosmetic surgical techniques

Attending Conferences, Continued medical education, Workshops

The postgraduate students are encouraged to present scientific papers or posters at various scientific meets.

Paper presentation in at least one national and one regional conference and participation in Quiz program is desirable.

Development of Teaching Skills

Postgraduate students should take bedside clinics or demonstrations for undergraduate students.

Performing social responsibility

The postgraduate students should take active part in health camps /social day celebrations / public teaching on special occasions from time to time.

Development of organizing capacity

The postgraduate student should get actively involved in organizing CME / conferences / workshop conducted by the department.

Thesis

- Thesis protocol to be submitted by the end of the first 5 months
- Thesis work to be carried out on a daily basis under the supervision of guide
- Progress reports for the thesis to be presented before guide every 3 monthly.

Logbook

The postgraduate student must register daily academic activities in the logbook and get it signed by the respective teacher.

ASSESSMENT

Internal examinations

1. Examination on Biostatistics & Research Methodology
 - Time: End of 2nd semester (June & December)
 - Total marks: 100
 - A postgraduate student has to secure pass-marks (>50%) in this examination to be eligible for appearing in final examination

- Students securing < 50% marks have to re-appear in the next examination.
- Practical: 70
- *Viva voce*: 20
- Logbook: 10

2. Internal examinations: 4

- At the end of 3rd, 4th & 5th semester
- Pre-final (2 months before final examination)

Marks distribution for internal examination (Total marks: 200):

- Theory paper: 100

The average marks secured in 4 internal examinations (each for Theory & Practical) will be counted as internal assessment. The student has to secure 50% marks in internal assessment (each theory and practical) examinations to become eligible for appearing to the final examination.

Summative / Final examination

1. Theory examination: 4 papers (100 marks each)

Total marks allotted for theory examination: 500 (Internal 100; Theory papers: 400)

Marks distribution for theory question papers:

- Long question: 1 (20 marks)
- Short questions / notes: 8 (8 X 10=80 marks)

A student has to secure 50% marks (200 out of 400) to pass the final theory examination

2. Practical examination:

Total marks allotted for practical examination: 500 (Internal 100; Practical & *Viva-voce*: 400)

The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A** 200 marks	Longcase (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

** Students should pass (secure 50% marks) separately in Part A

Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

Protocol for thesis evaluation

- Time for thesis submission: Six months ahead of the final examination
- Plagiarism check: Final un-bound thesis will undergo plagiarism check. If > 20% plagiarism is detected, the thesis will be returned to the student for re-writing.
- **Selection of Thesis Evaluator:** A list of tentative thesis evaluators from Govt. Medical Colleges & INIs with PG courses in Dermatology & Venereology will be provided to the Controller of Examination to form the panel of thesis evaluator. The thesis evaluator will be selected by the Controller of Examination from this panel.
- Thesis & evaluation sheet will be sent to the external evaluator. The final options for evaluation are: Accepted / Accepted with modification / Rejected. If accepted with modification / rejected, comments about suggested changes or reason for rejection are to be mentioned by the reviewer.
- Comments for suggested modifications will be intimated to the student and the guide. The student has to address the comments of the thesis evaluator and rewrite. The corrected version will be scrutinized by a departmental committee for final approval.
- In case a thesis is rejected, it has to be re-sent to the thesis evaluator for re-evaluation.
- Approval of the thesis is mandatory before the student appears for the final examination.

RECOMMENDED BOOKS

1. Atlas and Synopsis of Lever's Histopathology of the Skin: Wolters Kluwer Health; 2013.
2. Andrews GC, Domonkos AN, Arnold HL, Odom RB. Andrews' Diseases of the Skin: Clinical Dermatology: Saunders; 1982.
3. Arya OP, Osoba AO, Bennett FJ. Tropical venereology: Churchill Livingstone; 1988.
4. Baran R, Maibach H. Textbook of Cosmetic Dermatology: CRC Press; 2010.
5. Baumann L. Cosmetic Dermatology: Principles and Practice: McGraw-Hill; 2002.
6. Bologna JL, Schaffer JV, Cerroni L. Dermatology: Elsevier Health Sciences; 2017.
7. Bruess CE, Greenberg JS. Sexuality Education: Theory and Practice: Jones and Bartlett Publishers; 2004.
8. Burns T, Breathnach S, Cox N, Griffiths C. Rook's Textbook of Dermatology: Wiley; 2013.
9. Fisher AA, Falah KA, Atwater AR, DeKoven JG, Fowler JF, de la Feld SF, et al. Fisher's Contact Dermatitis: Contact Dermatitis Institute; 2019.
10. Freedberg IM, Fitzpatrick TB. Fitzpatrick's Dermatology in General Medicine: McGraw-Hill; 2003.
11. Hastings RC. Leprosy: Churchill Livingstone; 1994.
12. Hogeling M. Case-Based Inpatient Pediatric Dermatology: Springer International Publishing; 2016.
13. Holmes K, Sparling P, Stamm W, Piot P, Wasserheit J, Corey L, et al. Sexually Transmitted Diseases, Fourth Edition: McGraw-hill; 2007.
14. Holmes KK, Control CfD. Sexually transmitted diseases: Epidemiology Program Office; 1984.
15. Hurwitz S. Clinical Pediatric Dermatology: A Textbook of Skin Disorders of Childhood and Adolescence: Saunders; 1993.
16. Irvine PDAD, Hoeger PDPH, Yan PDAC. Harper's Textbook of Pediatric Dermatology: Wiley; 2011.
17. Jopling WH. Handbook of Leprosy: Heinemann Medical; 1978.
18. Kumar B, Kar HK. IAL Textbook of Leprosy: Jaypee Brothers, Medical Publishers Pvt. Limited; 2015.
19. Lever WF, Elder DE, Elenitsas R, Johnson BL, Murphy GF. Lever's Histopathology of the Skin: Wolters Kluwer Health; 2009.

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20. Marks JG, Elsner P, DeLeo VA. Contact & Occupational Dermatology: Mosby; 2002.
21. Masters WH, Johnson VE, Kolodny RC. Human sexuality: Little, Brown; 1985.
22. McMillan A, Young H. Clinical Practice in Sexually Transmissible Infections: Saunders; 2002.
23. Patterson JW. Weedon's Skin Pathology: Elsevier Health Sciences; 2014.
24. Petres J, Darroll R, Burgdorf W, Rompel R, Robins P. Dermatologic Surgery: Textbook and Atlas: Springer Berlin Heidelberg; 2012.
25. Ponzetti JJ. Evidence-based Approaches to Sexuality Education: A Global Perspective: Taylor & Francis; 2015.
26. Rocken M, Schaller M. Color Atlas of Dermatology: Thieme; 2012.
27. Schachner LA. Pediatric dermatology: Churchill Livingstone; 1995.
28. Sharma V. Sexually Transmitted Diseases and AIDS: Anshan; 2004.
29. Wolverton SE. Comprehensive Dermatologic Drug Therapy: Expert Consult - Online and Print: Elsevier Health Sciences; 2012.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

DERMATOLOGY & VENEREOLOGY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Discuss the cutaneous barrier function with its clinical importance. (10+10=20)
2. Write notes on the following: (10 X 8 =80)
 - a. Discuss about the mechanism of resistance, clinical implications and treatment of Methicillin-resistant Staphylococcus aureus (MRSA). (2+4+4)
 - b. Discuss the role of Langerhans' cell in immunity and cutaneous disease. (5+5)
 - c. Enumerate the dermatological use, and side-effects of Calcipotriol. (5+5)
 - d. Stains used for collagen and its application in cutaneous diseases (5+5)
 - e. Role of Tumour necrosis factor-alpha in inflammation (10)
 - f. Enumerate the small muscles of the hand, their nerve supplies and involvement in leprosy (2+2+6)
 - g. Illustrate the structure of dermo-epidermal junction and its clinical implications (7+3)
 - h. Discuss the importance of Toll-like receptors in cutaneous diseases and therapy. (6+4)

PAPER 2

DERMATOLOGY & VENEREOLOGY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Enumerate various trigger factors that may provoke atopic dermatitis. Discuss pathogenesis –directed treatment options for atopic dermatitis. (10+10=20)
2. Write notes on the following: (10 X 8 =80)
 - a. Discuss the etiology, clinical features and management of Chronic graft vs. host disease (2+4+4)
 - b. Discuss the etiology, investigations and treatment of Dermographism. (2+4+4)
 - c. Mucous membrane pemphigoid: Etiology, pathogenesis, investigations and management (2+2+3+3)
 - d. Discuss how to approach to a case of Antiphospholipid syndrome. (10)
 - e. Enumerate cutaneous manifestations of rheumatoid arthritis. (10)
 - f. Discuss the mechanism and management of Tropical ulcer. (3+7)
 - g. Discuss about the role of Nickel in contact dermatitis (10)
 - h. Outline the management of a child with Lamellar ichthyosis (10)

PAPER 3

DERMATOLOGY & VENEREOLOGY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Discuss pathogenesis, clinical features and management of type 2 lepra reaction (10+5+5=20)
2. Write notes on (10 X 8=80)
 - a. How to approach to a case with extragenital gonococcal infection? (10)
 - b. Illustrate the ultrastructure of Mycobacterium leprae. (10)
 - c. Outline the treatment of syphilis in pregnant women. (10)
 - d. How to manage the contacts of a case of leprosy? (10)
 - e. Discuss on the principles of universal precautions. (10)
 - f. Outline the management of neuritis in leprosy. (10)
 - g. Discuss about the diagnosis and treatment of Ophthalmia neonatorum. (5+5)
 - h. What are the methods of prevention of mother-to-child transmission (PMTCT) of HIV infection? (10)

PAPER 4

DERMATOLOGY & VENEREOLOGY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Enumerate various methods of hair transplantation techniques and describe 'Follicular Unit Transplantation (FUT) (5+15=20)
2. Write notes on the following: (10 X 8 =80)
 - a. What are the use of Rapamycin in Dermatology? (10)
 - b. Discuss about etiology, clinical presentation and management of acute generalized exanthematous pustulosis. (2+4+4)
 - c. Enumerate the principle, use and side effects of Excimer phototherapy (2+4+4)
 - d. Discuss about differential diagnosis, dermoscopic features and histopathology Trichotillomania. (2+4+4)
 - e. Discuss on the classification, clinical presentation and treatment Kaposi's sarcoma. (2+4+4)
 - f. Outline the management of Methotrexate toxicity. (10)
 - g. What are role in of Fillers in dermatology? (10)
 - h. Outline the treatment of Facial wrinkles. (10)

YEAR-WISE ENTRUSTABLE PROFESSIONAL ACTIVITIES (EPA) FOR MD RESIDENTS

		Competency domains						Level of competency				
		Clinical	Analytic	Skill development	Administrative	Academic	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year		
1.	Clinical parameters											
a.	History taking for common dermatological diseases, STIs and Leprosy	*	*	-	-	-	I	III	IV	V		
b.	General physical examination	*	-	*	-	-	III	IV	V	V		
c.	To identify primary, secondary & specific skin lesions	*	-	-	-	-	I	III	IV	V		
d.	Formulating provisional & differential diagnosis based on history and examination	-	*	-	-	-	I	II	III / IV	IV		
e.	Clinical presentation of a case	*	*	*	-	-	I	III	IV	V		
f.	Ability to manage inpatients	*	*	-	*	-	I	II / III	III / IV	IV		
g.	Diagnosing conditions requiring emergency care and providing primary care	*	*	-	-	-	I	II	III / IV	IV / V		
h.	Identifying system failures and taking appropriate corrective measures	*	*	*	-	-	I	II	III	IV / V		
2.	Analytic parameters											
a.	Advise and interpretation of diagnostic tests	-	*	*	-	-	I	II / III	IV	V		
b.	Understand various formularies and prescribe them appropriately.	-	*	*	-	-	I	II / III	IV	V		
3.	Skill development parameters											
a.	Performing minor procedures <ul style="list-style-type: none"> • Diascopy • Chemical cautery 	-	-	*	-	-	I	II / III	IV	V		

b.	Performing common surgical procedures <ul style="list-style-type: none"> • Skin biopsy • Excision biopsy • Comedone extraction • Paring 	-	-	-	*	-	-	I	II / III	IV	V
c.	Able to do side-laboratory procedures: <ul style="list-style-type: none"> • Tzanck test, • KOH mount, • Gram's stain • Giemsa stain • Slit Skin smear & ZN stain 	-	-	-	*	-	-	I	III	IV	V
d.	Able to use common equipment <ul style="list-style-type: none"> • Microscope • Wood's lamp • EC / RFC machine • Cryotherapy 	-	-	-	*	-	-	I	III	IV	V
e.	Able to use advanced equipment procedures <ul style="list-style-type: none"> • Phototherapy unit • Lasers • Dermoscope 	-	-	-	*	-	-	I	II	III	IV / V
f.	Advanced procedures <ul style="list-style-type: none"> • Chemical peels • Nerve biopsy • Microdermabrasion • PRP / FRP therapy 	-	-	-	*	-	-	I	II	III	IV / V

4. Administrative parameters										
a.	Obtain informed consent for tests and/or procedures	-	-	-	*	-	I	II	III / IV	V
b.	Patient record keeping	-	-	-	*	*	I	II	III / IV	V
c.	To work in an integrated manner with other departments	-	-	-	*	-	I	II	III / IV	V
d.	Adopt preventive measures at individual & community level for communicable & non-communicable diseases, venereal diseases and leprosy	-	-	-	*	-	I	II	III / IV	V
5. Academic parameters										
a.	Able to write scientific papers (min 1)	-	-	-	-	*	I	I	II	III / IV
b.	Able to make podium presentation (min 1)	-	-	-	-	*	I	II	III / IV	IV / V
c.	Up to date with recent advances in dermatology/STI/leprosy/drugs	-	-	-	-	*	I	II / III	III / IV	V
d.	Able to provide effective clinical teaching to UG students	-	-	-	-	*	I	II	III / IV	V
e.	Using evidence-based medicine to improve patient care	-	-	-	-	*	I	II	II / III	III / IV

Levels of competency:

Level I: Knowledge only; can observe

Level II: Can do under strict supervision

Level III: Can do under loose supervision

Level IV: Can do independently

Level V: Has expertise to teach others



EMERGENCY MEDICINE

MD in Emergency Medicine

COURSE NAME

MD in Emergency Medicine

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

GOALS

- To produce emergency physicians who are competent enough to identify the critically ill and injured patients, providing safe and effective immediate care with their expertise in resuscitation and skill in the practical procedures.
- To improve the safety and quality of care to the patients in Emergency Departments.
- To impart teaching to undergraduates, paramedical personnel and postgraduates from other specialities regarding the basic management of common emergencies.
- To keep up-to-date and be familiar with all recent advances in the field of Emergency Medicine.
- To develop communication skill with the patient and their relatives by maintaining patient dignity and privacy.
- To have knowledge in medico-legal cases and the importance of documentation.
- To acquire the spirit of scientific research and be oriented to research methodology.
- To serve as a future teacher, trainer, researcher and leader in the field of Emergency Medicine.

OBJECTIVES

At the end of three years, the Postgraduate student should:

- Be able to describe the clinical presentation of various diseases/disorders that occur in emergency situations; describe etiology, pathogenesis, principles of diagnosis and management of common conditions presenting as emergencies; recognize and manage appropriately all trauma patients in right time; be able to recognize the conditions beyond the area of specialty/competence and refer to appropriate specialist in time.
- Be able to perform triage i;e primary/secondary assessment and management of emergency patients; to take focused history and interpret the investigations; perform the life saving procedures needed in emergency situation like CPR, airway management, ventilation, vascular access, chest tube drain, etc.
- Be able to acquire communication and maintain interpersonal skills with the patient and their relatives, colleagues, subordinate staff, police and other workers of the society.
- Be able to work as a team leader or member, maintain patient confidentiality, manage unconscious patient, understand the limitations of therapeutic interventions, maintain medico-legal documentation, and collect and preserve the evidence.
- Be able to teach undergraduate students, nurses and other health professionals.
- Be ble to do research in emergency medicine and critical appraisal of scientific literature.

SYLLABUS CONTENT

- Resuscitation: Cardiopulmonary resuscitation, trauma resuscitation, anaphylaxis.
- General: Emergency medical services organization (infrastructure/resources, administration), Pre-hospital equipment and adjuncts, Medical transport, Disaster preparedness, medicolegal principles.

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- Respiratory emergencies: Acute respiratory distress, disorders of airway disorders, disorders of lungs, pleura, chest wall, pulmonary oedema, obstructive/restrictive lung diseases, hemoptysis, respiratory tract infection, pneumonia, embolism and traumatic lung injury.
 - Cardiovascular emergencies: Ischemic heart disease, Arrhythmias, Hypertensive disorder, Cardiac contractility disorder, Congenital heart disease, Valvular disease, Infectious disease of heart and blood vessels, Vascular and thromboembolic disease, Aneurysmal disease.
 - Shock: Hypovolemic shock, Neurogenic shock, Cardiogenic shock, Distributive shock, Obstructive shock, Endocrine shock.
 - Neurological emergencies: Stroke disorders, Infectious diseases of the nervous system, Tumors of brain and spinal cord, Neuromuscular diseases (myasthenia gravis), movement disorders, Altered sensorium.
 - Gastrointestinal and Hepatobiliary: Acute abdomen (bowel perforation, obstruction, appendicitis), Nausea and vomiting, Esophageal spasm, Achalasia, Hematemesis, Gastritis, Gastric outlet obstruction, Acute gastritis, Peptic ulcer disease, Hepatitis, Cholecystitis, Pancreatitis, Infections of the GI tract, Anorectal diseases.
 - Wound Assessment and Management: Wound preparation and dressings, Lacerations, Puncture wounds, Suturing, Burn wound management, Amputations, Degloving injuries, Soft tissue injury.
 - Analgesia: Local anaesthesia, Nerve blocks, Sedation for short procedures, Pharmacology of anaesthetic drugs.
 - Orthopedics emergencies: Fracture immobilization, Plastering, Cast, Splint, Reduction of joint dislocations,
 - Trauma: Triage, Primary and Secondary survey, Cervical spine evaluation and management, Traumatic brain injury, Cardiothoracic Trauma, Abdominal trauma, Extremity Trauma, Spine trauma, Penetrating injuries, Burn injuries,
 - Weapons of mass destruction (chemical, biological and radiological agents).
 - Obstetric and Gynecologic Emergencies: Abnormal uterine bleeding, Ectopic pregnancy, Antepartum and postpartum haemorrhage, hypertensive disease of pregnancy.
 - Pediatric Emergencies: Resuscitation of neonates and children, Intravenous access, Endotracheal intubation, Infectious diseases, Trauma, Procedural sedation, Respiratory, Cardiac, GI system emergencies, Haematologic emergency, Altered mental status, Seizure disorder, Child abuse and neglect.
 - Otolaryngologic Emergencies: Ear pain, Otitis externa, Otitis media, Foreign body ear, Epistaxis, Nasal foreign bodies,
 - Ophthalmic Emergencies: Conjunctivitis, Corneal abrasion, Dacryocystitis, Foreign bodies, Keratitis, Glaucoma, Hyphaema, Chorioretinitis, Optic neuritis, Papilledema, Vitreous haemorrhage, Retinal detachment.
 - Endocrine Emergencies: Diabetes ketoacidosis, Hyperosmolar hyperglycemic state, Hypothyroidism, Hyperthyroidism, Adrenal insufficiency.
 - Acid-Base and Electrolytes imbalance: Acid-base disorders (Respiratory/metabolic acidosis and alkalosis), Anion gap, Respiratory physiology, Fluid and electrolytes balance, Hyponatremia, Hypernatremia, Hypokalemia, Hyperkalemia, Magnesemia and phosphate physiology.
 - Urogenital Emergencies: Urinary retention, Renal failure, Urinary tract infection, Cystitis, Pyelonephritis, Complications of dialysis, Haemolytic uremic syndrome, Glomerulonephritis, Nephrotic syndrome, Genital lesions, Hernias, Balanoprophitis, Epididymitis, Orchitis, Fournier's gangrene, Testicular torsion, Priapism, Phimosis.
 - Hematologic and Transfusion Emergencies: Bleeding disorder, Sickle cell disease, Anemia, Thrombocytopenia, Pancytopenia, Leukemia.
 - Acute Pain Management: Physiology of pain, Analgesic drugs and management of pain.
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- Imaging: X-ray, CT scan, MRI, Ultrasonography and Echocardiography in Emergency.
 - Toxicology: Drugs and chemicals poisoning, Pesticides, Caustic ingestions, Drug overdose, Industrial toxins, Herbal poisons.
 - Bites and Stings: Snakebites, Animal bite, and Insect stings.
 - Environment Emergencies: Heat and cold injuries, Drowning, Lightning injuries, High altitude disorders.
 - Infectious Disease: Bacterial, Viral, Fungal, Parasitic and Zoonotic diseases.
 - Psychosocial and violence: Mental health disorders, Acute agitation, Mood disorder, Psychoses, Substance abuse disorders, Sexual assault, Intimate partner violence, Abuse of the elderly and impaired.
 - Neurological
 - Lumbar puncture
 - Burr hole and external ventricular drain placement
 - Gastrointestinal
 - Ryle's tube insertion
 - Paracentesis
 - Respiratory
 - Mechanical ventilation
 - Intercostal chest drain
 - Needle thoracentesis
 - Needle and tube thoracotomy
 - Trauma
 - Cervical spine protection
 - Cervical collar application
 - Supra-pubic catheterization
 - Wound management (preparation, debridement, closure, dressing)
 - Suture techniques
 - Splinting/Immobilization
 - Spinal immobilization
 - Logrolling
 - Helmet removal
 - Reduction of dislocations
 - Traction splints
 - Plaster technique
 - Pelvic stabilization
 - Local and regional anaesthesia

PROCEDURAL SKILLS IN EMERGENCY

MEDICINE:

- Resuscitation
 - Cardiopulmonary resuscitation
 - Use of Defibrillator/Automated External Defibrillator/Cardioversion
- Airway (for all age group)
 - Basic airway management (opening airway)
 - Bag and mask ventilation
 - Supraglottic airway insertion
 - Endotracheal intubation
 - Tracheostomy
 - Cricothyroidotomy
- Cardiovascular
 - ECG interpretation
 - Central venous access (IJV, SCV, Femoral)
 - Intra-osseous access
 - Venesection
 - Arterial cannulation
 - Cardiac pacing
 - Peri-cardiocentesis
- Toxicology
 - Decontamination
 - Gastric lavage
- Obstetrics and Gynaecology
 - Delivery
 - Speculum examination

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- Others
 - Bladder (Foley) catheterization/Supra-pubic catheterization
 - Nasal packing
 - Foreign body removal
 - Ocular techniques
 - Slit lamp
 - Reducing paraphimosis
 - Incision and drainage of abscess
 - Imaging
 - X-ray
 - Ultrasonography
 - Computed Tomography
 - Magnetic Resonance Imaging
 - Interpretation of laboratory reports
 - Haemogram
 - Biochemical
 - Acid-Base
 - Electrolytes
 - Transportation/Transfer of patients
 - Intra-hospital
 - Inter-hospital
 - Communications
 - Interpersonal
 - To patient and relatives
 - Major incident planning
 - Mass casualty
 - Disaster
- Toxicology – 7 days
 - Orthopedics – 15 days
 - Surgery – 15 days
 - Mandatory ACLS, PALS, ATLS and ENLS provider course
 - Second Year:
 - Emergency Department – 9 months
 - Anaesthesia – 15 days
 - ICU – 1 month
 - CCU – 15 days
 - PICU – 7 days
 - NICU – 7 days
 - ENT – 7 days
 - Ophthalmology – 7 days
 - Third Year:
 - Emergency Department – 10 months
 - Neurosurgery – 15 days
 - ICU - 90 days
 - Higher institute visit - 15 days

Logbook

The candidate is required to maintain a logbook for clinical and procedure skills during the academic tenure. The logbook has to be updated daily and counter checked and endorsed by the trainer.

CLINICAL POSTING

- First Year:
 - Orientation (including BLS)- 1 month
 - Emergency Department – 9 months
 - Radiology – 15 days
 - Labour and delivery – 7 days

Minimum number of Skills/Procedures to be performed independently

Procedure	Minimum to be performed independently
Bag mask ventilation	100
Tracheal intubation (Adult)	100
Tracheostomy	10
Pediatric and neonatal airway management	35
Cardiopulmonary resuscitation	50
Defibrillation	50
Cardioversion	15
Cardiac pacing (Transvenous)	10
Thrombolysis	20
Ventilator management	100
Intercostal chest tube	10
Needle thoracentesis	10
Suprapubic catheterization	5
Central venous access (IJV-25, SCV-10, Fem V-15)	50
Suturing (various techniques)	100
Arterial cannulation for monitoring/sampling	50
Venesection	10
Intraosseous access	10
Ultrasound (Abdomen-50, Thorax-50 and echocardiogram-25)	125
Nasal packing	10
Foley's catheterization	100
Paracentesis	10
Pericardiocentesis	5
Wound care	100
Splint application for various fractures	100
Spinal immobilization	10
Reduction of joint dislocations	20
Plaster techniques for various fractures	50

Cervical collar application	10
Pelvic stabilization	5
Local and regional anaesthesia	50
Conscious sedation and analgesia	10
Nerve blocks	10
Normal Delivery	10
Lumbar puncture	10
Burr hole and external ventricular drain insertion	5
Reducing paraphimosis	5
Nasogastric tube insertion	100
Incision and drainage of abscess	50
Analysis of plain X-ray films(chest-150, abdomen-25, extremity- 25)	200
Analysis of CT scans (Brain-150, Thorax-20, Spine-20, Abdomen-10)	200
Gastric lavage	20

DEPARTMENTAL ACADEMICS

1. Seminar – once a week
2. Journal club – once a fortnight
3. Case presentation – once a week
4. Mortality meeting – once a month
5. Lectures – once a week
6. Clinico-Pathological Conference – once a month
7. Attend and participate in Undergraduate classes
8. Take clinical classes for Undergraduate students
9. To present a paper at the national level conference

THESIS

- Objectives:
The student should be able to do the planning and conducting a systematic scientific inquiry, data analysis and deriving conclusion.
- The protocol should be submitted within five

months of starting the course and submitted six months before final examination. If more than 20% plagiarism is detected, the student will be asked to re-write and re-submit. The plagiarism checking will be done before the binding work. The thesis will be sent to one external evaluator for approval.

ASSESSMENT

Examination on Research methodology and biostatistics: It will be of 100 marks conducted by the Examination Cell at the end of 2nd semester (in the month of June & December). It will be considered as an internal examination and no marks will be added to the final/summative examination. Candidate should pass this examination to be eligible to appear for final examination.

The total mark for MD Emergency Medicine will be distributed as follows

- Internal Examination: At the end of 3rd, 4th, 5th semester and Pre-final examination (2 months before final examination). In each internal examination, there is 100 marks in theory and 100 marks in Practical (practical-70 + viva-

20 + logbook-10). The marks of the 4 internal examinations will be averaged to 100 each for theory and practical.

- Theory paper–Total 500 marks
4 papers (100 marks each)- 400 marks
Average of 4 internal examination- 100 marks

Paper 1: Basic sciences as relevant to Emergency Medicine (Applied Anatomy, Clinical Physiology, Clinical Biochemistry, Clinical Pharmacology, Clinical Microbiology, Clinical Pathology, Research Methodology, Biostatistics)

Paper 2: Emergency Medicine (Medicine, Cardiology, Neurology, Gastroenterology, Pulmonary Medicine, Dermatology, Psychiatry, Toxicology)

Paper 3: Emergency Medicine (Surgery, Trauma, Orthopedics, Obstetrics& Gynaecology, Anesthesiology, Eye, ENT, Urology, Dental, Radiology)

Paper 4: Recent advances in Emergency Medicine (Pediatrics, Principles of Pre-hospital Care, Disaster Medicine, Forensic Medicine)

Question paper format:

One long question- 20 marks

Eight short questions/notes- 8 x 10 = 80 marks

- Practical - 500 marks (practical & viva in final exam- 400 marks + average of 4 internal practical exam- 100 marks)

- The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A** 200 marks	Longcase (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

** Students should pass (secure 50% marks) separately in Part A

Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

RECOMMENDED BOOKS

1. Aghababian R. Essentials of Emergency Medicine: Jones and Bartlett; 2006.
2. Cameron P, Browne GJ, Mitra B, Dalziel S, Craig S. Textbook of Paediatric Emergency Medicine: Elsevier Health Sciences; 2018.
3. Cameron P, Little M, Jelinek G, Kelly AM, Brown AFT. Textbook of Adult Emergency Medicine E-Book: Elsevier Health Sciences; 2014.
4. David SS, Brown AFT. Textbook of Emergency Medicine: Lippincott Williams & Wilkins; 2012.
5. Fleisher GR, Ludwig S. Textbook of Pediatric Emergency Medicine: Wolters Kluwer/Lippincott Williams & Wilkins Health; 2010.
6. Hamilton GC. Emergency Medicine: An Approach to Clinical Problem-solving: Saunders; 2003.
7. Hogan DE, Burstein JL. Disaster Medicine: Lippincott Williams & Wilkins; 2007.
8. Marx JA, Hockberger RS, Walls RM, Adams J. Rosen's Emergency Medicine: Concepts and Clinical Practice: Mosby; 2002.
9. Roberts JR, Hedges JR. Clinical Procedures in Emergency Medicine: Elsevier Health Sciences; 2009.
10. Schwartz G, Hanke BK, Mayer TA, Cohen JS, Roth PB. Principles and Practice of Emergency Medicine: Wolters Kluwer Health; 2015.
11. Skinner D, Skinner DV, Swain A, Robertson C, Peyton JWR. Cambridge Textbook of Accident and Emergency Medicine: Cambridge University Press; 1997.
12. Strange GR, Ahrens W, Lee P, McQuillin KK. Pediatric Emergency Medicine: Just the Facts: McGraw-Hill; 2003.
13. Tintinalli JE, Stapczynski JS. Tintinalli's Emergency Medicine: A Comprehensive Study Guide: McGraw-Hill; 2011.
14. Wyatt JP, Illingworth RN, Graham CA, Hogg K, Robertson C, Clancy M. Oxford Handbook of Emergency Medicine: OUP Oxford; 2012.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the components and function of normal cardiac conduction system. Enumerate the indications of permanent pacing. Describe the techniques and their complications of temporary pacing. (20)
2. Enumerate the types of tachyarrhythmia. Describe the management of tachyarrhythmia as per ACLS guidelines. (10)
3. Classify the anti-arrhythmic drugs. Enumerate mechanism of action, pharmacokinetic, indications, dosing and adverse effects of amiodarone. (10)
4. Enumerate the principles of wound management in the emergency department. Describe the methods of wound preparation. (10)
5. Enumerate the steps of basic life support. (10)
6. Enumerate the tests of hemostasis for deriving diagnosis of a bleeding patient. (10)
7. Define hyperkalemia. Describe the management of hyperkalemia. (10)
8. Enumerate the descending and ascending tracts of spinal cord with diagram. Describe the types of spinal cord injury and their clinical features. (10)
9. Enumerate the risk factors, pathophysiology, clinical features, prevention and treatment of high altitude pulmonary edema. (10)

PAPER 2

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. A 45 years old male farmer was brought to the emergency department, who was diaphoretic, with frothing from mouth. His heart rate was 40/minute, systolic BP of 60 mm of Hg, and had pinpoint pupils. Enumerate the differential diagnosis of this patient. Describe the clinical syndromes, management, and disposition of this patient from emergency department. (20)
2. Enumerate the imaging methods and their features of a patient of suspected aortic dissection. (10)
3. Enumerate the indications, contraindications of thrombolysis in a patient with acute myocardial infarction. Describe the pharmacology of tenecteplase. (10)
4. What are the heat emergencies? Describe clinical features, diagnosis, treatment and prevention of heat stroke. (10)
5. Describe the management of a patient with agitation. (10)
6. Describe the approach of a patient with pain abdomen. (10)
7. Enumerate the clinical presentation, investigations and management of an ischemic stroke patient. (10)
8. Describe the clinical features and management of pulmonary thromboembolism. (10)
9. Enumerate the differential diagnosis of a patient with breathlessness coming to emergency department. Describe the treatment of acute exacerbation of chronic obstructive pulmonary disease. (10)

PAPER 3

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. A 35-year-old male brought to the emergency department with history of road traffic accident. His heart rate- 90/min, blood pressure 90/62 mmHg, oxygen saturation 82% in room air and having difficulty in breathing. Enumerate the steps of managing this patient in emergency department. Describe the differential diagnosis of breathlessness. Describe the management of pneumothorax. (20)
2. Describe the clinical presentation, diagnosis and management of amniotic fluid embolism. (10)
3. Describe the methods of wound closure. Enumerate the methods for repair of a lacerated wound. (10)
4. Define dislocation of a joint. Describe the types of gleno-humeral dislocations. Describe the Kocher's technique. (10)
5. Describe the indications, anatomy and technique of intercostal nerve blocks. (10)
6. Describe the causes, clinical features and management of acute painful vision loss. (10)
7. Describe the pathophysiology, clinical feature and treatment of acute otitis media. (10)
8. Describe the clinical feature, diagnosis and treatment of testicular torsion. (10)
9. Enumerate the types of dental luxation injuries. Describe the management of tooth avulsion. (10)

PAPER 4

Max. Marks:100

Time: 3 hrs

Attempt ALL questions

Illustrate your answer with SUITABLE DIAGRAMS

1. Describe the new diagnostic criteria for acute kidney injury. How will you investigate and manage a case of acute kidney injury in the emergency department. (20)
2. Describe the pathophysiology of diabetic ketoacidosis. Enumerate diagnosis and treatment of diabetic ketoacidosis. (10)
3. Describe the surviving sepsis campaign guidelines. (10)
4. Enumerate the types of adrenal insufficiency. Describe the clinical features, diagnosis and treatment of adrenal crisis. (10)
5. Describe the steps of RUSH (rapid ultrasonography in shock and hypotension) protocol. (10)
6. Describe the clinical presentation, assessment and management of a patient of intimate partner violence. (10)
7. Describe the components of hospital emergency operation plan. (10)
8. Describe the clinical features and management of acute diarrhea in a 3-year child. (10)
9. Enumerate the causes of stridor in children. Describe the management of epiglottitis. (10)

ENTRUSTABLE PROFESSIONAL ACTIVITIES (EPA)

S. No.	EPA	Competency Domains						Expected Level of Competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of PG	End of 1 st Year	End of 2 nd Year	End of 3 rd Year	
	Recognizing a patient requiring urgent care (Triage)	+	+	+	+	+	+	I	IV	V	V	S, H
	History taking and physical examination	+	+	+	+	+	+	I	IV	V	V	S, I, H
	Formulating differential diagnosis	+	+	+	+	+	+	I	III	IV	V	S, PG, H
	Planning investigations based on differential diagnosis	+	+	+	+	+	+	I	IV	V	V	S, PG, H
	Interpreting investigation reports	+	+	+	+	+	+	I	III	V	V	S, PG, H, I
	Implementing management plan	+	+	+	+	+	+	I	III	IV	V	S, P, PG, H
	Communicating in difficult situations	+	+	+	+	+	+	I	III	IV	V	S, P, UG, PG, C, H, I
Procedures												
	Bag and mask ventilation	+	+	+	+	+	+	I	IV	V	V	S, PG, H, I
	Endotracheal intubation	+	+	+	+	+	+	I	IV	V	V	S, PG, H, I
	Cricothyroidotomy	+	+	+	+	+	+	I	II	III	IV	S, PG, H, I
	Tracheostomy	+	+	+	+	+	+	I	II	III	IV	S, PG, H, I
	Pediatric /Neonatal endotracheal intubation	+	+	+	+	+	+	I	II	III	IV	S, PG, H, I
	Putting Ventilatory support	+	+	+	+	+	+	I	IV	V	V	S, PG, H, I
	Needle thoracentesis	+	+	+	+	+	+	I	IV	V	V	S, PG, H, I
	Intercostal chest drain (thoracostomy) insertion	+	+	+	+	+	+	I	III	IV	V	S, PG, H, I
	Cardiopulmonary resuscitation	+	+	+	+	+	+	I	IV	V	V	S, UG, PG, H, I
	Cardioversion	+	+	+	+	+	+	I	III	IV	V	S, PG, H, I
	Transvenous pacemaker insertion	+	+	+	+	+	+	I	II	III	IV	S, PG, H, I
	Pericardiocentesis	+	+	+	+	+	+	I	II	III	IV	S, PG, H, I

S. No.	EPA	Competency Domains							Expected Level of Competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of PG	End of 1 st Year	End of 2 nd Year	End of 3 rd Year		
	Thrombolysis	+	+	+	+	+	+	I	II	III	IV	S, PG, H, I	
	Central venous access	+	+	+	+		+	I	II	III	IV	S, PG, H, I	
	Arterial cannulation	+	+	+	+		+	I	III	IV	V	S, PG, H, I	
	Venesection	+	+	+	+		+	I	II	III	IV	S, PG, H, I	
	Intraosseous access	+	+	+	+		+	I	II	III	IV	S, PG, H, I	
	Nasal packing for epistaxis	+	+	+	+		+	I	II	III	IV	S, PG, H, I	
	Foley's catheter insertion	+	+	+	+		+	I	IV	V	V	S, PG, H, I	
	Suprapubic catheterization	+	+	+	+		+	I	II	III	IV	S, PG, H, I	
	Ryle's tube insertion	+	+	+	+		+	I	V	V	V	S, PG, H, I	
	Gastric lavage	+	+	+	+		+	I	V	V	V	S, PG, H, I	
	Paracentesis	+	+	+	+		+	I	IV	V	V	S, PG, H, I	
	Application of cervical collar	+	+	+	+		+	I	IV	V	V	S, PG, H, I	
	Fracture immobilization (Cast/Splint)	+	+	+	+		+	I	II	III	IV	S, PG, H, I	
	Reduction of joint dislocation	+	+	+	+		+	I	II	III	IV	S, PG, H, I	
	Stabilization of pelvic fracture	+	+	+	+		+	I	II	III	IV	S, PG, H, I	
	Conscious sedation and analgesia	+	+	+	+		+	I	II	III	IV	S, H, I	
	Local anesthesia	+	+	+	+		+	I	II	III	IV	S, PG, H, I	
	Incision and drainage of abscess	+	+	+	+		+	I	II	III	IV	S, PG, H, I	
	Simple wound repair	+	+	+	+		+	I	II	III	IV	S, PG, H, C, I	
	Nerve block	+	+	+	+		+	I	II	III	IV	S, PG, H, C, I	
	Lumbar puncture	+	+	+	+		+	I	III	IV	V	S, PG, H, I	
	Burr hole	+	+	+	+		+	I	I	II	III	S, PG, H, I	
	Point of care ultrasonography	+	+	+	+		+	I	III	IV	V	S, PG, H, I	
	Normal delivery	+	+	+	+		+	I	III	IV	IV	S, PG, H, I	
	Reducing paraphimosis	+	+	+	+		+	I	II	III	IV	S, PG, H, C, I	
	Managing polytrauma patients	+	+	+	+		+	I	III	IV	V	S, PG, H, C, I	

Competency Domains:

MK- Medical knowledge

PC: Patient Care

PBLI: Problem Based Learning & Improvement,

SBP: System Based Practice, P: Professionalism

ICS: Interpersonal Communication Skill,

Levels of competence:

Level 1: Knowledge only

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others

Multisource feedback (MSF):

S: Supervisor P: Patient

UG: UG student,

PG: Other PG students

C: Community,

H: other Health professionals, I: Self



ENT

MS in ENT

COURSE NAME

MS in ENT

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

PREAMBLE AND GOALS

A post-graduate student in Oto-Rhino-Laryngology should be able to diagnose and treat efficiently and ethically the common Ear, Nose and Throat related illness seen in the community. In addition he/she should also recognize and properly manage basic medical diseases and all kinds of diseases related to Ear, Nose, Throat, Head and Neck. He/she should be aware of all the recent advances and on-going studies pertaining to his/her speciality as well as the national programmes involving the speciality of E.N.T. He/ she should contribute to the community by training and implementing the preventive measures for certain diseases under his/her speciality. The PG student should be competent enough to teach medical and paramedical students skillfully to make them understand the subject and conduct research work.

Major Goal

Patient care Ability: A postgraduate in ORL-Head and Neck surgery at the end of its 3 year course should develop proper clinical acumen to interpret diagnostic results and correlate them with symptoms from history taking and become capable to diagnose the common clinical conditions/diseases in the speciality and to manage them effectively with success without making any serious complications; and sincerely to take such accurate decision, for the patient's best interest including making a referral to/ consultation with a more experienced colleague /professional friend while dealing with any patient with a difficult condition. He/ she should be able to create awareness about preventive Otolaryngology in society.

Teaching ability: He/she also should be able to teach an MBBS student about the commonly encountered conditions in ENT pertaining to their diagnostic features basic pathophysiological aspect and the general and basic management strategies.

Research Ability: He/she should also acquire elementary knowledge about research methodology, including record-keeping methods, and be able to conduct a research enquiry including making a proper analysis and writing a report on its findings.

Teamwork: He/she should be capable to work as a team member. He/she should develop general humane approach to patient care with communicating ability with the patient's relatives especially in emergency situation such as in Casualty department while dealing with cancer patients and victims of accident. He/she should also maintain human values with ethical consideration.

OBJECTIVES

A post-graduate at the end of a 3-year P.G. degree course should acquire the following:

- 1. Cognitive knowledge:** Describe embryology, applied anatomy, physiology, pathology, clinical features, diagnostic procedures and the therapeutics including preventive methods, (medical/surgical) pertaining to Otorhinolaryngology – Head & Neck Surgery.
- 2. Clinical decision-making ability & management expertise:** Diagnose conditions from history taking, clinical evaluation and investigations and develop expertise to manage medically as well as surgically the commonly encountered, disorders and diseases in different areas as follows:
 - **Otology, Neurology & Skull-base Surgery:** External, middle and internal ear diseases, including the common complications associated with middle ear, deafness, facial nerve palsy, tinnitus, vertigo and other conditions such as acoustic neuroma, malignant tumors, glomus tumor and petrous apex cholesteatoma etc. and to be capable of doing early diagnosis of these conditions and also to acquire adequate

knowledge about principles of therapy of these diseases.

- **Rhinology:** Able to Diagnose and manage Nose and paranasal sinus conditions such as infection, polyps and allergy. Acquire some surgical skills to do submucosal resection (SMR), septoplasty, functional endoscopic sinus surgery (FESS). Develop the capability to do oncologic diagnosis and therapy planning for proper management of such patients in collaboration with radiotherapists and medical oncologists.
 - **Laryngology:** Able to diagnose and manage benign lesions of the larynx including voice-disorders and pharyngeal and nasopharyngeal diseases, viz-adenoids and angiofibroma. Capable to do the diagnosis of oncologic conditions such as laryngeal carcinoma and plan its therapy strategies.
 - **Oral cavity/salivary glands:** Learn about Oral cavity and salivary gland diseases, their diagnosis and therapy planning with referral strategies for cancer patients to advanced cancer centres/ Hospital.
 - **Head/Neck conditions/diseases:** Learn about head and neck diseases including Parotid gland and thyroid diseases, neurogenic tumours and neck space infections/and their management.
 - **Broncho-oesophageal region:** Learn about broncho-oesophageal diseases/disorders such as congenital disorders, diagnosis of Foreign bodies in wind/food pipes with their management policies. Capable to perform Panendoscopies for oncologic evaluation in the head-neck region, including oesophageal malignancy.
 - **Plastic reconstruction following major head neck surgery & trauma:** Acquire general principles of reconstructive surgery and its referral needs.
 - **Advanced Surgical methods:** Acquire knowledge about phono surgery like microlaryngoscopic surgery, palatopharyngoplasty for VPI & Cleft palate, and thyroplasty for voice-disorders.
 - **General principles of newer therapy/ Surgery:** Newer knowledge about ENT diseases in general, including technological (Laser) and pharmacologic advances (medicines) and newer method of therapy for certain conditions such as Obstructive sleep apnoea syndrome and asthma.
 - **Traumatology & Facio-maxillary Injury:** Acquire knowledge in the management of Traumatology in general and faciomaxillary injury in particular, including nasal fractures.
 - Be capable of doing screening in the community, of the audiological & speech-related disabilities, and also to do early identification of malignancies and create its awareness in the community/ society to eventually get better cooperation from people in health management.
 - **Radiology:** Acquire knowledge about radiology/imaging and to interpret different radiological procedures and imaging in Otolaryngology-Head and Neck and skull base regions. There should be collaboration with Radiology department for such activities.
 - **Audiology & Rehabilitation:** Perform different audiological and neuro-otological tests for diagnosis of audiology/vestibular disorders/diseases and become capable to interpret these findings and to incorporate their implication in diagnosis and their treatment including the rehabilitative methods in audiology and speech pathology including hearing aids and other assistive and implantable devices.
 - **Psychologic and social aspect:** Some elementary knowledge in clinical Psychology and social, work management is to be acquired for the management of patients, especially those terminally ill and disable-persons and interacting with their relatives.
3. **Teaching:** Acquire the ability to teach an MBBS student in simple and straight forward language about the common ENT ailments/disorders especially about their signs/symptoms for diagnosis with their general principles of therapy.

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4. **Research:** Develop the ability to conduct a research enquiry on clinical materials available in the Hospital and in the community.
 5. **Patient doctor relation:** Develop the ability to communicate with the patient and his/her relatives pertaining to the disease condition, its severity and options available for the treatment/therapy.
 6. **Preventive Aspect:** Acquire knowledge about prevention of some conditions especially in children such as middle ear and sinus infection, hereditary deafness and early diagnosis of head-neck malignancy. Hence he/she should know about the preventive Otorhinolaryngology (ENT).
 7. **Identification of a special areas within the subject:** To further develop higher skills within the specialty in a specialized area such as Otology, Neurology, Rhinology, head and neck oncology, skull base surgery and audiological medicine, Resident may identify some area of interest, during the Residency and do fellowship/Senior Residency Programme in one of such areas like Otology.
 8. **Presentation of Seminar/paper:** Should develop the public speaking ability and should be able to make presentation on disease-conditions/research topics to fellow colleagues in a Seminar/meeting/ conference using audiovisual aids.
 9. **Research writing:** Should be capable to write case-reports and research papers for publication in scientific journals.
 10. **Teamwork:** Team spirit inpatient management, working together in OPD, OT, ward and sharing responsibility with colleagues such as doctor, nurses and other staff are essential. A resident has to develop these attributes through different mechanism of interaction.

COURSE CONTENT

THEORY :

Basic Sciences:

Anatomy of the ear, physiology of hearing and equilibrium, the anatomy of nose and paranasal sinuses, anatomy of pharynx, oesophagus, deglutition anatomy of larynx and tracheobronchial tree, physiology of respiration, physiology of generation and reception of speech. surgical anatomy of skull base, cranial nerves, imaging and radiology pertaining to ear, nose and throat (ENT), knowledge of immunology and microbiology as regarding ENT, radiotherapy and chemotherapy in head & neck cancers, wound healing, principles of laser surgery, basics of anaesthesia and intensive care in relation to ENT, a thorough knowledge of anatomy of head and neck region including thyroid, neck spaces and salivary glands, physiology of smell.

Audiology:

i) Brief knowledge of acoustics. ii) Epidemiology/ prevention/ rehabilitation of balance & hearing disorders. iii) Diagnostic audiometry. iv) Use of computers in audiological and vestibular testing and rehabilitation. v) Hearing aids. vi) Diagnostic testing of the vestibular system. vii) Cochlear implants.

Otology:

Diseases of the external auditory canal and middle ear: acute suppurative otitis media, CSOM. Complications of CSOM, plastic surgery of ear, otosclerosis, SN loss in adults and children, vertigo, Meniere's disease, ototoxicity, Vestibular Schwannoma, tumours of middle ear cleft, glomus jugulare, disorders of facial nerve, cochlear implants.

Laryngology:

i. Acute & chronic infections of oral cavity, pharynx, tonsils and larynx. • Trauma & stenosis of larynx. • Management of obstructed airway and tracheostomy. • Disorders of voice. • Neurological affections of pharynx and larynx. • Pharyngeal pouch. • Tumours of the larynx. • Angiofibroma and nasopharyngeal lesions.

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- ii. Tumours of oropharynx and lymphoma head and neck.
 - iii. Tumours of hypopharynx.
 - iv. Benign diseases of the neck.
 - v. The thyroid gland and disorders.
 - vi. Diseases of salivary gland: neoplastic & non-neoplastic.
 - vii. Tumours of infratemporal fossa and parapharyngeal space, cysts, granulomas and tumours of jaw, nose and sinuses.
 - viii. Facial plastic surgery and reconstructive surgery of head and neck.
 - ix. Terminal care of head and neck cancer.

Rhinology and Radiology of the nose and paranasal sinuses :

- i. Congenital anomalies of the nose.
- ii. Conditions of the external nose.
- iii. Abnormalities of smell.
- iv. Allergic rhinitis.
- v. Intrinsic rhinitis and nasal polypi.
- vi. Infective rhinosinusitis, complication and surgical management.
- vii. Disorders and trauma of facial skeleton.
- viii. Disorders of the nasal septum.
- ix. CSF rhinorrhoea.
- x. Epistaxis.
- xi. Snoring and sleep apnea.
- xii. Chronic granulomas of nose and PNS.
- xiii. The orbit in relation to ENT.
- xiv. Transphenoidal hypophysectomy.
- xv. Overview of facial pain and headache.

PRACTICAL / CLINICAL MANDATORY :

Dissection of head & neck and 10 temporal bone dissection which includes:

- Cortical mastoidectomy.
- MRM & radical mastoidectomy.
- Facial nerve decompression.
- Post tympanostomy.
- Labyrinthectomy.
- Endolymphatic sac decompression.
- Translabrynthine approach to IAM.

The essential list of Surgical Procedures Following procedures are classified as:

- To be done independently (PI).
- To assist a senior specialist /consultant (PA).
- To wash and observe the procedure (0).

(A) Otology:

To be done independently (PI). (The minimum number to be done is given against each procedure):

- i. Cortical mastoidectomy - 5 cases.
- ii. MRM & radical mastoidectomy - 2 cases.
- iii. Myringoplasty - 3.s
- iv. Myringotomy and Grommet insertion - 3 cases
- v. Ossiculoplasty - 1 case.
- vi. Facial N Decompression - optional.
- vii. To have assisted or observed - Stapedectomy (PA/0).

(b) Rhinology

To be done independently (PI):

- i. Reduction of fractured nasal bones - 1 case.
- ii. SMR- 7 cases.
- iii. Septoplasty - 2 cases.
- iv. Diagnostic nasal endoscopy - 5 cases.
- v. FESS. • Uncinectomy. • Polypectomy • Anterior ethmoidal cell clearance. • Middle meatal antrostomy. - 2 cases.
- vi. Caldwell Luc - 1 case.
- vii. Antral lavage - 10 cases.
- viii. Intranasal antrostomy - 5 cases.

To assist or observe:

- i. FESS - post ethmoid, sphenoid, frontal sinus surgery.
- ii. Maxillofacial surgeries.
- iii. External operations of frontoethmoid sinus.
- iv. Maxillectomy – total & partial.

(C) Laryngology and Head and Neck Surgery To be done independently (PI):

- i. Tracheostomy - 2 cases.
- ii. Tonsillectomy - 10 cases.
- iii. Adenoidectomy - 2 cases.
- iv. DL Scope - 10 cases.
- v. Oesophagoscopy, upper oesophagus foreign body removal- 5 cases.

To assist or observe:

- i. Bronchoscopy.
- ii. Total & partial laryngectomy.
- iii. Block dissections of the neck.
- iv. Thyroid surgery.
- v. Salivary gland surgery.
- vi. Microlaryngeal surgery.

SYLLABUS FOR INDIVIDUAL PAPERS

PAPER –I

- Physiology- Mechanism of perception of smell and taste, mechanism of breathing and voice production, lacrimation, deglutition and salivation. Functional tests of the nose and paranasal sinuses, Mechanism of cough and sneezing.
- Physics of sound, theories of hearing, mechanism of perception of sound and speech Production, Physiology of equilibrium & Cerebral function. Physiology of brain in connection with the hearing, speech, smell and phonation. Audiologic tests like audiometry, impedance, evoked potentials, OAE, Speech audiometry Physiology of larynx, tracheobronchial tree & oesophagus - Histology of mucous membranes, internal ear and other associated organs and structures, Nose, PNS, Nasopharynx, Larynx,

Tracheobronchial tree, Lymph-epithelial system. Mechanism of immune system/immunology and genetics.

- Anatomy- Embryogenesis of ear, nose and throat including the palate and the larynx, Esophagus, trachea and lungs, tongue, salivary gland Head & Neck & skull base etc.
- Parapharyngeal spaces in the neck including connective tissue barriers of the larynx.
- Applied anatomy of the skull bones, accessory sinuses, external, middle and inner ears, nose, PNS, nasopharynx, meninges, brain, pharynx, larynx, trachea and bronchi, lungs, pleurae, oesophagus and the mediastinum. Anatomy of all cranial nerves with their functions.

PAPER II

- Clinical methodology as applied to ORL HN disease in adult & children and the accessory discipline- diagnosis and surgical treatment of diseases of nose, throat and ear in adult and children. Prevention and treatment, infectious diseases of Otolaryngology and Head Neck region. Circulatory and nervous disturbances of the nose, throat and ear and their effects on other organs of the body. Deformities, injuries, sinus infections, polyps and the tumours of the nose, and paranasal sinuses. Examination of the ear, deafness and allied diseases, complications of diseases of the ear. Injuries, tumours, nervous and circulatory, neurological disturbances of the ear. Diagnosis and treatment of tinnitus and vertigo. Diagnosis and rehabilitation of the Hearing handicapped including, dispensing of hearing aid other vibrotactile aids.
- Surgical pathology of Otolaryngology and Head Neck region.
- Basic knowledge of anesthesia is related to ENT.
- Examination of diseases of children (Pediatric ORL) in connection with throat and larynx. Neurological and vascular disturbances. Congenital and neonatal stridor.
- Pathology of various diseases of the larynx and throat, trachea-bronchial tree and their causative organisms.

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- Indications and various techniques of direct laryngoscopy, nasal endoscopy, bronchoscopy and oesophagoscopy, including microlaryngoscopic procedures.
 - Reading of radiograms, scans, audiograms, nystagmograms and tympanograms in connection with ENT diseases/ disorders.
 - Special apparatus for the diagnosis and treatment of the diseases of ear, nose and throat including audiometer, BERA, ENG, Speech analyzer etc.
 - Radiology, Imaging – computed tomography and magnetic resonance imaging, (MRI) and interventional radiology and angiography as related to E.N.T.
 - General pathologic aspects such as wound healing and also Pathology and Pathogenesis of ENT diseases, Pharmacology, molecular biology, genetics, cytology, hematology, and immunology as applicable to otolaryngology.
 - General principles of faciomaxillary traumatology and also neck injury, Plastic surgery as applicable to Otolaryngology.

PAPER- III

- The recent developments in the diagnosis of pathogenesis treatments of the ENT diseases.
- The knowledge of the frontiers of the otolaryngology and lateral skull base surgery.
- Rhinoplasties, endoscopic sinus surgery, and anterior cranial fossa surgery.
- Knowledge of LASERS and fibre optics.
- Other methods of managing the Hearing loss.
- Implantable hearing aids. Cochlear Implants.
- Phonosurgery
- Aetiology and Management of sleep apnea/ snoring,
- Hypophysectomies and optic nerve decompressions.
- Immunotherapy and modalities of the gene therapy
- Newer techniques for Radiotherapy including, use of gamma knife for treatment of intracranial tumours and other malignancy.
- Chemotherapy of cancer.
- Basic computers, computer averaging of the biological signals and its applications in Otolaryngology & Otolaryngologic equipment.
- Audiologic and speech disorders and their management strategies.
- Principles of Jurisprudence and ethical issues and applicable to ENT surgeons.

TEACHING AND LEARNING PROGRAMME

A candidate pursuing the course should work in the institution as a full-time student. No candidate should be permitted to run a clinic/laboratory/nursing home while studying postgraduate course. Each year should be taken as a unit for the purpose of calculating attendance. Every student shall attend teaching and learning activities during each year as prescribed by the department and not absent himself/herself from work without valid reasons. A list of teaching and learning activities designed to facilitate students acquire essential knowledge and skills outlined is given below.

1. Lectures

Lectures are to be kept to a minimum. They may, however, be employed for teaching certain topics. Lectures may be didactic or integrated.

PAPER –IV (General surgical Principles & Head Neck Surgery)

- General Surgery, Head & Neck Oncology, and & Medicine as applicable to the ENT disorders/ diseases. Surgery of congenital deformities of nose, ear (Pinna) & trachea/oesophagus etc.
- Didactic Lectures: Recommended for selected common topics for postgraduate students of all specialities. Few topics are suggested as examples: i. Bio-statistics. ii. Use of library. iii. Research methods. iv. Medical code of

conduct and medical ethics. v. National Health and Disease Control Programmes. vi. Communication Skills etc. These topics may preferably be taken up in the first few weeks of the 1st year.

- Integrated Lectures: These are recommended to be taken by multidisciplinary teams for selected topics, eg. jaundice, diabetes mellitus, thyroid etc.

2. Journal Club:

Recommended to be held once a week. All the PG students are expected to attend and actively participate in the discussion and enter in the logbook relevant details. Further, every candidate must make a presentation from the allotted journal(s), selected articles at least four times a year and a total of 12 articles presentations in three years. The presentations would be evaluated using checklists and would carry weightage for internal assessment (see checklist in chapter IV). A time table with the names of the student and the moderator should be announced in advance.

3. Subject Seminar:

Recommended to be held once a week. All the PG students are expected to attend and actively participate in the discussion and enter in the logbook relevant details. Further, every candidate must present on selected topics as least four times a year and a total of 12 seminar presentations in three years. The presentations would be evaluated using checklists and would carry weightage for internal assessment (see checklist in chapter IV). A timetable for the subject with names of the student and the moderator should be announced in advance.

4. Dissection Head and Neck Temporal bone dissection which includes:

- Cortical mastoidectomy.
- MRM and radical mastoidectomy.
- Facial nerve decompression.
- Posterior tympanostomy.
- Labrinthectomy
- Endolymphatic sac decompression.

5. Ward Rounds: Ward rounds may be service or teaching rounds.

• Service Rounds:

Postgraduate and interns should do every day for the care of the patients. Newly admitted patients should be worked up by the PGs and presented to the seniors the following day.

• Teaching Rounds:

Every unit should have 'grand rounds' for teaching purpose. A diary should be maintained for day to day activities by the students. Entries of (a) and (b) should be made in the logbook.

6. Clinico-pathological Conference:

Recommended at least once in three months for all postgraduate students. Presentation to be done by rotation. If cases are not available due to lack of clinical postmortems, it could be supplemented by published CPCs.

7. Clinical cases (minimum of 40 cases) to be presented, which will be assessed by using checklists (see chapter IV)

8. Inter-departmental Meetings:

- With departments of pathology and radio-diagnosis at least once a week.
- Radio-diagnosis:

Interesting cases and imaging modalities should be discussed. These meetings should be attended by postgraduate students and relevant entries must be made in the logbook.

9. Teaching Skills:

Postgraduate students must teach undergraduate students (eg. medical, nursing) by taking demonstrations, bedside clinics, tutorials, lectures etc. Assessment is made using a checklist by concerned faculty as well students. (see model checklist in chapter IV). Record of their participation to be kept in Logbook. Training of postgraduate students in educational science and technology is recommended.

10. Continuing Medical Education Programmes (CME):

Recommended that at least 2 state-level CME programmes should be attended by each student in 3 years.

11. Conferences: Attending conferences is optional. However, it is encouraged.

ASSESSMENT

Examination on Research Methodology & Biostatistics

- Timing: End of 2nd Semester
- Total marks: 100
- Will be considered as an internal examination
- Candidate should pass to appear in Final examination
- No marks will be added to final/summative examination
- Will be conducted by Examination Cell in the month of June & December

INTERNAL EXAMINATIONS

Timeline: End of the 3rd, 4th and 5th semester, pre-final (2 months before final examination).

Marks distribution: Theory 100 marks, and practical with viva and logbook

(Practical – 70, viva – 20, logbook – 10).

The marks of the 4 internal examinations will be averaged to 100 each for theory and practical.

SUMMATIVE/FINAL EXAMINATIONS

Theory

4 papers (100 marks each) for MD/MS

Paper I – Applied Basic Sciences (approximately 60% weightage on Anatomy and Physiology and 40% on other applied basic sciences related to Otorhinolaryngology & Head & Neck surgery and General Surgical principles)

Paper-II – Ear, Neuro-otology and Audiology

Paper III – Rhinology, Laryngology, Head & Neck Surgery

Paper IV – Recent advances in relation to Oto-rhino laryngology and Head & Neck

surgery including Genetics and General Surgical Principles.

Question Paper Format

One Long question – 20 marks

Eight Short question/notes – 10 x 8 = 80 marks

Total marks in theory: 500 marks

Theory papers in the final examination – 400 marks

Average of 4 internal examinations – 100 marks

Practical

Total marks: 500

Practical and viva in the final examination – 400 marks

Average of 4 internals (practical + viva + logbook) examinations – 100 marks

The format of the practical examination (400 marks)

- The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A** 200 marks	Longcase (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/ Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

** Students should pass (secure 50% marks) separately in Part A

Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

Thesis Evaluation

- The student should submit the completed thesis 6 months before the final examination.
- Plagiarism check: If more than 20% plagiarism is detected, the student will be asked to re-write and re-submit. Plagiarism checking will be done before the thesis is bound.
- The thesis will be sent to one external evaluator for approval.
- Permission of the external evaluator will be sought by email before sending the thesis.

RECOMMENDED BOOKS

1. Ballenger JJ, Ballenger WL, Ballenger HC. Diseases of the nose, throat, and ear: Lea & Febiger; 1969.
2. Biswas A. Clinical Audio-vestibulometry for Otologists and Neurologists: Bhalani Publishing House; 1995.
3. Brackmann D, Shelton C, Arriaga MA. Otologic Surgery: Elsevier Health Sciences; 2015.
4. Donald PJ. Surgery of the Skull Base: Lippincott-Raven; 1998.
5. Donald PJ. Difficult Case in Head and Neck Cancer Surgery: Thieme; 2011.
6. Donald PJ, Gluckman JL, Rice DH. The Sinuses: Raven Press; 1995.
7. Flint PW, Haughey BH, Robbins KT, Thomas JR, Niparko JK, Lund VJ, et al. Cummings Otolaryngology - Head and Neck Surgery E-Book: Elsevier Health Sciences; 2014.
8. Gulya AJ, Minor LB, Glasscock ME, Poe D. Glasscock-Shambaugh Surgery of the Ear: People's Medical Publishing House-USA; 2010.
9. Harnsberger HR. Handbook of Head and Neck Imaging: Mosby; 1995.
10. Jackson C. Bronchoscopy and Esophagoscopy; a Manual of Peroral Endoscopy and Laryngeal Surgery: Creative Media Partners, LLC; 2018.
11. Kleinsasser O. Microlaryngoscopy and endolaryngeal microsurgery: Techniques and typical cases: W. B. Saunders Co.; 1968.
12. Ludman H, Wright T. Diseases of the Ear, 6Ed: Taylor & Francis; 1997.
13. Marks SC. Nasal and Sinus Surgery: W.B. Saunders; 2000.
14. Marlow RSS, Rob C, Dudley HAF, Pories WJ, Carter DC. Rob & Smith's Operative Surgery: Neurosurgery: Butterworths; 1989.
15. Montgomery WW. Surgery of the upper respiratory system: Lea & Febiger; 1979.
16. Paparella MM, da Costa SS, Fagan J. Paparella's Otolaryngology: Head & Neck Surgery: Two Volume Set: Jaypee Brothers, Medical Publishers Pvt. Limited; 2019.
17. Remacle M, Eckel HE. Surgery of Larynx and Trachea: Springer Berlin Heidelberg; 2010.
18. Shah JP, Patel SG, Singh B. Head and Neck Surgery and Oncology: Elsevier/Mosby; 2012.
19. Stammberger H, Kopp W, Hasler G, Dekornfeld TJ, Hawke M. Functional Endoscopic Sinus Surgery: The Messerklinger Technique: Decker; 1991.

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20. Watkinson J, Gilbert R. Stell & Maran's Textbook of Head and Neck Surgery and Oncology: CRC Press; 2011.
21. Watkinson JC, Clarke RW. Scott-Brown's Otorhinolaryngology and Head and Neck Surgery: Basic Sciences, Endocrine Surgery, Rhinology: Taylor & Francis Group; 2018.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

APPLIED BASIC SCIENCES

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Discuss the development of the middle ear cleft and describe the gross and microscopic anatomy of inner ear. (10+5+5=20)
2. Describe various phases of deglutition with its clinical application. Discuss briefly about the evaluation of a case with dysphagia. (5+5=10)
3. Discuss the principle and Role of Digital Subtraction Angiography in ENT. (10)
4. Describe the surgical anatomy of Ethmoid bone in relation to transnasal endoscopic surgeries. (10)
5. Discuss the role of topical steroids in Rhinology. (10)
6. Describe the pathophysiology and discuss the management of Diphtheria. (5+5=10)
7. Discuss the roll of Positron Emission Tomography – Computed Tomography Imaging in head neck malignancy. (10)
8. Classify the anticancer drugs and briefly discuss about Cisplatin. (5+5=10)
9. Discuss the role of regional anesthesia in ENT. (10)

PAPER 2

EAR, NEURO-OTOLOGY AND AUDIOLOGY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Classify Otosclerosis. Describe in brief about the contra-indications of surgery in Otosclerosis. Write management of Perilymph Fistula following stapedotomy. (5+5+10=20)
2. Classify Vertigo according to duration of episode. Write about pathophysiology of Meniere's disease and its surgical management. (2.5+2.5+5=10)
3. Discuss about Combine Approach Tympanoplasty and various methods of ossicular reconstruction. (5+5=10)
4. Discuss about the pathophysiology and management of Sigmoid Sinus Thrombosis. (5+5=10)

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5. Discuss the clinical features and various surgical approaches for Vestibular Schwannoma. (5+5=10)
 6. What is auditory brainstem response? Discuss its various component and its clinical applications. (2.5+2.5+5=10)
 7. Describe the pathophysiology and management of sudden onset sensory-neural hearing loss. (5+5=10)
 8. Discuss the management of external canal atresia with microtia. (5+5=10)
 9. Classify the fractures of temporal bone and discuss the management of traumatic facial nerve paralysis (5+5=10)

PAPER 3

RHINOLOGY, LARYNGOLOGY, HEAD & NECK SURGERY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Classify Metastatic neck nodes. Describe in details the management of Metastatic neck disease with unknown primary. (10+10=20)
2. Write about the Theories of origin and surgical management of Nasopharyngeal Angiofibroma. (5+5=10)
3. Classify the laryngotracheal stenosis and discuss the management of subglottic stenosis. (5+5=10)
4. Enumerate the various congenital anomalies of larynx and describe the management of laryngomalacia. (5+5=10)
5. Classify the parotid tumor. Discuss the various land mark used to locate facial nerve during parotid surgery and complications of parotidectomy. (2.5+2.5+5=10)
6. Discuss the various methods for voice rehabilitation after laryngectomy. (10)
7. Classify the complications of sinusitis and discuss the management of orbital management (5+5=10)
8. Discuss the evaluation and management of CSF rhinorrhea. (5+5=10)
9. Classify the fungal sinusitis and discuss about the pathophysiology and management of Allergic Fungal Rhinosinusitis. (2.5+2.5+5=10)

PAPER 4

RECENT ADVANCES IN ENT

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Classify Lasers. Write short note on CO₂ Laser. Write various applications of Laser in ENT. (2.5+7.5+7.5=20)
2. Classify Shock. Write the management of septic shock following Endoscopic Sinus Surgery. (5+5=10)
3. Discuss about the Indications and Contra-indications of Cochlear implantation. (5+5=10)
4. Discuss the role of Image Guided Surgery in ENT. (10)
5. Describe the role of Pectoralis Major flap in Head and Neck reconstruction. (10)
6. Briefly describe about various suture materials used in surgery. (10)
7. Discuss about organ preservation protocol in Laryngeal Cancer. (10)
8. What is intensity-modulated radiation therapy? Discuss the role of post-operative radiotherapy (10)
9. Discuss the roll of bone scan in temporal bone pathology. (10)

YEAR-WISE ENTRUSTABLE PROFESSIONAL ACTIVITIES (EPA) FOR MS ENT RESIDENTS

S. No.	EPA	Competency Domains							Level of competency				MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year		
1	Gathering a history and performing a physical examination	*	*	*	*	*	*	II	III	IV	V	S, P, UG, PG, I	
2	Prioritizing a differential diagnosis following a clinical encounter	*	*	*	*	*	*	I	II	III	IV	S, PG, I	
3	Recommending and interpreting common diagnostic and screening tests	*	*	*	*	*	*	II	III	IV	V	S, I	
4	Entering and discussing orders and prescriptions and giving the necessary instructions to the patients	*	*	*	*	*	*	I	II	III	IV	S, P, PG, I	
5	Documenting a clinical encounter in patient records	*	*	*	*	*	*	II	II	III	IV	S, PG, I	
6	Provide an oral presentation of a clinical encounter	*	*	*	*	*	*	II	III	IV	V	S, PG, I	
7	Form clinical questions and retrieve evidence to advance patient care	*	*	*	*	*	*	I	II	III	IV	S, I	
8	Give or receive a patient handover to transition care responsibility	*	*	*	*	*	*	I	II	III	IV	S, PG, H, I	
9	Collaborate as a member of an interprofessional team	*	*	*	*	*	*	I	II	III	IV	S, PG, H, P, I	
10	Recognize a patient requiring urgent or emergency care and initiate evaluation and management	*	*	*	*	*	*	I	II	III	IV	S, PG, H, P, I	
11	Obtain informed consent for tests and/or procedures	*	*	*	*	*	*	I	II	IV	V	S, P, PG	
12	Performing general procedures of a physician	*	*	*	*	*	*	I	II	III	V	S, PG, I	
13	Identify system failures and contribute to a culture of safety and improvement	*	*	*	*	*	*	I	II	III	IV	S, PG, I	

S. No.	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year	
14	Management of dizzy patient	*	*	*	*	*	*	I	II	III	IV	S, PG, P, I, H
15	Management of Epistaxis	*	*	*			*	I	II	III	IV	S, PG, P, I, H
16	Management of patient with stridor	*	*	*	*		*	I	II	III	IV	S, PG, P, I, H
17	Management of foreign bodies of the aerodigestive tract	*	*	*			*	I	II	III	IV	S, PG, P, I, H
18	Preoperative evaluation and counselling	*	*			*	*	I	II	III	IV	S, PG, P, I, H, UG
19	Post-operative care	*	*									
20	Performing anterior and posterior nasal packing	*	*			*	*	I	II	III	IV	S, PG, P, I, H, UG
21	Removal of Foreign bodies of ear and nose	*	*			*	*	I	II	III	IV	S, PG, P, I, H, UG
22	Emergency reduction of fracture nasal bone	*	*			*	*	I	II	III	IV	S, PG, P, I, H, UG
23	Performing Adenotonsillectomy operation	*	*			*	*	I	II	III	IV	S, PG, P, I, H, UG
24	Performing Septoplasty operation	*	*			*	*	I	II	III	IV	S, PG, P, I, H, UG
25	Performing Middle meatal antrostomy	*	*			*	*	I	II	III	IV	S, PG, P, I, H, UG
26	Perform Oesophagoscopy and Foreign body removal	*	*			*	*	I	II	III	IV	S, PG, P, I, H, UG
27	Perform Bronchoscopy and Foreign body removal	*	*			*	*	I	II	II	III	S, PG, P, I, H, UG
28	Perform Tracheostomy	*	*			*	*	I	II	IV	V	S, PG, P, I, H, UG
29	Performing Cortical mastoidectomy	*	*			*	*	I	II	III	IV	S, PG, P, I, H, UG
30	Performing Myringoplasty	*	*			*	*	I	II	III	IV/V	S, PG, P, I, H, UG
31	Performing anterior and posterior ethmoidectomy, sphenoidotomy and frontal sinusotomy	*	*			*	*	I	II	III	IV	S, PG, P, I, H, UG
32	Performing Head and Neck surgeries	*	*			*	*	I	I	II	III	S, PG, P, I, H, UG
33	Performing Modified radical mastoidectomy	*	*			*	*	I	II	III	IV	S, PG, P, I, H, UG

S. No.	EPA	Competency Domains						Level of competency					MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year		
34	Cadaver temporal bone dissection: Cortical mastoidectomy, modified radical mastoidectomy	*		*				I	II	III	IV	S, PG, I	
35	Performing common office procedures: indirect laryngoscopy, videolaryngoscopy, postnasal examination and diagnostic nasal endoscopy	*	*	*		*		I	II	IV	V	S, PG, P, I, H, UG	
36	Cadaver temporal bone dissection: Facial nerve decompression, Stapedectomy	*		*				I	II	III/IV	V	S, PG, I	
37	Reading and interpreting all basic ENT X-rays and Chest X-ray	*	*				*	I	II	III/IV	V	S, PG, I	
38	Reading and interpreting PTA and Impedance audiograms	*	*		*		*	I	II	III	IV	S, PG, I	
39	Reading and interpretation of CT PNS, HRCT temporal bone and CT Neck	*	*				*	I	II	III	IV	S, PG, I	
40	Research Methodology and Writing up a research paper	*					*	I	II	III	IV	S, I	
41	Day-care and minor procedures in ENT E.g: Lobuloplasty, Keloid excision etc.	*	*				*	I	II	III/IV	V	S, PG, P, I, H, UG	
42	Conducting Pure Tone Audiometry and Impedance Audiometry	*	*				*	I	II	III	IV	S, PG, P, I	
43	Cadaver temporal bone dissection: Advanced temporal bone dissection	*		*				I	II	III	IV	S, PG, I	
44	Reading and interpretation of CECT Neck, CT Cerebellopontine angle, Barium swallow, Fistulogram	*	*				*	I	II	III	IV	S, PG, I	
45	Reading and interpretation of MRI	*	*				*	I	I	II	III	S, PG, I	
46	Reading and interpretation of BERA and OAE	*	*				*	I	II	III	IV	S, PG, I	

Competency Domains:	Levels of competence:	Multisource feedback (MSF):
MK: Medical Knowledge	Level I: Knowledge only; can observe	Supervisor: S
PC: Patient Care	Level II: Can do under strict supervision	Patients/Relatives: P
PBLI: Problem Based Learning and Improvement	Level III: Can do under loose supervision	Undergraduate students: UG
SBP: Systems-Based Practice	Level IV: Can do independently	Peers: PG
P: Professionalism	Level V: Has expertise to teach others	Community: C
ICS: Interpersonal and Communication Skills		Other health professionals: H
		Self: i



FORENSIC MEDICINE
AND
TOXICOLOGY

MD in Forensic Medicine and Toxicology

COURSE NAME

MD in Forensic Medicine and Toxicology

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

PREAMBLE

The purpose of Postgraduate education is to create specialists who would provide high-quality health care and advance the cause of science through research & training. This programme is meant to standardize and strengthen Forensic Medicine teaching at the postgraduate level throughout the country so that it will benefit the judiciary and the legal system of the country in providing justice which will ultimately benefit the community at large. It will also help in achieving uniformity in undergraduate teaching. The purpose of this document is to provide teachers and learners illustrative guidelines to achieve defined outcomes through learning and assessment. This document was prepared by various subject-content specialists. The Reconciliation Board of Academic Committee has attempted to render uniformity without compromise to purpose and content of the document. Compromise in purity of syntax has been made in order to preserve the purpose and content. This has necessitated retention of “domains of learning” under the heading “competencies”.

SUBJECT SPECIFIC LEARNING OBJECTIVES

The Goal of MD Forensic Medicine is to train a doctor to become a competent medico-legal expert, teacher and researcher in the subject who:

1. is aware of medico-legal aspects in various settings
2. is aware of contemporary advances and developments in the field of Forensic Medicine.

3. has acquired the competencies pertaining to the subject of Forensic Medicine that is required to be practised at all levels of the health system.
4. is oriented to the principles of research methodology.
5. has acquired skills in educating and imparting training to medical, paramedical and allied professionals.

A post-graduate student, upon successfully qualifying in the M.D (Forensic Medicine) examination should be able to:

1. Become an expert in Forensic Medicine.
2. Identify and define medico-legal problems as they emerge in the community and work to resolve such problems by planning, implementing, evaluating and modulating Medicolegal services.
3. Undertake medico-legal responsibilities and discharge medico-legal duties in required settings.
4. Keep abreast with all recent developments and emerging trends in Forensic Medicine, Medical Ethics and the law.
5. Deal with general principles and practical problems related to forensic, clinical, emergency, environmental, medico-legal and occupational aspects of toxicology.
6. Deal with medico-legal aspects of Psychiatry, mental health and drug addiction.
7. Impart education in Forensic Medicine and Toxicology to under-graduate and postgraduate students with the help of modern teaching aids.
8. Assess the students' knowledge and skills in the subject of Forensic Medicine
9. Oriented to research methodology and conduct of research in the subject.

SUBJECT SPECIFIC COMPETENCIES

By the end of the course, the student should have acquired knowledge (cognitive domain), professionalism (affective domain) and skills (psychomotor domain) as given below:

Cognitive domain

1. Describe the legal and medico-legal system in India.
2. Acquire knowledge on the philosophy and guiding principles of Forensic Medicine course.
3. Describe the programme goals and objectives of the Forensic Medicine course.
4. Acquire knowledge on the conduct of medico-legal autopsy independently with required physical assistance, prepare a report and derive inferences.
5. Outline the principles and objectives of the post-mortem examination.
6. Describe the formalities and procedures of medico-legal autopsies in accordance with existing conventions and the law.
7. Identify the role of anatomy, physiology, biochemistry, microbiology, pathology, blood bank, psychiatry, radiology, forensic science laboratory as well as other disciplines of medical science to logically arrive at a conclusion in medico-legal autopsies and examination of medico-legal cases.
8. Describe the principles of the techniques used in toxicological laboratory namely TLC (Thin Layer Chromatography), GLC (Gas Liquid Chromatography), AAS (Atomic Absorption Spectrophotometry), HPLC (High-Performance Liquid Chromatography) and Breath Alcohol Analyzer.
9. Describe relevant legal/court procedures applicable to medico-legal/medical practice.
10. Describe the general forensic principles of ballistics, serology, analytical toxicology and photography.

11. Interpret, analyze and review medico-legal reports prepared by other medical officers at the time of need.
12. Describe the role of DNA profile and its application in medico-legal practice.
13. Describe the law/s relating to poisons, drugs, cosmetics, narcotic drugs and psychotropic substances.
14. Describe the legal and ethical aspects of Forensic Procedures including Narco-analysis, Brain mapping and Polygraph etc.
15. Describe the medico-legal aspects of Psychiatry, addiction and mental health.

Affective domain

1. Should be able to function as a part of a team, develop an attitude of cooperation with colleagues, and interact with the clinician or other colleagues to provide the best possible opinion.
2. Should be able to follow ethical principles in dealings with patients, police personnel, relatives and other health personnel and to respect their rights.
3. Follow medical etiquettes in dealing with each other.
4. Develop communication skills to word reports and professional opinion as well as to interact with patients, relatives, peers and paramedical staff, and for effective teaching.

Psychomotor domain

At the end of the course, the student should acquire the following skills and be able to:

1. Perform medicolegal autopsy independently with required physical assistance, prepare a report and derive inferences.
2. Perform medico-legal examination of users of alcohol, drugs and poisons and prepare a report.
3. Perform medico-legal cases of sexual offences and prepare a report.

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4. Interpret histopathological, microbiological, radiological, chemical analysis, DNA profile and other investigative reports for medico-legal purposes.
 5. Perform medico-legal examination of bones, clothing, wet specimens and weapons.
 6. Depose as an expert witness in a court of Law on medico-legal matters.
 7. Examine, identify, prepare reports and initiate management on medico-legal cases in an emergency set up.
 8. Identify and discharge all legal responsibilities in medico-legal matters.
 9. Plan, organize and supervise medico-legal work in general/teaching/district hospitals and in any health care set up.
 10. Collect, preserve and dispatch various samples and trace evidence to the concerned authorities in appropriate manner.
 11. Help and Advise authorities on matters related to medical ethics and medico-legal issues.
 12. Discharge duties in respect of forensic, clinical, emergency, environmental, medico-legal and occupational aspects of toxicology.
 13. Plan, organize and manage toxicological laboratory services in any health care set up.
 14. Provide information and consultation on all aspects of toxicology to professionals, industry, Government and the public at large.
 15. Manage medico-legal responsibilities in mass disasters involving multiple deaths like fire, traffic accident, aircraft accident, rail accident and natural calamities.
 16. Do interaction with allied departments by rendering services in advanced laboratory investigations and relevant expert opinion.
 17. Participate in various workshops/seminars/journal clubs/demonstration in the allied departments, to acquire various skills for collaborative research.

TIME FRAME TO ACQUIRE KNOWLEDGE & SKILLS:

First-year of PG programme:

1. Orientation Programme
2. Basic autopsy skills.
3. Orientation to the applied aspects of Anatomy, Physiology, Biochemistry
4. General principles of Forensic Medicine.
5. Introduction to Medical Toxicology.
6. Assisting in the scheduling of teaching sessions.
7. Participation in undergraduate teaching.
8. Posting for autopsy work, clinical forensic medicine and toxicology.
9. Participation in departmental activities
10. Participation in the seminar, CME, workshop etc.
11. Orientation to organization and functioning of toxicology/research laboratory.
12. Preparation of thesis protocol.
13. Being self-updated with recent advances in the subject

Second-year of PG programme:

1. Conduct of autopsy examination without supervision in routine autopsy cases
2. Conduct of autopsy examination with supervision in expert opinion cases.
3. Conduct of theory and practical sessions for undergraduates
4. Thesis and other research work
5. Clinical forensic medicine work for practical experience in medico-legal procedures and on-the-job practical training in medico-legal aspects of emergency medicine, radiology and other clinical disciplines.

6. Orientation to the applied aspects of Microbiology, Pathology, Blood Bank, Psychiatry as related to forensic sciences.
7. Posting for autopsy work, clinical forensic medicine and toxicology laboratory.
8. Attend court summons for cases conducted by themselves or were deputed to attend in cases where an expert is required to depose by Court of Law

Third-year of PG programme:

1. Organize teaching sessions and thesis work.
2. Submission of thesis six months prior to examination.
3. Posting for autopsy work, clinical forensic medicine and toxicology laboratory to continue.
4. The PG trainee shall be required to conduct a minimum of 100 autopsy cases and minimum of 100 clinical cases during the entire training period.
5. Attend Court summons for cases conducted by themselves or when deputed where an expert is required to depose by the Court of Law.
6. The PG trainee shall be required to attend or accompany an expert to attend a minimum of 20 court summonses, of which at least 5 should pertain to clinical cases.

Components of the PG Curriculum

The major components of the PG curriculum shall be:

- Theoretical knowledge
- Practical/Clinical Skills
- Training in Thesis
- Attitudes, including communication.
- Training in research methodology.

SYLLABUS

THEORY

1. General Principles of Forensic Medicine and Toxicology

- Identify the role of anatomy, physiology, biochemistry, microbiology, pathology, blood bank, psychiatry, radiology, forensic science laboratory as well as other disciplines of medical science to logically arrive at a conclusion in medico-legal autopsies and examination of medico-legal cases.
- Describe the basic principles of techniques used in toxicological laboratory namely TLC, GLC, ASS, HPLC and Breath Alcohol Analyzer.
- Execute the skills and knowledge expected at the undergraduate level.

2. Applied Sciences and Allied Subjects

Anatomy: Anatomy of parts and organs of the body which are important from the medico-legal aspect.

- Describe surface and regional anatomy of the head, neck, chest and abdomen.
- Describe gross anatomy and blood supply of heart, brain, lungs, spleen, liver and kidneys.
- Describe the gross anatomy of male and female genitalia.
- Describe the comparative anatomy of the male and female skeleton.
- Perform histological examination of various tissues.
- Describe the development of the foetus.

Physiology and Biochemistry: Mechanism of phenomena that are important in the body from the medico-legal viewpoint.

- Describe the mechanism of fluid and electrolyte balance, thermoregulation in newborn and adults, endocrine functions.
- Describe the physiology of sexual behaviour.
- Describe physiological functioning of the circulatory system, digestive system, respiratory system, haemopoietic

system, central nervous system and reproductive system including pregnancy.

Pathology: Pathophysiology of vital processes and response mechanisms that modulate tissue and organ reaction to all forms of injury and have a bearing on antemortem and post-mortem appearance in medico-legal cases, assessment of the duration of injuries and correlate trauma and disease.

- Describe pathology of inflammation and repair, immunity and hypersensitivity, Thrombosis and embolism, electric and ionizing radiation injuries, genetic factors in disease, deficiency disorders and malnutrition.
- Describe pathology of myocardial infarction, congenital heart diseases, tuberculosis of lungs, cirrhosis of the liver, diseases of glomeruli and tubules and interstitial; tissues of Kidney, tumours, endocrine disorders, venereal diseases, spontaneous intracranial haemorrhages.
- Describe the pathology of sudden death.
- Describe local and systemic response to trauma and pathophysiology of shock.
- Describe pathology of common infections and infestations of medico-legal significance.

Dentistry: Adequate knowledge of dentistry for the solution of medico-legal problems like injuries, age determination and identification

Radiology: Adequate knowledge of radiological procedures for the solution of medico-legal problems.

Fundamentals of Forensic Medicine:

- Describe the general forensic principle of ballistics, serology, analytical toxicology and photography.
- Interpret the scene of the crime.
- Describe the role of DNA profile and its application in medico-legal practice.
- Examine bloodstains for blood grouping, nuclear sexing, HLA typing, seminal stains

and hair for medico-legal purpose.

- Describe ethical aspects of Forensic Procedures including Narco-analysis, Brain mapping and Polygraph.

3. Medical Ethics and Law (Medical Jurisprudence)

- Describe the history of Forensic Medicine.
- Describe the legal and medico-legal system in India.
- Describe medical ethics and the law in relation to medical practice, different code of ethics, oath, etiquette, Medical Council of India, disciplinary control, rights and duties of a registered medical practitioner, professional misconduct, consent in medical practice, informed consent, confidentiality, medical negligence (including all related issues) and Supreme Court and High Court landmark judgments related to forensic medicine and medical jurisprudence,
- Describe medical ethics and law in relation to organ transplantation, biomedical human research and experimentation, human rights, cloning, genetic engineering, human genome, citizen's charter and International codes of medical ethics.
- Describe the ethics and law in relation to artificial insemination, abortion, antenatal sex, foetus, genetics and euthanasia.
- Interpret the ethics and law applicable to the human (clinical trials) and animal experimentation.
- Describe ethics in relation to the elderly, women and children.
- Describe medical ethics and law in relation to nursing and other medical services/practices.
- Understanding about bio-ethics.
- Relevant sections of IPC, Cr P, IEA, Acts Like CPA, MTP, PCPNDT, NDPS & other acts in relation to poisons, Organ Transplantation Act, NHRC, Domestic Violence Act 2005,

Immoral Trafficking Prevention Act, Dowry Prohibition Act, Mental Health Act, Right to Information Act,

- Medical certification of cause of death and relevant vital statistics.
- Recent laws applicable to the medical man.

4. Clinical Forensic Medicine

- Examine, assess legal implications and prepare report or certificate in cases of physical assault, suspected drunkenness, sexual offences, the consummation of marriage and disputed paternity.
- Collect, preserve and dispatch the specimen/material to the concerned authority and interpret the clinical and laboratory findings which are reported.
- Examine the injured person, prepare a medico-legal report and initiate management.
- Determine the age and establish the identity of an individual for medico-legal purpose.
- Examine a person and assess disability in industrial accidents and diseases.
- Perform examination and interpret findings for medico-legal purposes in cases pertaining to pregnancy, delivery, artificial insemination, abortion, sterilization, Impotence, AIDS and infectious disease.
- Describe normal and abnormal sexual behaviour and medico-legal implications.
- Examine and assess the medical fitness of a person for insurance, government service, sickness and fitness on recovery from illness.
- Examine medico-legal problems related to clinical disciplines of medicine and allied subjects, Pediatrics, Surgery and allied subjects, ENT, Ophthalmology, Obstetrics and Gynaecology, Dermatology and Anesthesiology.
- Examine medico-legal problems related to children, women and elderly.

- Identify the causes of torture and violation of human rights and issues thereto

5. Forensic Pathology

- Apply the principles involved in methods of identification of human remains by race, age, sex, religion, complexion, stature, hair, teeth, anthropometry, dactylography, foot prints, hairs, tattoos, poroscopy and superimposition techniques.
- Perform medicolegal postmortem and be able to exhume, collect, preserve and dispatch specimens or trace evidence to the appropriate authority.
- Diagnose and describe the pathology of wounds, mechanical and regional injuries, ballistics and wound ballistics, electrical injuries, lightning, neglect and starvation, thermal injuries, deaths associated with sexual offences, pregnancy, delivery, abortion, child abuse, dysbarism and barotraumas.
- Describe the pathophysiology of shock and neurogenic shock.
- Describe the pathophysiology of asphyxia, classification, medico-legal aspects and postmortem findings of different types of asphyxial deaths.
- Diagnose and classify death, identify the signs of death, postmortem changes, interpret autopsy findings, artefacts and results of the other relevant investigations to logically conclude the cause, manner (suicidal, homicidal and accidental) and time of death.
- Manage medico-legal responsibilities in mass disasters involving multiple deaths like fire, traffic accident, aircraft accident, rail accident and natural calamities.
- Demonstrate postmortem findings in infant death and to differentiate amongst live birth, stillbirth and dead born.
- Perform postmortem examination in cases of death in custody, torture and violation of human rights.

- Perform postmortem examination in cases of death due to alleged medical negligence in operative and anaesthetic deaths.

6. Toxicology

PRINCIPLES:

Introduction, laws in relation to poisons, toxicological, medico-legal aspects and pattern of poisoning in India. Duties of medical practitioners in cases of suspected poisoning.

For clinical toxicology, integration is necessary with the department of internal medicine, for pharmaceutical toxicology with department of pharmacology, and for analytical toxicology with forensic toxicology division of FSL.

Section 1: General Toxicology

a) Details of Diagnosis and Management

Poisons encountered in India, General symptoms of poisoning, bedside tests and advanced laboratory methods to detect poison/drug in a patient's body fluids and other samples, details of methodologies in treatment of poisoning: decontamination, supportive therapy, antidote therapy, procedures of enhanced elimination, etc.

b) Medico-legal Considerations

The procedure of intimation of suspicious cases or actual cases of foul play to the police, maintenance of records, preservation and dispatch of relevant samples for laboratory analysis, Medico-legal issues involving consent in poisoned/intoxicated victims, psychological issues, etc., Detailed knowledge about Indian Statutes on poisoning, drug abuse, etc.

c) Analytical Toxicology

A detailed description of analytical methods available for toxicological analysis:

Chromatography – thin layer chromatography, gas chromatography, liquid chromatography, Spectro-photometric techniques, neutron activation analysis, advanced instrumentation techniques.

- d) Importance of Poison Control Centres and their mode of establishment and functioning.

Section 2: Chemical Toxicology

a) Caustics

Inorganic acids – sulphuric, nitric, hydrochloric, hydrofluoric acids. Organic acids – carbolic acid (phenol), oxalic, formic, and acetylsalicylic acids
Common alkalis

b) Inorganic Elements

Phosphorus, phosphine, halogens, barium

c) Heavy Metals

Arsenic, lead, mercury, copper, iron, cadmium, thallium, zinc, metal fume fever.

d) Alcohols

Ethanol, methanol, isopropanol, ethylene glycol, diethylene glycol

e) Hydrocarbons and Pesticides

Aliphatic, aromatic, and halogenated hydrocarbons. Detailed classification of pesticides, and detailed knowledge about organophosphates, carbamates, organochlorines, pyrethroids, paraquat, aluminium and zinc phosphide, ethylene dibromide, long-acting anticoagulant rodenticides (bromadiolone).

f) Toxic Gases

Ammonia, formaldehyde, hydrogen sulfide, phosgene, carbon monoxide, hydrogen cyanide & derivatives, methyl isocyanate, tear (riot control) gases

Section 3: Pharmaceutical Toxicology

a) Antipyretics, analgesics, NSAIDs, antihistamines

b) Anti-Infectives Common antibacterial, and antiviral, antiprotozoal, antifungal drugs: an overview

c) Neuropsychotoxicology: Sedative-hypnotics, anticonvulsants, antipsychotics, antidepressants, and antimanic Drugs, with special emphasis on barbiturates, benzodiazepines, phenytoin, lithium, haloperidol, neuroleptics, tricyclics

- d) Narcotic analgesics, anaesthetics, and muscle relaxants
- e) Cardiovascular Toxicology Cardiovascular drugs, anticoagulants, and cardiotoxic plants – oleander, odallam, aconite, digitalis
- f) Gastro-intestinal and endocrinal drugs.

Section 4: Bio toxicology

- a) Poisonous plants
Castor, croton, Calotropis, Abrus, datura, strychnine, etc.
- b) Food poisoning & food adulterants
Bacterial, viral, chemical food poisoning, toxic mushrooms and fish, Argemone
- c) Venomous bites and stings
Snakebite, scorpion sting, bee & wasp sting, spider bite, marine envenomation

Section 5: Sociomedical Toxicology

- a) Substances of dependence and abuse
Tobacco, cannabis, amphetamines, cocaine, opiates, hallucinogens, designer drugs & solvent abuse.

7. Forensic Psychiatry

- Explain the common terminologies of forensic importance in Psychiatry.
- Describe the medico-legal aspects of Psychiatry and mental health.
- Describe medico-legal aspects of drug addiction.
- Describe the role of Psychiatry in criminal investigation, punishment and trial.
- Describe the civil and criminal responsibilities of a mentally ill person.
- Describe the role of Psychology in criminal investigation, punishment and trial

8. Forensic immunology & recent advances.

- Basic concepts of immunology and serology
- Principles of various immune-serological

tests, precipitin test, pregnancy test, sperm antibody test.

- Role of immunological techniques in crime investigation and exclusion of parentage.
- Incompatibility and adverse reaction of drugs commonly used in therapy etc
- Anaphylaxis and hypersensitivity reactions
- DNA & fingerprint system, lie detector & polygraph, narco-analysis.
- National Health policies.
- Lifesaving manoeuvres and pre-hospital first aid.
- Routine and advanced imaging techniques and equipment.
- Medico-legal record keeping.
- Basics of medical education technology and research methodology.
- Computer and its use and its applicability in the speciality.
- Medical auditing.

PRACTICAL

1. Medico-legal autopsy
2. Foetal Autopsy
3. Age estimation
4. Medico-legal injury report preparation.
5. Medico-legal examination of an alcoholic and other drugs.
6. Medico-legal examination in cases of sexual offences.
7. Medico-legal examination of poisoning cases.
8. Medico-legal examination of a bundle of bones, weapons, clothing, wet specimens, poisons.
9. Detection of common poisons in a toxicology laboratory.
10. Medico-legal examination of photographs.
11. Medico-legal examination of X-rays.
12. Laboratory examination of biological trace material evidence.

13. Court evidence / attendance.
14. Expert opinion on clinical cases of medico legal importance.

TEACHING AND LEARNING METHODS

Teaching methodology

1. **Lectures:** Lectures are to be kept to a minimum. They may, however, be employed for teaching certain topics. Lectures may be didactic or integrated. The course shall be for three years, organized in six units (0-5). This modular pattern is a guideline for the department, to organize training. The training programme can be modified depending upon the workload and academic assignments of the department.
2. **Journal Club & Subject seminars:**
Both are recommended to be held once a week. All the PG students are expected to attend and actively participate in the discussion and enter in the Log Book relevant details. Further, every PG trainee must make a presentation from the allotted journal(s), selected articles and a total of 12 seminar presentations in three years. The presentations would be evaluated and would carry weightage for internal assessment.
3. **Case Presentations:** Minimum of 5 cases to be presented by every PG trainee each year. They should be assessed using checklists and entries made in the logbook
4. **Clinico-Pathological correlation/ Conference:** Recommended once a month for all postgraduate students. Presentation is to be done by rotation. If cases are not available, it could be supplemented by published CPCs.
5. **Inter-Departmental Meetings:** These meetings should be attended by postgraduate students and relevant entries must be made in the Log Book.
6. **Teaching Skills:** The postgraduate students shall be required to participate in the teaching and training programme for undergraduate students and interns.
7. Undertake audit, use information technology tools and carry out research, both basic and clinical, with the aim of publishing his work and presenting his work at various scientific fora.
8. **Continuing Medical Education Programmes (CME):** At least two CME programmes should be attended by each student in 3 years.
9. **Conferences:** The student to attend courses, conferences and seminars relevant to the speciality.
10. The department should encourage e-learning activities.
11. **Rotation:**
Other than the Department of Forensic Medicine, the student may be posted for training in the following clinical disciplines for a given period of time on a rotational basis:

Sl. no	Place of posting	1 st year	2 nd year	3 rd year
1	Trauma & Emergency medicine / Casualty	15 days	1 Month	15 days
2	Radiology			8 days
3	Psychiatry	8 days	7 days	
4	Forensic science lab		7 days	8 days
5	Pathology	7 days	8 days	
6	O&G (labour room)			7 days

ASSESSMENT

Internal Examinations

1. Examination on Research Methodology & Biostatistics

Timing: End of 2nd Semester

- Total marks: 100
- Will be considered as an internal examination
- Candidate should pass to appear in Final examination
- No marks will be added to final/summative examination
- Will be conducted by Examination Cell in the month of June & December

Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

Timeline: End of the 3rd, 4th and 5th semester, pre-final (2 months before final examination).

Marks distribution: Theory 100 marks, and practical with viva and logbook (Practical – 70, viva – 20, logbook – 10). The marks of the 4 internal examinations will be averaged to 100 each for theory and practical.

SUMMATIVE ASSESSMENT/ FINAL EXAMINATIONS

Theory

4 papers (100 marks each)

Question Paper Format:

- One Long question – 20 marks
- Eight Short question/notes – 8 x 10 = 80 marks

Total marks in theory: 500 marks

Theory papers in the final examination – 400 marks

Average of 4 internal examination – 100 marks

The examination shall be in three parts:

1. Thesis

The thesis shall be submitted at least six months before the final Theory and Practical examination. A PG trainee shall be allowed to appear for the Theory and Practical/Clinical examination only after the acceptance of the Thesis by the reviewer.

2. Theory

The examinations shall be organized on the basis of 'Grading' or 'Marking system' to evaluate and to certify PG trainee's level of knowledge, skill and competence at the

end of the training. Obtaining a minimum of 50% marks in 'Theory' as well as 'Practical' separately shall be mandatory for passing the examination as a whole. The examination for M.D. shall be held at the end of 3rd academic year. There shall be four papers each of three hours duration. These are:

Theory Examination: There shall be four theory papers.

- **Paper 1:** Basic of Forensic Medicine, basic sciences and allied subjects. - 100 marks
- **Paper-II:** Clinical Forensic Medicine and medical jurisprudence. - 100 marks
- **Paper III:** Forensic pathology. - 100 marks
- **Paper IV:** recent advances in Forensic Medicine, Forensic Psychiatry and Medical Toxicology, applied aspects of clinical disciplines and forensic sciences – 100 marks

3. Practical examination

Total marks: 500

Practical and viva in the final examination – 400 marks

Average of 4 internals (practical + viva + logbook) examinations – 100 marks

The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A** 200 marks	Longcase/ Adult autopsy & Foetal autopsy (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/ Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

** Students should pass (secure 50% marks) separately in Part A

RECOMMENDED READING

Books (latest edition)

1. Subramanyam BV. Modi's Medical Jurisprudence and Toxicology. Butterworths India, New Delhi.
2. Nundy A. Principles of Forensic Medicine, New Central Book Agency Calcutta.
3. Lyon's Medical Jurisprudence for India. Delhi Law House, Delhi.
4. Reddy KSN. The Essentials of Forensic Medicine and Toxicology, K. Saguna Devi Publishers, Hyderabad.
5. Parikh CK. Parikh's Textbook of Medical Jurisprudence, Forensic Medicine and Toxicology, CBS Publishers and Distributors, New Delhi.
6. Bernard Knight. Forensic Pathology. Arnold Publishers London.
7. Di Maio VJ, Di Maio D. Forensic Pathology. CRC Press New York.
8. Camps FE. Gradwohl's Legal Medicine. Bristol: John Wright and Sons Ltd.
9. American College of Legal Medicine Textbook Committee. Legal Medicine Mosby Publishers, USA.
10. Di Maio VJM. Gunshot Wounds, CRC Press USA.
11. Gordon I, Shapiro HA, Berson SD. Forensic Medicine – A Guide to Principle. Churchill Livingstone New York.
12. Mant AK. Taylor's Principles and Practice of Medical Jurisprudence, Churchill Livingstone, New York.
13. Parikh CK. Medicolegal Postmortems in India. Medical Publications, Bombay.
14. Gresham GA, Turner AF. Postmortem Procedures An illustrated Text Book. Wolfe Medical Publications.
15. Ludwing J. Current Methods of Autopsy Practice. WB Saunders Company, London.

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16. Gordon I, Turner R. Medical Jurisprudence E and S Livingstone Ltd. London.
 17. Spitz WU, Fisher RS. Medicolegal Investigation of Death. Charles Thomas Publishers.
 18. Schroeder O.C. Dental Jurisprudence. PSG Publishing Company, Littleton, Massachusetts.
 19. Stark MM. A Physicians Guide to Clinical Forensic Medicine. Humana Press Totowa, New Jersey.
 20. Olshakar JS, Jackson JS. Jackson MC, Smock WS. Forensic Emergency Medicine. Lippincott William and Wilkins, Philadelphia.
 21. Norah Rudin, Keith Inman. An introduction to Forensic DNA Analysis. CRC Press, London.
 22. Robertson J, Ross AM, Burgoyne LA. DNA in Forensic Science - Theory, Technique and Application. Ellis Horwood, UK
 23. Curry AS. Method of Forensic Science Vol. I-III. Inter-science Publishers London.
 24. Clement JG, Ranson DL. Craniofacial Identification in Forensic Medicine. Arnold Publishers, London.
 25. Sellier GK, Kneubuechl BP. Wound Ballistics and the scientific background. Elsevier, Amsterdam.
 26. Bernard Knight. Simpson's Forensic Medicine. Arnold Publishers London.
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MODEL SAMPLE QUESTION PAPERS

PAPER 1

(BASIC SCIENCES AND ALLIED SUBJECTS AS APPLICABLE TO FORENSIC MEDICINE & TOXICOLOGY)

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the anatomy of the circle of Willis. Describe the etiopathology of intracranial haemorrhage. (20)
2. What is the medico- legal importance of age? How will you estimate the age of a person? (10)
3. Discuss the medicolegal significance of histochemical changes following physical injuries. (10)
4. Define & classify abortion. Write the complication of criminal abortion. (10)
5. Define vasovagal shock. Write the limitations in autopsy suspecting death due to vasovagal attack. (10)
6. Discuss the pathophysiology of traumatic fat embolism. (10)
7. Describe in detail 'fetal circulation', changes occurring during and after birth and its medicolegal significance. (10)
8. Discuss the process of wound healing and factors influencing it. (10)
9. Describe the coronary arterial system with the help of a diagram. Discuss it's applied aspect in relation to forensic medicine. (10)

PAPER 2

CLINICAL FORENSIC MEDICINE AND MEDICAL JURISPRUDENCE

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Discuss the interpretation of clinical and laboratory findings in a victim of an alleged case of rape. (20)
2. Describe how the deficiency in medical service will be treated as liability on the part of the medical practitioner. Explain with known examples or hypothetical examples. (10)
3. Discuss the procedures of cadaveric organ transplantation and its medicolegal significance. (10)
4. What is artificial insemination (AID) & outline the legal problems associated with it. (10)
5. What are the characteristics features of a dead born fetus? (10)
6. Define diffuse axonal injury and discuss its pathophysiology. (10)
7. What are the defences available to a doctor in medical negligence cases? (10)
8. Discuss about product liability in relation to medical negligence. (10)
9. What are the roles of informed consent in medical & surgical practice? (10)

PAPER 3

FORENSIC PATHOLOGY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Discuss the data on which the approximate time since death may be determined in medico-legal cases. Mention the factors that influence such estimation.
2. Outline the role of forensic pathologist in the crime scene examination of a suspected suicidal firearm injury case. (10)
3. Describe the post mortem changes in a case of wet drowning with its medicolegal significance. (10)
4. Discuss about the brain stem death and its importance. (10)
5. Discuss the procedure in dissection of neck structures in relation to violent asphyxial death. (10)
6. What are the limitations of skeletal remains examination? (10)
7. What are the errors in post-mortem examination and reporting? (10)
8. What is exhumation and second autopsy? (10)
9. How do you opine the cause of death is antemortem burn-in cases of charred body? (10)

PAPER 4

(RECENT ADVANCES IN FORENSIC MEDICINE, FORENSIC PSYCHIATRY AND MEDICAL TOXICOLOGY
APPLIED ASPECTS OF CLINICAL DISCIPLINES AND FORENSIC SCIENCES)

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Discuss technological advancements in the detection of poisons and trace evidence.
2. Discuss legal, social and ethical aspects of recent methods of procreation. (10)
3. Describe the changing patterns of drug abuse in India. (10)
4. What are the proposed amendments to rape laws in India? (10)
5. Enumerate the principle of Gas Chromatography and how it helps in toxicology. (10)
6. Discuss about aphrodisiac substances. Add a note on Sildenafil Citrate. (10)
7. How to interpret the reports from chemical examiners and histopathology reports and finalization of cause of death? (10)
8. Describe the role of forensic psychiatry in crime investigation, punishment and trial. (10)
9. What is post mortem sperm retrieval and its ethical issues? (10)

ENTRUSTABLE PROFESSIONAL ACTIVITIES (YEAR WISE)

S. NO.	EPA	COMPETENCY DOMAINS						EXPECTED LEVEL OF COMPETENCY				MSF
		MK	PC	PBLI	SBP	P	ICS	DAY 1 OF RESIDENCY	END OF 1 ST YEAR	END OF 2 ND YEAR	END OF 3 RD YEAR	
1	Medicolegal Autopsy – Independent, Reporting	+		+	+	+	+	I	II	III	IV	
2	Medicolegal Examination – Alcohol, drug, poisons- Reporting	+	+	+	+	+	+	I	II	III	IV	
3	Medicolegal Examination – Sexual offence-Reporting	+	+	+	+	+	+	I	II	III	IV	
4	Interpretation of H.P/X-ray for Medicolegal purpose- Reporting	+		+	+	+	+	I	II	III	IV	
5	Medicolegal Examination of Burn	+	+	+	+	+	+	I	II	III	IV	
6	Preparation of expert Opinion	+		+	+	+	+	I	II	III	IV	
7	Depose as an expert witness in a court of law	+		+	+	+	+	I	II	III	IV	
8	Collect, preserve & dispatch various samples of trace evidence	+		+	+	+	+	I	II	III	IV	
9	Consultation to clinician in medicolegal issues	+		+	+	+	+	I	II	III	IV	
10	Plan, organize & manage toxicological laboratory service	+		+	+	+	+	I	II	III	IV	
11	Manage medicolegal responsibility in mass disasters	+		+	+	+	+	I	II	III	IV	
12	Rotational duties in allied department	+		+	+	+	+	I	II	III	IV	
13	Participation of various workshop/seminar/journal club/demonstration	+		+	+	+	+	I	II	III	IV	

Competency Domains:

MK: Medical Knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I



GENERAL MEDICINE

MD in General Medicine

COURSE NAME

MD in General Medicine

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

OBJECTIVES

The postgraduate training should enable the student to:

- Practice efficiently internal medicine speciality, backed by scientific knowledge including basic sciences and skills
- Diagnose and manage the majority of conditions in his speciality (clinically and with the help of relevant investigations)
- Exercise empathy and a caring attitude and maintain professional integrity, honesty and high ethical standards
- Plan and deliver comprehensive treatment using the principles of rational drug therapy
- Plan and advise measures for the prevention and rehabilitation of patients belonging to his speciality;
- Manage emergencies efficiently by providing Basic Life Support (BLS) and Advanced Life Support (ALS) in emergency situations
- Recognize conditions that may be outside the area of the speciality/ competence and refer them to an appropriate specialist
- Demonstrate skills in the documentation of case details including epidemiological data
- Play the assigned role in the implementation of National Health Programs
- Demonstrate competence in basic concepts of research methodology and clinical

epidemiology, and preventive aspects of various disease states

- Be a motivated 'teacher' - defined as one keen to share knowledge and skills with a colleague or a junior or any learner
- Continue to evince keen interest in continuing education irrespective of whether he/she is in a teaching institution or is practising and use appropriate learning resources
- Be well versed with his medico-legal responsibilities
- Undertake audit, use information technology tools and carry out research - both basic and clinical, with the aim of publishing the work and presenting the work at scientific forums.
- The student should be able to recognize the mental condition characterized by self-absorption and reduced ability to respond to the outside world (e.g. Autism), abnormal functioning in social interaction with or without repetitive behaviour and/or poor communications, etc.

SUBJECT SPECIFIC COMPETENCIES

A. Cognitive domain

By the end of the course, the student should have acquired knowledge (cognitive domain), professionalism (affective domain) and skills (psychomotor domain) as given below:

Basic Sciences :

- Basics of human anatomy as relevant to clinical practice e.g. surface anatomy of various viscera, neuro-anatomy, important structures/organs location in different anatomical locations in the body; common congenital anomalies.
- The basic functioning of various organ-system, control of vital functions, pathophysiological alteration in diseased states, interpretation of symptoms and signs in relation to pathophysiology.
- Common pathological changes in various organs associated with diseases and their

correlation with clinical signs; understanding various pathogenic processes and possible therapeutic interventions possible at various levels to reverse or arrest the progress of diseases.

- Knowledge about various microorganisms, their special characteristics important for their pathogenetic potential or of diagnostic help; important organisms associated with tropical diseases, their growth pattern/life-cycles, levels of therapeutic interventions possible in preventing and/or eradicating the organisms.
- Knowledge about pharmacokinetics and pharmacodynamics of the drugs used for the management of common problems in a normal person and in patients with diseases kidneys/liver etc. which may need an alteration in metabolism/excretion of the drugs; rational use of available drugs.
- Knowledge about various poisons with specific reference to different geographical and clinical settings, diagnosis and management.
- Research Methodology and Studies, epidemiology and basic Biostatistics.
- National Health Programmes.
- Biochemical basis of various diseases including fluid and electrolyte disorders; Acid-base disorders etc.
- Recent advances in relevant basic science subjects.

Systemic Medicine:

- Preventive and environmental issues, including principles of preventive health care, immunization and occupational, environmental medicine and bioterrorism.
- Ageing and Geriatric Medicine including Biology, epidemiology and neuropsychiatric aspects of ageing.
- Clinical Pharmacology - principles of drug therapy, the biology of addiction and complementary and alternative medicine.

- Genetics - overview of the paradigm of the genetic contribution to health and disease, principles of Human Genetics, single gene and chromosomal disorders and gene therapy.
- Immunology - The innate and adaptive immune systems, mechanisms of immune-mediated cell injury and transplantation immunology.
- Cardio-vascular diseases - Approach to the patient with possible cardiovascular diseases, heart failure, arrhythmias, hypertension, coronary artery disease, valvular heart disease, infective endocarditis, diseases of the myocardium and pericardium and diseases of the aorta and peripheral vascular system.
- Respiratory system - approach to the patient with respiratory disease, disorders of ventilation, asthma, Congenital Obstructive Pulmonary Disease (COPD), Pneumonia, pulmonary embolism, cystic fibrosis, obstructive sleep apnoea syndrome and diseases of the chest wall, pleura and mediastinum.
- Nephrology - approach to the patient with renal diseases, acid-base disorders, acute kidney injury, chronic kidney disease, tubulointerstitial diseases, nephrolithiasis, Diabetes and the kidney, obstructive uropathy and treatment of irreversible renal failure.
- Gastro-intestinal diseases - approach to the patient with gastrointestinal diseases, gastrointestinal endoscopy, motility disorders, diseases of the oesophagus, acid peptic disease, functional gastrointestinal disorders, diarrhoea, irritable bowel syndrome, pancreatitis and diseases of the rectum and anus.
- Diseases of the liver and gall bladder - approach to the patient with liver disease, acute viral hepatitis, chronic hepatitis, alcoholic and non-alcoholic steatohepatitis, cirrhosis and its sequelae, hepatic failure and liver transplantation and diseases of the gall bladder and bile ducts.
- Haematologic diseases - haematopoiesis, anaemias, leucopenia and leucocytosis, myeloproliferative disorders, disorders of

haemostasis and haemopoietic stem cell transplantation.

- Oncology - epidemiology, biology and genetics of cancer, paraneoplastic syndromes and endocrine manifestations of tumours, leukaemias and lymphomas, cancers of various organ systems and cancer chemotherapy.
- Metabolic diseases - inborn errors of metabolism and disorders of metabolism.
- Nutritional diseases - nutritional assessment, enteral and parenteral nutrition, obesity and eating disorders.
- Endocrine - principles of endocrinology, diseases of various endocrine organs including diabetes mellitus.
- Rheumatic diseases - approach to the patient with rheumatic diseases, osteoarthritis, rheumatoid arthritis, spondyloarthropathies, systemic lupus erythematosus (SLE), polymyalgia, rheumatic fibromyalgia and amyloidosis.
- Infectious diseases - Basic consideration in Infectious Diseases, clinical syndromes, community-acquired clinical syndromes. Nosocomial infections, Bacterial diseases - General consideration, diseases caused by gram-positive bacteria, diseases caused by gram-negative bacteria, miscellaneous bacterial infections, Mycobacterial diseases, Spirochetal diseases, Rickettsia, Mycoplasma and Chlamydia, viral diseases, DNA viruses, DNA and RNA respiratory viruses, RNA viruses, fungal infections, protozoal and helminthic infections.
- Neurology - approach to the patient with neurologic disease, headache, seizure disorders and epilepsy, coma, disorders of sleep, cerebrovascular diseases, Parkinson's disease and other movement disorders, motor neuron disease, meningitis and encephalitis, peripheral neuropathies, muscle diseases, diseases of neuromuscular transmission and autonomic disorders and their management.
- The mental condition characterized by complete self-absorption with reduced ability to

communicate with the outside world (Autism), abnormal functioning in social interaction with or without repetitive behaviour and/or poor communication etc.

- Dermatology - Structure and functions of the skin, infections of the skin, papulosquamous and inflammatory skin rashes, photo-dermatology, erythroderma, cutaneous manifestations of systematic diseases, bullous diseases, drug-induced rashes, disorders of hair and nails, principles of topical therapy.

B. Affective Domain

- Should be able to function as a part of a team, develop an attitude of cooperation with colleagues, and interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.
- Always adopt ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel and to respect the rights of the patient including the right to information and second opinion.
- Develop communication skills to word reports and professional opinion as well as to interact with patients, relatives, peers and paramedical staff, and for effective teaching.

C. Psychomotor domain

Clinical Assessment Skills

- Elicit a detailed clinical history
- Perform a thorough physical examination of all the systems

Procedural skills

- Test dose administration
- Mantoux test Sampling of fluid for culture IV-Infusions Intravenous injections Intravenous cannulation ECG recording Pleural tap Lumbar puncture Cardiac
- TMT Holter Monitoring
- Echocardiogram

- Doppler studies
- Cardio Pulmonary Resuscitation (CPR) Central venous line insertion, CVP monitoring Blood and blood components matching and transfusions Arterial puncture for ABG Fine needle aspiration cytology (FNAC) from palpable lumps Bone marrow aspiration and biopsy Abdominal paracentesis - diagnostic Aspiration of liver abscess Pericardiocentesis Joint fluid aspiration Liver biopsy Nerve/muscle/ skin/ kidney/ pleural biopsy Ultrasound abdomen, echocardiography Upper GI endoscopy, procto-sigmoidoscopy
- Respiratory management
- Nebulization Inhaler therapy Oxygen delivery
- Critically ill person
- Monitoring a sick person Endotracheal intubation CPR Using a defibrillator Pulse oximetry Feeding tube/Ryle's tube, stomach wash
- Naso-gastric intubation Urinary catheterization - male and female
- Prognostication
- Haemodialysis
- Neurology- interpret · Nerve Conduction studies · EEG · Evoked Potential interpretation · Certification of Brain death Intercostal tube placement with underwater seal Thoracocentesis Sedation Analgesia
- Laboratory-Diagnostic Abilities
- Urine protein, sugar, microscopy Peripheral blood smear Malarial smear Ziehl Nielson smear-sputum, gastric aspirate Gram's stain smear-CSF, pus Stool pH, occult blood, microscopy KOH smear Cell count - CSF, pleural, peritoneal, any serous fluid
- Subdural, ventricular tap Joint Aspiration - Injection Endoscopic Retrograde Cholangio-Pancreatography (ERCP) Peritoneal dialysis

Interpretation Skills

- Clinical data (history and examination findings), formulating a differential diagnosis in order of priority, using principles of clinical decision making, plan investigative work-up, keeping in mind the cost-effective approach i.e. problem solving and clinical decision making.
- Blood, urine, CSF and fluid investigations - hematology, biochemistry
- X-ray chest, abdomen, bone and joints
- ECG
- Treadmill testing
- ABG analysis
- Ultrasonography
- CT scan chest and abdomen
- CT scan head and spine
- MRI
- Barium studies
- IVP, VUR studies
- Pulmonary function tests
- Immunological investigations
- Echocardiographic studies

Interpretation under supervision

- Hemodynamic monitoring
- Nuclear isotope scanning
- MRI spectroscopy/SPECT
- Ultrasound-guided aspiration and biopsies

Communication skills

- While eliciting clinical history and performing physical examination Communicating health, and disease Communicating about a seriously ill or mentally abnormal Communicating death
- Informed consent
- Empathy with patient and family members
- Referral letters, and replies
- Discharge summaries
- Death certificates
- Pre-test counselling for HIV

- Post-test counselling for HIV
- Pedagogy -teaching students, other health functionaries-lectures, bedside clinics, discussions
- Health education - prevention of common medical problems, promoting a healthy lifestyle, immunization, periodic health screening, counselling skills in risk factors for common malignancies, cardiovascular disease, AIDS
- Dietary counselling in health and disease
- Case presentation skills including recording case history/examination, preparing follow-up notes, preparing referral notes, oral presentation of new cases/follow-up cases
- Co-coordinating care - teamwork (with house staff, nurses, faculty etc.)
- Linking patients with community resources
- Providing referral
- Genetic counselling

Demonstrating

- Professionalism
- Ethical behaviour (humane and professional care to patients) Utilization of information technology
- Medline search, Internet access, computer usage Research methodology
- Designing a study
- Interpretation and presentation of scientific data Self-directed learning
- Identifying key information sources
- Literature searches
- Information management Therapeutic decision-making
- Managing multiple problems simultaneously
- Assessing risks, benefits and costs of treatment options
- Involving patients in decision-making
- Selecting specific drugs within classes
- Rational use of drugs

COURSE CONTENTS

Basic Sciences

1. Basics of human anatomy as relevant to clinical practice · surface anatomy of various viscera · neuro-anatomy · important structures/organs location in different anatomical locations in the body · common congenital anomalies
2. The basic functioning of various organ-system, control of vital functions, pathophysiological alteration in diseased states, interpretation of symptoms and signs in relation to pathophysiology.
3. Common pathological changes in various organs associated with diseases and their correlation with clinical signs; understanding various pathogenic processes and possible therapeutic interventions possible at various levels to reverse or arrest the progress of diseases.
4. Knowledge about various microorganisms, their special characteristics important for their pathogenetic potential or of diagnostic help; important organisms associated with tropical diseases, their growth pattern/life-cycles, levels of therapeutic interventions possible in preventing and/or eradicating the organisms.
5. Knowledge about pharmacokinetics and pharmacodynamics of the drugs used for the management of common problems in a normal person and in patients with diseases kidneys/liver etc. which may need an alteration in metabolism/excretion of the drugs; rational use of available drugs.
6. Knowledge about various poisons with specific reference to different geographical and clinical settings, diagnosis and management.
7. Research Methodology and Studies, epidemiology and basic Biostatistics.
8. National Health Programmes.
9. Biochemical basis of various diseases including fluid and electrolyte disorders; Acid-base disorders etc.

10. Recent advances in relevant basic science subjects.

Systemic Medicine

1. Preventive and environmental issues, including principles of preventive health care, immunization and occupational, environmental medicine and bioterrorism.

2. Ageing and Geriatric Medicine:

- Biology
- Epidemiology
- Neuro-psychiatric aspects of ageing

3. Clinical Pharmacology:

- Principles of drug therapy
- Biology of addiction
- Complementary and alternative medicine

4. Genetics:

- Overview of the paradigm of the genetic contribution to health and disease
- Principles of Human Genetics
- Single gene and chromosomal disorders · gene therapy

5. Immunology:

- Innate and adaptive immune systems
- Mechanisms of immune-mediated cell injury
- Transplantation immunology

6. Cardio-vascular diseases:

- Approach to the patient with possible cardiovascular diseases
- Heart failure
- Arrhythmias
- Hypertension
- Coronary artery disease
- Valvular heart disease
- Infective endocarditis
- Diseases of the myocardium and pericardium
- Diseases of the aorta and peripheral vascular system

7. Respiratory system:

- Approach to the patient with respiratory disease
- Disorders of ventilation
- Asthma
- Congenital Obstructive Pulmonary Disease (COPD)
- Pneumonia
- Pulmonary embolism
- Cystic fibrosis
- Obstructive sleep apnoea syndrome and diseases of the chest wall, pleura and mediastinum

8. Nephrology:

- Approach to the patient with renal diseases
- Acid-base disorders
- Acute kidney injury
- Chronic kidney disease
- Tubulointerstitial diseases
- Nephrolithiasis
- Diabetes and the kidney
- Obstructive uropathy and treatment of irreversible renal failure

9. Gastro-intestinal diseases:

- Approach to the patient with gastrointestinal diseases
- Gastrointestinal endoscopy
- Motility disorders
- Diseases of the oesophagus
- Acid peptic disease
- Functional gastrointestinal disorders
- Diarrhoea
- Irritable bowel syndrome
- Pancreatitis and diseases of the rectum and anus

10. Diseases of the liver and gall bladder:

- Approach to the patient with liver disease
- Acute viral hepatitis
- Chronic hepatitis

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- Alcoholic and non-alcoholic steatohepatitis
 - Cirrhosis and its sequelae
 - Hepatic failure and liver transplantation
 - Diseases of the gall bladder and bile ducts
11. Haematologic diseases:
- Haematopoiesis
 - Anaemias· leucopenia and leucocytosis
 - Myeloproliferative disorders
 - Of haemostasis and haemopoietic stem cell transplantation
12. Oncology:
- Epidemiology
 - Biology and genetics of cancer
 - Paraneoplastic syndromes and endocrine manifestations of tumours
 - Leukaemias and lymphomas
 - Cancers of various organ systems and cancer chemotherapy
13. Metabolic diseases - inborn errors of metabolism and disorders of metabolism.
14. Nutritional diseases - nutritional assessment, enteral and parenteral nutrition, obesity and eating disorders.
15. Endocrine - principles of endocrinology, diseases of various endocrine organs including diabetes mellitus.
16. Rheumatic diseases:
- Approach to the patient with rheumatic diseases
 - Osteoarthritis
 - Rheumatoid arthritis
 - Spondyloarthropathies
 - Systemic lupus erythematosus (SLE)
 - Polymyalgia
 - Rheumatic fibromyalgia and amyloidosis
17. Infectious diseases:
- The basic consideration in Infectious Diseases
- Clinical syndromes
 - Community-acquired clinical syndromes
 - Nosocomial infections
 - Bacterial diseases - General consideration, diseases caused by gram-positive bacteria, diseases caused by gram-negative bacteria
 - miscellaneous bacterial infections
 - Mycobacterial diseases
 - Spirochetal diseases
 - Rickettsia
 - Mycoplasma and Chlamydia
 - Viral diseases
 - DNA viruses
 - DNA and RNA respiratory viruses
 - RNA viruses
 - Fungal infections, protozoal and helminthic infections.
18. Neurology - approach to the patient with neurologic disease, headache, seizure disorders and epilepsy, coma, disorders of sleep, cerebrovascular diseases, Parkinson's disease and other movement disorders, motor neuron disease, meningitis and encephalitis, peripheral neuropathies, muscle diseases, diseases of neuromuscular transmission and autonomic disorders and their management.
19. The mental condition characterized by complete self-absorption with reduced ability to communicate with the outside world (Autism), abnormal functioning in social interaction with or without repetitive behaviour and/or poor communication etc.
20. Dermatology:
- Structure and functions of skin
 - Infections of skin
 - Papulosquamous and inflammatory skin rashes
 - Photo-dermatology
 - Erythroderma
 - Cutaneous manifestations of systematic diseases
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- Bullous diseases
- Drug-induced rashes
- Disorders of hair and nails
- Principles of topical therapy

Theory

There will be four theory papers, as below:

Paper I: Basic Medical Sciences

Paper-II: Systemic Medicine

Paper III: Tropical Medicine and Infectious Diseases, Poisoning, Dermatology, Psychiatry, Geriatrics

Paper IV: Recent Advances in Medicine

TEACHING AND LEARNING METHODS

The minimum teaching schedule for PGs shall incorporate the following:

1. Seminars

- At least one per week.
- Minimum of 48 in a year

2. Journal Clubs

- At least one per week
- Minimum of 48 in a year

3. Group Discussions in the form of general clinics or bedside clinics.

- At least one per week
- Minimum of 48 in a year

4. Clinical Meetings

- Attendance in Institute common academic presentation/ mortality meeting/video conferencing sessions with other institutes is a must for PGs.

5. Clinico-Pathological Conferences

- Preferably at least twice per year for the departments of Medicine.

6. Lectures

- At least one per fortnight
- Minimum of 24 in a year

7. Guest lectures

As per availability

Sample timetable

Day	Week 1	Week 2	Week 3	Week 4
Monday				
Tuesday	Journal club	Journal club	Journal club	Journal club
Wednesday	clinics	Clinics	clinics	Clinics
Thursday	Seminar	Seminar	Seminar	Seminar
Friday	Institute common academic presentation			
Saturday	Mortality meet/ video conferencing sessions			

Methodology for the conduct of seminars

Objective: To ensure that students are well versed in the various aspects of a topic including recent advances and to improve their communication skills.

Procedure:

Sl. No.	Step	Responsibility	Document/Record
1.	The schedule for the seminar is prepared and shall incorporate the name (s) of the student (s), the topic and the moderator (faculty).	HOD/Coordinator	Time table
2.	The student (s) shall meet the concerned faculty at least 10 days in advance of the seminar and seek their guidance.	Student (s) and faculty	

3.	The draft of the seminar is prepared incorporating the usage of AV aids where required.	Student (s)	
4.	In consultation with the moderator (faculty) changes if any are made and the seminar presentation is finalised.	Student (s) and faculty	
5.	Where necessary the hand-outs are prepared.	Student (s)	Hand-out
6.	On the designated day the student (s) present the seminar under the guidance of the moderator (faculty)	Student (s)	
7.	Attendance is taken of all present	Clerk	Attendance register (s)
8.	The seminar is evaluated based on pre-determined criteria.	Moderator	Logbook

Methodology for the conduct of journal club

Objective: To improving the analytical skills of Post-graduates and also ensure that they keep themselves abreast of the latest happenings and ensure that they have in-depth knowledge of a disease/concept.

Procedure:

Sl. No.	Step	Responsibility	Document/Record
1.	The schedule for the journal club is prepared and shall incorporate the name (s) of the student (s), the co-ordinator (faculty). The journal club shall necessarily have one original research paper or landmark article appraised critically. It is desirable that it also includes one review article and a series of brief summaries which concentrate on the latest happenings in the field. The co-ordinator shall necessarily be a person trained in the conduct of the journal club and shall be rotated at regular intervals (as decided by the department).	HOD	Time table
2.	The staff co-ordinator selects the paper (s). The article shall be selected as per pre-determined criteria.	Staff co-ordinator	Checklist
3.	Selected paper under the original article the section is circulated among staff and fellow students at least 10 days before the presentation.	Student	
4.	The student prepares a presentation using appropriate AV aids and as per the checklist which is attached as annexure.	Student	Checklist for journal the club signed by staff co-ordinator
5.	The original article is presented and discussed under the supervision of the staff co-ordinator as per the checklist. This shall preferably not be more than 30 minutes.	Student	
6.	At the end of the presentation, the group comes to a consensus opinion about the study.	Student	Checklist
7.	It is preferable that this final analysis be used to generate a "Letter to the editor" which can be sent for publication. Any such article sent shall have the student who has done the review as the first author and the faculty who has been the coordinator as the second author.	Student and staff co-ordinator	Draft of the manuscript maintained in the department.

8.	It is preferable that a review article be presented and discussed as per the checklist and the time for this is 20 minutes.	Student	
9.	It is also preferable that brief summaries of recent advances be presented and the time for this is 10 minutes.	Resident	
10.	Attendance is taken of all present.	Clerk	Attendance register (s)
11.	The journal club is evaluated based on pre-determined criteria.	Moderator	Logbook

Methodology for the conduct of group discussions (general and micro-clinics)

Objective: To ensure that students are well versed in the various aspects of a case including holistic approach and management and to improve their communication skills.

Procedure:

Sl. No.	Step	Responsibility	Document/Record
1.	The schedule for the clinics is prepared and shall incorporate the name (s) of the student and the moderator (faculty).	HOD/Coordinator	Time table
2.	The student shall meet the concerned faculty at least 1 day in advance and the case shall be allotted.	Student and faculty	
3.	On the designated day the student presents the case and teaching activity is carried out.	Student	
4.	Attendance is taken of all present.	Clerk	Attendance register (s)
5.	The case presentation is evaluated based on pre-determined criteria.	Moderator	Logbook

Methodology for the conduct of clinicopathological conference (CPC)

Objective: To ensure that students better understand the correlation of the clinical picture with the pathology findings and lead to overall better understanding.

Procedure:

Sl. No.	Step	Responsibility	Document/Record
1.	The schedule for the clinicopathological	HOD/Coordinator	Time table
2.	At least 10 days prior to the CPC the cases are finalised (preferably jointly & Pathology department).	HODs of both departments	
3.	On the designated day the PG student presents the case and the Pathologist (s) who have reported the case presents the findings.	Student (s) & Pathologist	
4.	Discussions are held.	Students and faculty	
5.	Attendance is taken of all present.	Clerk	Attendance register (s)

Thesis

1. Every candidate shall carry out work on an assigned research project under the guidance of a recognized Postgraduate Teacher; the project shall be written and submitted in the form of a thesis.
2. Every candidate shall submit the thesis plan within the time frame specified by the department.
3. The thesis shall be submitted before the commencement of theory examination as per the regulation of the institution.
4. Requirements:-
 - Identify a relevant research question
 - Conduct a critical review of the literature
 - Formulate a hypothesis
 - Determine the most suitable study design
 - State the objectives of the study
 - Prepare a study protocol
 - Undertake the study according to the protocol
 - Analyze and interpret research data, discuss, summarize and draw conclusions
 - Write a research paper.

Departmental training schedule & posting of residents :

Illustration of structured training

Time period	Description/ levels	content	Responsibility
1 st month	Orientation	Basic cognitive skill	-Combined duties - Supervised procedures
1 st year	Beginners	Procedural ability, OPD, Ward work, Emergency and intensive critical care under the supervision	History sheet writing Clinical abilities, -Procedural abilities (PA, PI)*, -Laboratorydiagnostic (All PI) -Communication skills BLS & ACLS
2 nd year	intermediate	All the above and Intermediate degree of cognitive abilities Specialised procedural skills Emergency and critical care	Independent duties - All procedures - Respiratory management abilities (All PI) - Communication skills (PA, PI) - Writing thesis - Teaching UGs
3 rd year		All the above and Special skills	Advanced levels of independent duties, - casualty calls, - ICU, NICU, - UG teaching

The trainees in internal medicine should be designated as residents.

According to the year of residency, he/she should be designated as First/Second/Third-year resident.

Outdoor Patient (OPD) Responsibilities

- * The working of the residents in the OPD should be fully supervised.
- * They should evaluate each patient and write the observations on the OPD card with date and signature.
- * Investigations should be ordered as and when necessary using prescribed forms.
- * Residents should discuss all the cases with the consultant and formulate a management plan.
- * Patient requiring admission according to resident's assessment should be shown to the consultant on duty.
- * Patient requiring immediate medical attention should be sent to the casualty services with details of the clinical problem clearly written on the card.
- * Patient should be clearly explained as to the nature of the illness, the treatment advice and the investigations to be done.
- * Resident should specify the date and time when the patient has to return for follow up.

In-Patient Responsibilities

Each resident should be responsible and accountable for all the patients admitted under his care. The following are the general guidelines for the functioning of the residents in the ward:

- * Detailed workup of the case and case sheet maintenance:

He/She should record a proper history and document the various symptoms. Perform a proper patient examination using standard methodology. He should develop skills to ensure patient comfort/consent for examination. Based on the above evaluation he/she should be able to formulate a differential diagnosis and prepare a management plan. Should develop skills for the recording of medical notes, investigations and be able to properly document the consultant round notes.

- * To organize his/her investigations and ensure collection of reports.
 - * Bedside procedures for therapeutic or diagnostic purpose.
 - * Presentation of a precise and comprehensive overview of the patient in clinical rounds to facilitate discussion with senior residents and consultants.
 - * To evaluate the patient twice daily (and more frequently if necessary) and maintain a progress report in the case file.
 - * To establish rapport with the patient for communication regarding the nature of illness and further plan management.
 - * To write instructions about patient's treatment clearly in the instruction book along with time, date and the bed number with the legible signature of the resident.
 - * All treatment alterations should be done by the residents with the advice of the concerned consultants and senior residents of the unit.
 - * Following guidelines should be observed by the resident during admission day.
 - * Resident should work up the patient in detail and be ready with the preliminary necessary investigations reports for the evening discussion with the consultant on duty.
 - * After the evening round the resident should make changes in the treatment and plan out the investigations for the next day in advance.
 - * Duty days for each Junior Resident should be allotted according to the duty roster.
 - * The resident on duty for the day should know about all sick patients in the wards and relevant problems of all other patients so that he could face an emergency situation effectively.
 - * In the morning, detailed over (written and verbal) should be given to the next resident on duty. This practice should be rigidly observed.
 - * If a patient is critically ill, discussion about management should be done with the senior resident or consultant at any time.
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- * The doctor on duty should be available in the ward throughout the duty hours.
 - * Care of sick patients in the ward should have precedence over all other routine work for the doctor on duty.
 - * Patients in critical condition should be meticulously monitored and records maintained.
 - * If patient merits ICU care then it must be discussed with the senior residents and consultants for transfer to ICU.
 - * At the time of joining the residency programme, the resuscitation skills should be demonstrated to the residents and practical training provided at various workstations.
 - * Residents should be fully competent in providing basic and advanced cardiac life support.
 - * They should be fully aware of all advanced cardiac support algorithms and be aware of the use of common resuscitative drugs and equipment like defibrillators and external cardiac pacemakers.
 - * The resident should be able to lead a cardiac arrest management team.
 - * Patient should be informed about his/her discharge one day in advance and discharge cards should be prepared 1 day prior to the planned discharge.
 - * The discharge card should include the salient points in history and examination, complete diagnosis, important management decisions, hospital course and procedures done during the hospital stay and the final advice to the patient.
 - * Consultants and Senior Residents should check the particulars of the discharge card and countersign it.
 - * Patient should be briefed regarding the date, time and location of OPD for the follow-up visit.
 - * In case it is anticipated that a particular patient is in a serious condition, relatives should be informed about the critical condition of the patient beforehand.
 - * Residents should be expected to develop appropriate skills for breaking bad news and bereavements.
 - * Follow up death summary should be written in the file and face sheet notes must be filled up and the sister in charge should be requested to send the body to the mortuary with respect and dignity from where the patient's relatives can be handed over the body.
 - * In case of a medico-legal case, a death certificate has to be prepared in triplicate and the body handed over to the mortuary and the local police authorities should be informed.
 - * Autopsy should be attempted for all patients who have died in the hospital especially if the patient died of an undiagnosed illness.

Bedside Procedures

The following guidelines should be observed strictly:

- * Be aware of the indications and contraindications for the procedure and record it in the case sheet. Rule out contraindications like low platelet count, prolonged prothrombin time, etc.
- * Plan the procedure during routine working hours, unless it is an emergency. Explain the procedure with its complications to the patient and his/her relative and obtain written informed consent on a proper form. Perform the procedure under strict aseptic precautions using standard techniques. The emergency tray should be ready during the procedure.
- * Make a brief note on the case sheet with the date, time, nature of the procedure and immediate complications, if any. Monitor the patient and watch for complications(s).

Medico-Legal Responsibilities of the Residents

- * All the residents are given education regarding medico-legal responsibilities at the time of admission in a short workshop.
- * They must be aware of the formalities and steps involved in making the correct death certificates, mortuary slips, medico-legal entries, requisition for autopsy etc.

- * They should be fully aware of the ethical angle of their responsibilities and should learn how to take legally valid consent for different hospital procedures & therapies.
- * They should ensure confidentiality at every stage.

Allied department posting

All residents will be posted to allied departments relating to medicine according to the roster prepared by the department of medicine

ASSESSMENT

Internal assessment:

In addition to examination on research methodology & biostatistics, a total of 4 internal examinations will be conducted at end of the 3rd, 4th and 5th semester, and pre-final (2 months before final examination).

Examination on research methodology & biostatistics:

- At end of 2nd semester
- Total mark: 100
- Will be considered as an internal examination
- Candidate has to pass the examination to appear the final examination
- No mark will be added to final/summative examination
- Will be conducted by examination cell in the month of June & December

Marks distribution for internal examination:

Theory 100 marks.

Practical with viva and logbook (Practical – 70, viva – 20, logbook – 10=100 marks).

The marks of the 4 internal examinations will be averaged to 100 each for theory and practical.

Summative examination:

Theory Examination:

Total mark; 500 (4 papers 100 marks each =400 & average of 4 internal examinations: 100) .
Question Paper Format: In each paper, One Long question carrying 20 marks and Eight Short question/notes – 10 x 8 = 80 marks.

Practical examination:

Practical examination: Total marks: 500 (Practical and viva in the final examination – 400 marks and an average of 4 internals- 100 marks).

The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A* 200 marks	Longcase (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/ Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

* Students should pass (secure 50% marks) separately in Part A

Thesis evaluation :

- The student should submit the completed thesis 6 months before the final examination
- If more than 20% plagiarism is detected, the student will be asked to rewrite & resubmit the thesis
- The thesis will be sent to the external evaluator for approval

Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical*	100	100	100	100	100	400	500

* Practical (70 marks), Viva (20 marks), Logbook (10 marks)

The student has to secure 50% marks in the internal examination to be eligible to appear for the final examination.

In the final theory examination, a student should secure 50% marks (200 out of 400) to pass.

In the final practical examination, a student has to secure 50% marks (200 out of 400) overall and additionally they have to secure 50% marks (100 out of 200) in Part A separately.

RECOMMENDED BOOKS

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4. Campbell WW. DeJong's The Neurologic Examination: Wolters Kluwer Health; 2012.
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6. Dooley JS, Lok ASF, Garcia-Tsao G, Pinzani M. Sherlock's Diseases of the Liver and Biliary System: Wiley; 2018.
7. Firkin F, Chesterman C, Rush B, Pennigton D. De Gruchy's Clinical Hematology In Medical Practice, 5th Ed: Wiley India Pvt. Limited; 2008.
8. Foster C, Medicine WUD, Mistry N, Peddi PF, Sharma S. The Washington Manual of Medical Therapeutics: Lippincott Williams & Wilkins; 2004.
9. Fuster V, Hurst JW, Alexander RW, O'Rourke RA. Hurst's the Heart: McGraw-Hill, Medical Pub. Division; 2004.
10. Glynn M. Hutchison's Clinical Methods : An Integrated Approach to Clinical Practice, 23/e: Elsevier Health Sciences; 2012.
11. Goldman L, Schafer AI. Goldman-Cecil Medicine, 2-Volume Set: Elsevier - Health Sciences Division; 2019.
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13. Houghton AR, Gray D. Chamberlain's Symptoms

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- and Signs in Clinical Medicine, An Introduction to Medical Diagnosis: CRC Press; 2010.
14. Kasper DL, Fauci AS, Hauser SL, Longo DL, Jameson JL, Loscalzo J. Harrison's Principles of Internal Medicine 19th Ed (Vol.1 & Vol.2): McGraw-Hill Education; 2015.
 15. Macleod J, Douglas G, Nicol EF, Robertson CE. Macleod's Clinical Examination: Churchill Livingstone/Elsevier; 2009.
 16. Mann DL, Zipes DP, Libby P, Braunwald E, Bonow RO. Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine: Elsevier/Saunders; 2015.
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 18. Munjal Y. API Textbook of Medicine (Volume I & II): Jaypee Brothers, Medical Publishers Pvt. Limited; 2015.
 19. Papadakis MA, McPhee SJ, Rabow MW. Current Medical Diagnosis and Treatment 2020: McGraw-Hill Education; 2019.
 20. Patten J. Neurological Differential Diagnosis: Springer; 1996.
 21. Perloff JK, Marelli A. Perloff's Clinical Recognition of Congenital Heart Disease: Expert Consult - Online and Print: Elsevier Health Sciences; 2012.
 22. Ralston SH, Penman ID, Strachan MWJ, Hobson R. Davidson's Principles and Practice of Medicine E-Book: Elsevier Health Sciences; 2018.
 23. Schamroth L, Schamroth C. An Introduction to Electrocardiography: Blackwell Scientific; 1990.
 24. Seaton A, Leitch AG, Seaton D. Crofton and Douglas's Respiratory Diseases: In Two Volumes: Wiley; 2008.
 25. Seaton A, Seaton D, Leitch AG. Crofton And Douglas's Respiratory Diseases: 2 VOLUME SET, 5th Ed: Wiley India Pvt. Limited; 2008.
 26. Shlomo Melmed MM, Polonsky KS, P. Reed Larsen MDF, Kronenberg HM. Williams Textbook of Endocrinology: Elsevier Health Sciences; 2015.
 27. Spillane J. Bickerstaff's Neurological Examination In Clinical Practice, 6th Ed: Wiley India Pvt. Limited; 2008.
 28. Taal MW, Brenner BM, Rector FC. Brenner and Rector's the Kidney: Elsevier/Saunders; 2012.
 29. Victor M, Ropper AH, Adams RD. Adams and Victor's Principles of Neurology: Medical Pub. Division, McGraw-Hill; 2001.
 30. Warrell DA, Cox TM, Firth JD. Oxford Textbook of Medicine: Oxford University Press; 2005.
 31. Wintrobe MM, Greer JP, Foerster J, Arber DA, Rodgers GM. Wintrobe's Clinical Hematology: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2009.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASIC SCIENCES INCLUDING APPLIED ANATOMY, PHYSIOLOGY, BIOCHEMISTRY, PHARMACOLOGY, MICROBIOLOGY, IMMUNOLOGY AND PATHOLOGY.

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. A young female in the puerperium period presents to emergency with acute abdominal pain with swelling of abdomen for last 2 days. On examination found to have tender hepatomegaly with ascites. How will you approach and assess the various causes? Describe the Collateral circulation in a patient with inferior venacava obstruction. (10+10)
2. Discuss the anatomy of Circle of Willis and indicate the sites of aneurysm formation.
3. Compensatory physiological mechanisms that occur with a patient who has septic shock.
4. Discuss the biochemical changes that occur in a patient with diabetic ketoacidosis.
5. Biochemical abnormalities encountered in order of time sequence in acute myocardial infarction.
6. Enumerate important drug interactions with antituberculous drugs.
7. Discuss the pharmacological basis of the therapeutics of a patient with a blood pressure of 160/108 mmHg and diabetes mellitus.
8. Discuss the laboratory diagnosis of AIDS.
9. Discuss the immunology of lepra reactions.

PAPER 2

SYSTEMIC MEDICINE

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. A 44 year old male with history of Diabetes Mellitus for last 6 years, on Oral anti diabetic drugs presented to emergency department with H/O fever on and off for last 7 days associated with non productive cough and Shortness of breath. His Respiratory rate was 32/min with other vitals stable. How will you approach this case and what are the various differential diagnosis? Write aetiology, clinical features, diagnosis and treatment of atypical pneumonia. (8+3+3+3+3)
2. Discuss the aetiology and treatment of reflux nephropathy.
3. Enumerate psychiatric manifestations of collagen vascular disease.
4. Outline the management of refractory idiopathic thrombocytopenic purpura.
5. Discuss about diagnostic approach to growth retardation.
6. Outline the treatment of Diabetic ketoacidosis.
7. Outline the management of SLE.
8. How to approach to a patient with unstable angina?
9. Outline the management of pneumothorax

PAPER 3

TROPICAL MEDICINE, ENVIRONMENTAL MEDICINE, POISONING, DERMATOLOGY, PSYCHIATRY,
GERIATRICS

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. A 52 year female presented to OPD with Cough without Expectoration for last 15 days associated with on and off pruritic urticarial rash with generalised erythema of body.He had a travel history to South India 1 month back.How will you Approach the case? Discuss the life cycle, clinical manifestations, complications, diagnosis and treatment of Strongyloidesstercoralis infestation. (5+3+3+3+3+3)
2. Compare and contrast tropical vs western cardiomyopathy.
3. Discuss the epidemiology of diabetes mellitus in India.
4. Outline the management strategies for an epidemic of cholera.
5. Enumerate clinical features of organophosphorus poisoning.
6. How to diagnose tropical sprue?
7. Discuss the neurobiological basis and management of late-life depression (LLD).
8. Outline recent treatment modalities for Hepatitis C infection.
9. Outline the management of Hematotoxic Snake bite.

PAPER 4

INTERNAL MEDICINE: RECENT ADVANCES

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. A 22 year female found in a pond in drowned condition and was shifted to Emergency department.In ED, patient was found to be in a confused state .Vitals were normal except Tachypnoea.On examination found to have crepitations in both side Infrascapular and Infraaxillaryareas.Other systemic examinations were normal.How are you going to manage this case ? Discuss the recent advances in therapy of various types of epilepsies. (10+10)
2. Enumerate clinical features and diagnosis of mixed connected tissue diseases.
3. Discuss the status of newer antituberculous agents.
4. Outline current treatment f Alzheimer's disease.
5. How to approach to a patient presenting with Raynaud's phenomenon?
6. Outline current management of acute aorticdissection.
7. Discuss recent advances in the management of myocardial infarction
8. What are the new modalities of treatment in bronchial asthma?
9. What is the role of Biosimilars in nephrology?

ENTRUSTABLE PROFESSIONAL ACTIVITIES (EPA) FOR M.D (GEN. MEDICINE) RESIDENTS

S.No.	EPA	Competency Domains							MSF
		MK	PC	PBLI	SBP	P	ISC		
1	History taking and general physical examination	*	*	*	*	*	*	*	S, P, PG, I
2	Formulating a differential diagnosis based on history and examination	*		*				*	S, PG, I
3	Ordering and interpretation of common diagnostic tests	*	*	*	*	*			S, I
4	Entering and discussing orders and prescriptions and giving the necessary instructions to the patients	*	*	*	*	*	*	*	S, P, PG, I
5	Document clinical details in the patient record/Writing OP/IP case sheets /Filling up various Lab. requisition forms / Writing a discharge summary under supervision		*		*	*			S, PG, I
6	Clinical presentation of a case to the Professor and discuss with him about the provisional diagnosis/ results of the investigations/ care plan/ on dose adjustment /transferring patient from critical areas to general ward/discharging a patient/ opinions on the referred patients/Evidence-based medicine	*		*	*			*	S, PG, H
7	Using evidence-based medicine to improve patient care	*		*					S, I
8	Give or receive a patient handover to transition care responsibility	*	*		*	*		*	S, PG, H, I
9	Participating efficiently as a member of an interprofessional team	*				*		*	S, PG, H, I
10	Diagnosing conditions requiring emergency care and providing primary care	*	*	*	*	*		*	S, PG, H, P, I
11	Obtain informed consent for tests and/or procedures	*	*		*	*		*	S, P, PG
12	Performing general medical and surgical procedures	*	*	*	*	*		*	S, PG, I
13	Identifying system failures and taking appropriate corrective measures	*	*	*	*	*		*	S, PG, I

S.No.	EPA	Competency Domains							MSF
		MK	PC	PBLI	SBP	P	ISC		
14	Knowing the topography/ system functioning procedures / administrative hierarchy of the institution			✓	✓				Co-PGs/Nurses
15	Knowing the Research Methodology/Collecting data for the research and compiling them/ Analysis of the collected research data and writing a research paper/dissertation	✓				✓			supervisors
16	Recording ECG/ Interpreting 1. Basic ECG 2. Advanced (arrhythmias) 3.Interpretation of ABG analysis report 3. Interpretation of co mplicated ECG 4. CSF analysis 6.Images 7.USG	✓		✓					Supervisors
17	Making an AR entry for a Medico-legal case/Knowing the Procedure to send stomach wash material to forensic laboratory for analysis	✓			✓				Supervisors/ Nurses
18	Learning to write interdepartmental references for consultations/ Learning to use electronic medical records	✓		✓	✓				Supervisors
19	Performing Basic Life Support /Advanced Cardiac life support	✓	✓	✓					supervisors
20	Performing bedside procedures such as IM/IV/SC injections/ Ryle's tube, Urinary catheter insertions / drawing venous blood/CBG estimation/ Performance of Pleural aspiration / Abdominal paracentesis/ Performance of bone marrow aspiration/ LP /FNAC/ Endotracheal intubation/ Central venous catheterisation/Liver biopsy/Pericardiocentesis	✓	✓	✓				✓	Supervisors/ nurses/
20	Drawing blood for ABG analysis/ Bronchodilator nebulisation/ Setting up infusion pumps/ Pulseoxymeter/ Cardiac monitoring	✓	✓	✓				✓	Supervisors/ nurses
21	Counselling patients on various diets and lifestyle modification	✓	✓					✓	Supervisors/ nurses/ patient attenders

S.No.	EPA	Competency Domains							MSF
		MK	PC	PBLI	SBP	P	ISC		
22	Searching for / and applying for evidence-based medicine	✓				✓			supervisors
23	Participation in UG/PG clinical class/ seminar/ symposium / journal club etc	✓							Supervisors/co PGs
24	Presentation of a case to the Professor and discuss with him about the provisional diagnosis/ results of the investigations/ care plan/ on dose adjustment /transferring patient from critical areas to general ward/discharging a patient/ opinions on the referred patients/Evidence-based medicine	✓	✓	✓		✓		✓	supervisors
25	Performance of bone marrow aspiration/ LP /FNAC	✓	✓	✓		✓		✓	Supervisors/ nurses/ pathologist
26	Ordering relevant investigations/Writing a prescription	✓	✓	✓		✓			Supervisors/ pharmacist/lab in-charge
27	Interpretation of level 3 ECG/ CSF analysis /Images/USG	✓	✓	✓		✓			supervisors
28	Formulate care plan for critically ill patients	✓	✓	✓		✓			supervisors
29	Performance of soft skills such as counselling with the patient /attenders/ Breaking a bad news/Graveprognosis/Death/ informed consent/discharge advice/follow up	✓	✓	✓		✓		✓	Supervisors/ nurses/patient attenders/ patients
30	Recognition of adverse drug reactions/blood transfusion reactions/complications	✓	✓	✓		✓		✓	Supervisors/ nurses

Competency Domains:	Levels of competence:	Multisource feedback (MSF):
MK: Medical Knowledge	Level 1: Knowledge only; can observe	Supervisor: S
PC: Patient Care	Level 2: Can do under strict supervision	Patients/Relatives: P
PBLI: Problem Based Learning and Improvement	Level 3: Can do under loose supervision	Undergraduate students: UG
SBP: Systems-Based Practice	Level 4: Can do independently	Peers: PG
P: Professionalism	Level 5: Has the expertise to teach others	Community: C
ICS: Interpersonal and Communication Skills		Other health professionals: H
		Self: I



GENERAL SURGERY

MS in General Surgery

COURSE NAME

MS in General Surgery

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

OBJECTIVES

At the end of postgraduate training, the PG student should be able to: -

1. Diagnose and appropriately manage common surgical ailments in a given situation.
2. Provide adequate preoperative, post-operative and follow-up care of surgical patients.
3. Identify situations calling for urgent or early surgical intervention and provide appropriate surgical care.
4. refer at the optimum time to the appropriate centres or speciality.
5. Counsel and guide patients and relatives regarding need, implications and problems of surgery in the individual patient.
6. Provide and coordinate emergency resuscitative measures in acute surgical situations including trauma.
7. Organize and conduct relief measures in situations of mass disaster including triage.
8. Effectively participate in the National Health Programs especially in the Family Welfare Programs.
9. Discharge effectively medico-legal and ethical responsibilities and practice his speciality ethically.
10. minimize medical errors.

11. Regularly update his/her knowledge in recent advances and newer techniques in the management of surgical patients.
12. Obtain informed consent prior to performance of the operative procedure.
13. Perform a surgical audit on a regular basis and maintain records (manual and/or electronic) for life.
14. Participate regularly in departmental academic activities by presenting Seminar, Case discussion, Journal Club and Topic discussion on a weekly basis and maintain logbook.
15. Demonstrate sufficient understanding of basic sciences related to his speciality.
16. Plan and advise measures for the prevention and rehabilitation of patients belonging to his speciality.
17. practice surgical conscience and operating room etiquette

COURSE CONTENTS

No limit can be fixed and no fixed number of topics can be prescribed as course contents. She/he is expected to know the subject in-depth, however, emphasis should be on the diseases/health problems most prevalent in that area. Knowledge of recent advances and basic sciences as applicable to his/her speciality should get high priority. Competence in surgical skills commensurate with the speciality (actual hands-on training) must be ensured.

General topics:

A student should have a fair knowledge of basic sciences (Anatomy, Physiology, Biochemistry, Microbiology, Pathology and Pharmacology) as applied to his speciality. Further, the student should acquire in-depth knowledge of his subject including recent advances and should be fully conversant with the bedside procedures (diagnostic and therapeutic) and having knowledge of the latest diagnostics and therapeutics available.

1. History of medicine with special reference to ancient Indian texts

2. Health economics - basic terms, health insurance
3. Medical sociology, doctor-patient relationship, family adjustments in disease, organizational behaviour, conflict resolution
4. Computers - record-keeping, computer-aided learning, virtual reality, robotics
5. Hazards in hospital and protection: AIDS, hepatitis B, tuberculosis, radiation, psychological
6. Environment protection - bio-medical waste management
7. Surgical audit, evidence-based surgical practice, quality assurance
8. Concept of essential drugs and rational use of drugs
9. Procurement of stores and material & personnel management
10. Research methodology - library consultation, formulating research, selection of topic, writing thesis protocol, preparation of consent form from patients
11. Bio-medical statistics, clinical trials
12. Medical ethics
13. Consumer protection
14. Newer antibiotics
15. The problem of resistance.
16. Sepsis - SIRS
17. Nosocomial infection
18. Advances in imaging technologies
19. Disaster management, mass casualties, Triage
20. O.T. design, technologies, equipment
21. Critical care in surgical practice
22. Response to trauma
23. Wound healing
24. Fluid and electrolyte balance
25. Nutrition
26. Blood transfusion
27. Brain death
28. Cadaveric organ retrieval

Systemic Surgery

The student must acquire knowledge in the following important topics but teaching should not be limited to these topics. A standard text-book may be followed, which will also identify the level of learning expected of the trainees.

- Wound healing including recent advances
- Asepsis, antisepsis, sterilization and universal precaution
- Surgical knots, sutures, drains, bandages and splints
- Surgical infections, causes of infections, prevention
- Common aerobic and anaerobic organisms and newer organisms causing infection including *Helicobacter Pylori*
- Tetanus, gas gangrene treatment & prevention
- Chronic specific infections TB, Filariasis
- Boils, cellulitis, abscess, necrotizing fasciitis and synergistic infection
- Antibiotic therapy rationale including antibiotic prophylaxis, misuse, abuse
- Hospital-acquired nosocomial infection causes and prevention including MRSA etc
- HIV, AIDS and Hepatitis B & C, Universal precautions when dealing with patients suffering from these diseases
- Fluid and electrolyte balance including acid-base disturbance, consequences, interpretation of blood gas analysis data and management
- Rhabdomyolysis and prevention of renal failure
- Shock (septicaemic, hypovolaemic, Neurogenic, anaphylactic), aetiology, pathophysiology and management
- Blood and blood components, transfusion indication, contraindication, mismatch and prevention and management of complications of massive blood transfusion

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- Common preoperative preparation (detailed preoperative workup, risk assessment according to the disease and general condition of the patient as per ASA grade) and detailed postoperative complications following major and minor surgical procedures
 - Surgical aspects of diabetes mellitus particularly management of diabetic foot and gangrene, preoperative control of diabetes, consequences of hypo- and hyperglycaemia in a postoperative setting
 - Consequences and management of bites and stings including snake, dog, human bites
 - Mechanisms and management of missile, blast and gunshot injuries
 - Organ transplantation: Basic principles including cadaver donation, related Human Organ Transplant Acts, ethical and medicolegal aspects.
 - Nutritional support to surgical patients
 - Common skin and subcutaneous condition
 - Sinus and fistulae, pressure sores
 - Acute arterial occlusion, diagnosis and initiate management
 - Types of gangrene, Burger's disease and atherosclerosis
 - Investigations in case of arterial obstruction, amputation, vascular injuries: basic principles and management
 - Venous disorders: Varicose veins
 - Diagnosis, principles of therapy, prevention of DVT: basic principles and management
 - Lymphatic: Diagnosis and principles of management of lymphangitis and lymphedema
 - Surgical management of Filariasis
 - Burns: causes, prevention and management
 - Wounds of the scalp and its management
 - Recognition, diagnosis and monitoring of patients with a head injury, Glasgow coma scale
 - Undergo advanced trauma and cardiac support course (certified) before appearing in final examination
 - Recognition of acute cerebral compression, indication for referrals.
 - Cleft lip and palate
 - Leukoplakia, retention cysts, ulcers of the tongue
 - Oral malignancies
 - Salivary gland neoplasms
 - Branchial cyst, cystic hygroma
 - Cervical lymphadenitis nonspecific and tuberculous, metastatic lymph nodes and lymphomas.
 - Diagnosis and principles of management of goitre
 - Thyroglossal cyst and fistula
 - Thyrotoxicosis
 - Thyroid neoplasms
 - Management of solitary thyroid nodule
 - Thoracic outlet syndrome
 - Management of nipple discharge
 - Breast abscess
 - Clinical breast examination, breast self-examination
 - Screening and investigation of the breast lump
 - Concept of Single Stop Breast Clinic
 - Cancer breast diagnosis, staging and multimodality management (common neoadjuvant and adjuvant and palliative chemotherapy protocols and indications of radiation and hormonal therapy, pathology and interpretation of Tumour Markers, breast cancer support groups and counselling)
 - Recognition and treatment of pneumothorax, haemothorax
 - Pulmonary embolism: Index of suspicion, prevention/recognition and treatment
 - Flail chest, stove in chest
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- Postoperative pulmonary complication
 - Empyema thoracis
 - Recognition of oesophageal atresia and principles of management
 - Neoplasms of the lung including its prevention by tobacco control
 - Cancer oesophagus: principles of management including the importance of early detection and timely referral to a specialist
 - Achalasia cardia
 - Gastro-oesophageal reflux disease (GERD)
 - Congenital hypertrophic pyloric stenosis
 - Aetiopathogenesis, diagnosis and management of peptic ulcer including the role of H. Pylori and its diagnosis and eradication
 - Cancer stomach
 - Signs and tests of liver dysfunction
 - Amoebic liver abscess and its non-operative management
 - Hydatid cyst and its medical and surgical management including laparoscopic management
 - Portal hypertension, index of suspicion, symptoms and signs of liver failure and timely referral to a specialist centre management of upper GI hemorrhage
 - Obstructive jaundice with emphasis on differentiating medical vs surgical Jaundice, the algorithm of investigation, diagnosis and surgical treatment options
 - Neoplasms of liver
 - Rupture spleen
 - Indications for splenectomy
 - Clinical features, diagnosis, complications and principles of management of cholelithiasis and cholecystitis including laparoscopic cholecystectomy
 - Management of bile duct stones including endoscopic, open and laparoscopic management
 - Carcinoma gall bladder, incidental cancer gallbladder, index of suspicion and its staging and principles of management
 - Choledochal cyst
 - Acute pancreatitis both due to gallstones and alcohol
 - Chronic pancreatitis
 - Carcinoma pancreas/ pancreatic malignancies
 - Peritonitis: causes, recognition, diagnosis, complications and principles of management with knowledge of typhoid perforation, tuberculous peritonitis, postoperative peritonitis
 - Abdominal pain types and causes with emphasis on diagnosing early intraabdominal acute pathology requiring surgical intervention
 - Intestinal amoebiasis and other worms manifestation (Ascariasis) and their surgical complications (Intestinal Obstruction, perforation, gastrointestinal bleeding, the involvement of biliary tract)
 - Abdominal tuberculosis both peritoneal and intestinal
 - Intestinal obstruction
 - Appendix: Diagnosis and management of acute appendicitis
 - Appendicular lump and abscess
- Colon**
- Congenital disorders, Congenital megacolon
 - Colitis infective / non-infective
 - Inflammatory bowel diseases · Premalignant conditions of the large bowel
 - Ulcerative colitis
 - Carcinoma colon
 - Principles of management of types of colostomy
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Rectum and Anal Canal:

- Congenital disorders, Anorectal anomalies
- Prolapse of rectum
- Carcinoma rectum
- Anal Canal: surgical anatomy, features and management of fissures, fistula – in- ano.
- Perianal and ischiorectal abscess
- Haemorrhoids – Non-operative outpatient procedures for the control of bleeding (Banding, cryotherapy, injection) operative options - open and closed haemorrhoidectomy and stapled haemorrhoidectomy
- Anal carcinoma Management of lower GI bleeding
- Clinical features, diagnosis, complication and principles of management of inguinal hernia including laparoscopic repair
- Umbilical, femoral hernia and epigastric hernia
- Open and Laparoscopic repair of incisional/primary ventral hernia
- Urinary symptoms and investigations of urinary tract
- Diagnosis and principles of management of urolithiasis
- Lower Urinary tract symptoms or prostatism
- Benign prostatic hyperplasia; diagnosis and management
- Genital tuberculosis in male
- Phimosis and paraphimosis
- Carcinoma penis
- Diagnosis and principles of treatment of undescended testis
- Torsion testis
- Hydrocele, haematocele and pyocele Varicocele: Diagnosis (Medical Board for fitness)
- Varicocele: Diagnosis (Medical Board for fitness)

- Acute and chronic epididymo-orchitis
- Testicular tumours
- Principles of management of urethral injuries
- Management of soft tissue sarcoma
- Prosthetic materials used in surgical practice
- Telemedicine, teleproctoring and e-learning
- Communication skills

Clinical cases and Symptoms-based approach to the patient with:**Head & Neck**

- Ulcers and premalignant lesions in the oral cavity
- Solitary nodule of the thyroid
- Enlarged Lymph nodes in the neck

Breast Diseases

- Suspected breast lump
- Benign breast disease/ mastalgia

Acute Abdominal Conditions

- Acute abdominal pain
- Blunt Trauma Abdomen
- Acute intestinal obstruction
- Acute retention of Urine
- Upper gastrointestinal bleeding
- Lower gastrointestinal bleeding
- Haematuria

Chronic Abdominal Conditions

- Gall stone disease
- Dysphagia
- Chronic abdominal pain
- Epigastric mass
- Right hypochondrium mass
- Right iliac fossa mass
- Renal/ loin mass
- Inguino-scrotal swelling
- Scrotal swelling

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- Gastric outlet obstruction
 - Anorectal symptoms
 - Obstructive jaundice

Vascular Diseases

- Peripheral vascular disease
- Varicose veins

Genitourinary

- Hydronephrosis, Pyonephrosis, perinephric abscess
- Renal tuberculosis
- Renal tumours
- Carcinoma prostate
- Genital tuberculosis in male
- Bladder outlet obstruction

At the end of the course, postgraduate students should be able to perform independently (including perioperative management) the following:

- Start IV lines and monitor infusions
- Start and monitor blood transfusion
- Venous cut-down
- Start and manage a C.V.P. line
- Conduct CPR (Cardiopulmonary resuscitation)
- Basic/ advanced life support
- Endotracheal intubation
- Insert nasogastric tube
- Proctoscopy
- Urethral catheterisation
- Surgical management of wounds
- Biopsies including image-guided
- Manage pneumothorax / pleural space collections
- Infiltration, surface and digital Nerve blocks
- Incise and drain superficial abscesses
- Control external hemorrhage
- Vasectomy (Preferably non-scalpel)
- Circumcision
- Surgery for hydrocele

- Surgery for hernia
- Surgery and Injection/banding of piles
- Management of all types of shock
- Assessment and management of burns
- Hemithyroidectomy
- Excision of thyroglossal cyst
- Excision Biopsy of Cervical Lymph node
- Excision of a benign breast lump
- Modified Radical mastectomy
- Axillary Lymph node Biopsy
- Excision of gynaecomastia
- Excision of skin and subcutaneous swellings
- Split thickness skin graft
- Management of hernias/herniotomy, herniorrhaphy and hernioplasty (Lichtenstein)
- Laparoscopic and open cholecystectomy
- Management of Liver abscess/ percutaneous image-guided aspiration and open drainage of liver abscesses
- Appendectomy
- Management of intestinal obstruction, small bowel resection, perforation and anastomosis
- Colostomy

The student must have observed or assisted (the list is illustrative) in the following:

- Hartmann's procedure for cancer rectum
- Splenectomy (emergency)
- Stomach perforation
- Varicose Vein surgery
- Craniotomy (Head Injury)
- Superficial parotidectomy
- Submandibular gland excision
- Soft tissue tumours including sarcoma
- Pancreaticoduodenal resection
- Hydatid cyst liver
- Pancreatic surgery
- Retroperitoneal operations

Theory

Paper 1: Basic Sciences as applied to general surgery

Paper 2: General Surgery including breast and gastroenterology

Paper 3: Surgery including sub-specialities

Paper 4: Surgery including traumatology and recent advances

TEACHING AND LEARNING METHODS

Teaching methodology

Didactic lectures are of least importance; small group discussion such as seminars, journal clubs, symposia, reviews and guest lecturers should get priority for theoretical knowledge. Bedside teaching, grand rounds, structured interactive group discussions and clinical demonstrations should be the hallmark of clinical/practical learning with appropriate emphasis on e-learning. The student should have hand-on training in performing various procedures and ability to interpret various tests/investigations. Exposure to newer specialized diagnostic/therapeutic procedures concerning her/his subject should be given. Self-learning tools like assignments and case-based learning may be promoted.

DEPARTMENTAL TRAINING SCHEDULE & POSTING

1. Surgical Posting: Each postgraduate (PG) is posted in a surgical unit soon after joining the course
2. Rotations in Specialty Departments are done after the PG has spent Six months in learning basic ward work and surgical skills in the surgical unit. They may be posted in allied departments like paediatric surgery, urology, cardiothoracic surgery, plastic surgery, neurosurgery, Surgical Oncology and radiology. Please consider orthopedics for management of long bone fractures

TEACHING AND LEARNING ACTIVITIES

1. Most of the teaching is conducted within the unit by the consultants and senior residents of the respective unit. Various learning activities are Journal Club presentations, case presentations, clinical ward rounds and teaching rounds.
2. Seminars are held every week which are attended by the entire department. The postgraduate students will have to present seminars at regular intervals.
3. Interdepartmental meetings are held weekly with the radiology and pathology department. Interesting cases are discussed in these meetings. The postgraduate students are required to attend Clinico-pathological conference (CPC) which is held every month and Clinical combined rounds and Clinical Grand rounds (CGR) which are held weekly.

THESIS

All postgraduates are required to carry out a research project under the guidance of the faculty of the department. They are encouraged to select the project of their choice. They must submit the protocol within four months of joining the MS degree course.

Standards for clinical and technical skills

The practical application of knowledge is evidenced through clinical and technical skills.

1. Has observed

- Has adequate knowledge of the steps through direct observation.
- Demonstrates that he/she can handle instruments relevant to the procedure appropriately and safely.
- Can perform some parts of the procedure with reasonable proficiency.

2. Can do with assistance

- Knows all the steps - and the reasons that lie behind the methodology.
- Can carry out a straightforward procedure proficiently from start to finish.

- Knows and demonstrates when to call for assistance/advice from the supervisor (knows personal limitations).

3. Can do whole but may need assistance

- Can adapt to well-known variations in the procedure encountered, without direct input from the trainer.
- Recognises and makes a correct assessment of common problems that are encountered.
- Is able to deal with most of the common problems.
- Knows and demonstrates when he/she needs help.
- Requires advice rather than help that requires the trainer to scrub.

4. Competent to do without assistance, including management of complications

- Can deal with common cases to a satisfactory level and without the requirement for external input.
- Is capable of supervising juniors

5. The curriculum is consistent with the four domains of Good Medical Practice:

- Knowledge, skills and performance
- Safety and quality
- Communication, partnership and team-working
- Maintaining trust

Professional Skills

This part of the syllabus concentrates on the behaviour and professional skills required of all surgeons and are common to all specialities.

Good Medical Practice identifies seven key principles and values on which good practise is founded:

- Good clinical care
- Maintaining good medical practice

- Teaching and training, appraising and assessing,
- Relationships with patients
- Working with colleagues
- Probity
- Health

➤ They combine all aspects of the curriculum (knowledge, clinical skills and technical skills) with clinical experience and professionalism and allow the practitioner to reach conclusions and make decisions in the patient's best interests.

➤ These skills are important in (but are not limited to) decisions over case selection for operative or non-operative treatment when to refer patients for second opinions, recognition of limitations of skill and end of life care.

Research

- Trainees will be expected to be able to provide evidence of an understanding of, and participation in, research
- Trainees should have peer-reviewed papers published in an indexed journal and first author presentations at a regional, national or international meeting during speciality training. The trainee's contribution to each of these pieces of work should have been significant.

Audit/Service improvement

- Trainees will be expected to be able to provide evidence of an understanding of, and participation in, audit and / or service improvement:

Medical Education and Training

- Trainees will be expected to be able to provide evidence of an understanding of, and participation in, medical education and training (undergraduate and/or postgraduate):
- Trainees should provide evidence of having been involved in teaching, management activities and leadership
- Trainees will be expected to be able to provide evidence of having attended appropriate national

or international educational conferences or meetings during training.

- Trainees will be expected to provide evidence of having attended specific courses/gained specific qualifications
- Trainees must have a valid ATLS provider or instructor credential at the time of completion.

Operative experience

Trainees will be expected to be able to provide evidence (in their consolidated logbook) of the breadth of operative experience defined in the syllabus of their speciality. In addition they will have attained the knowledge, skills and behaviour as defined in the following (common) modules of the syllabus:

Module 1: Basic Science Knowledge relevant to surgical practice

Module 2: Common surgical conditions

- To assess and initiate investigation and management of common surgical conditions which may confront any patient whilst under the care of surgeons, irrespective of their speciality.
- To have sufficient understanding of these conditions so as to know what and to whom to refer in a way that an insightful discussion may take place with colleagues who will be involved in the definitive management of these conditions.

Module 3 Basic surgical skills

- To prepare oneself for surgery.
- To safely administer appropriate local anaesthetic agents.
- To handle surgical instruments safely.
- To handle tissues safely.
- To incise and close superficial tissues accurately.
- To tie secure knots.
- To safely use surgical diathermy.
- To achieve haemostasis of superficial vessels.
- To use a suitable surgical drain appropriately.

- To assist helpfully, even when the operation is not familiar.
- To understand the principles of the anastomosis.
- To understand the principles of endoscopy including laparoscopy.

Module 4: The principles of assessment and management of the surgical patient

- To assess the surgical patient.
- To elicit a history that is relevant, concise, accurate and appropriate to the patient's problem.
- To produce timely, complete and legible clinical records.
- To assess the patient adequately prior to operation and manage any pre-operative problems appropriately.
- To propose and initiate surgical or non-surgical management as appropriate.
- To take informed consent for straightforward cases.

Module 5: Peri-operative care of the surgical patient

- To manage patient care in the perioperative period.
- To assess and manage preoperative risk.
- To take part in the conduct of safe surgery in the operating theatre environment.
- To assess and manage bleeding including the use of blood products.
- To care for the patient in the post-operative period including the assessment of common complications.
- To assess, plan and manage post-operative fluid balance.
- To assess and plan perioperative nutritional management.

Module 6: Assessment and early treatment of the patient with trauma

- To safely assess the multiply injured patient.

Module 7: Surgical care of the paediatric patient

- To assess and manage children with surgical problems, understanding the similarities and differences from adult surgical patients.
- To understand common issues of child protection and to take action as appropriate.

Module 8: Management of the dying patient

- To manage the dying patient appropriately.
- To understand consent and ethical issues in dying patient.
- To manage the dying patient in consultation with the palliative care team.

Module 9: Organ and tissue transplantation

- To understand the principles of organ and tissue transplantation.
- To assess brain stem death and understand its relevance to continued life support and organ donation.

Module 10: Health promotion

- To promote good health.

ASSESSMENT**Internal Assessment:**

A total of 4 internal examinations will be conducted at the end of the 3rd, 4th and 5th semester, and pre-final (2 months before final examination).

Marks distribution: Theory 100 marks, and Practical with viva and logbook

(Practical – 70, viva – 20, logbook – 10=100 marks).

The marks of the 4 internal examinations will be averaged to 100 each for theory and practical.

Summative

Theory Examination: 4 papers (100 marks each).

- Question Paper Format: In each paper, One Long question carrying 20 marks and Eight Short question/notes – 10 x 8 = 80 marks.
- Total theory marks: 500 Theory papers in the final examination – 400 marks and average of 4 internal examination – 100 marks.
- Students have to secure 50% marks in internal marks (in both theory and practical) to be eligible to appear for the final examination.

Practical Examination**Internal Assessment**

- 70 marks: Clinical cases (45marks) operative demonstration (25marks)
- 20 marks: viva
- 10 marks: logbook

Summative Assessment

- Practical examination: Total marks: 500 (Practical and viva in the final examination – 400 marks and an average of 4 internals- 100 marks).
- The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A** 200 marks	Longcase (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/ Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

** Students should pass (secure 50% marks) separately in Part A

Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

RECOMMENDED BOOKS

1. Browse NL, Black J, Burnand KG, Corbett SA, Thomas WEG. Browse's Introduction to the Investigation and Management of Surgical Disease: Taylor & Francis; 2010.
2. Brunnicardi FC, Andersen DK, Billiar TR, Dunn DL, Hunter JG, Kao LS, et al. Schwartz's Principles of Surgery 11th Edition: McGraw-Hill Education; 2019.
3. Carter DC. Rob & Smith's Operative Surgery: Atlas of General Surgery, 3Ed: Taylor & Francis; 1998.
4. Ellis BW, Paterson-Brown S, Bailey H. Hamilton Bailey's Emergency Surgery, 13Ed: Taylor & Francis; 2000.
5. Fischer JE. Fischer's Mastery of Surgery: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2012.
6. Jain SK, Stoker DL, Tanwar R. Basic Surgical Skills and Techniques: Jaypee Brothers, Medical Publishers Pvt. Limited; 2018.
7. Lumley J, D'Cruz A, Hoballah J, Scott-Connor C. Hamilton Bailey's Physical Signs: Demonstrations of Physical Signs in Clinical Surgery, 19th Edition: CRC Press; 2016.
8. Townsend CM, Sabiston DC. Sabiston Textbook of Surgery: The Biological Basis of Modern Surgical Practice: Elsevier Saunders; 2004.
9. Williams NS, O'Connell PR, McCaskie AW. Bailey and Love's Short Practice of Surgery: Taylor & Francis Group; 2018.
10. Zinner M, Ashley JS. Maingot's Abdominal Operations, 12th Edition: McGraw-hill; 2012.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASIC SCIENCES AS APPLIED TO GENERAL SURGERY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the surgical anatomy of the rectum with special reference to the nerve supply and mesorectal anatomy. Outline the principles of total mesorectal excision. (20)
2. Describe the lymphatic drainage of breast and discuss the principles guiding sentinel node biopsy for breast cancer. (10)

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3. Discuss the blood supply of the colon and rectum and discuss its influence in planning the various colonic resections. (10)
 4. Discuss the anatomical basis of myocutaneous flaps. (10)
 5. Discuss the pathological varieties of salivary gland tumours and briefly outline their surgical management. (10)
 6. Discuss the role of fine needle aspiration cytology in surgical pathology. (10)
 7. Enumerate the various types of cirrhosis liver and its relevance to etiopathology of Portal hypertension. (10)
 8. Discuss the physiology of intestinal motility and its role in postoperative care in abdominal operations. (10)
 9. Enumerate the various causes and effects of hypokalemia in the perioperative period and briefly discuss its management. (10)

PAPER 2

GENERAL SURGERY INCLUDING BREAST AND GASTROENTEROLOGY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. A 30-year-old alcoholic is brought to the emergency department with a history of hematemesis? Describe the management plan in such a scenario. (20)
 2. Discuss the principles of triple assessment in the management of breast lumps. (10)
 3. Enumerate the indications and contraindications of breast conservation surgery with a brief descriptions its various components. (10)
 4. Enumerate the types of diaphragmatic hernias and approach to its management. (10)
 5. Discuss the radiological basis for choosing the treatment modality for managing Pseudocyst of pancreas. (10)
 6. Briefly outline the work up and management of a 40 years old man with progressive dysphagia and weight loss of 2 months duration. (10)
 7. Enumerate the differential diagnosis and work up of a patients with multiple colonic polyps. (10)
 8. Discuss the management of Choledochal cysts based on its classification. (10)
 9. Enlist the pathological types of ileocecal tuberculosis and its outline management. (10)
-

PAPER 3

SURGERY INCLUDING SUB-SPECIALITIES

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. A 25 year old female presents with a swelling in the front of the neck for two years. Her eyes appear prominent on examination. Describe the plan of management of this patient? (20)
2. List the differential diagnosis of non-healing ulcer of the leg and its management. (10)
3. Briefly discuss the pathophysiology of Hirschsprung Disease and its outline management. (10)
4. Discuss the clinical presentation and management of extradural haemorrhage. (10)
5. Enumerate the early and late complications in a patient of head and neck burn, mentioning the treatment options of each. (10)
6. Briefly outline the management of abdominal aortic aneurysm. (10)
7. Discuss the principles guiding the management Torsion of testis. (10)
8. Discuss the clinical presentation and management of Posterior urethral valve. (10)
9. Briefly outline the treatment options in the management of renal stones and the basis of the choice of management. (10)

PAPER 4

GENERAL SURGERY INCLUDING TRAUMATOLOGY AND RECENT ADVANCES

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the plan of management of a motor vehicle driver involved in road traffic accident, brought to the casualty in shock. (20)
2. Outline the management plan in the scenario of a mass casualty. (10)
3. Briefly outline the management considerations in a patient with Flail Chest. (10)
4. Compare and contrast the role Endovascular laser ablation with radiofrequency ablation in the management of varicose veins. (10)
5. Management of a patient with giant incisional hernia with loss of domain. (10)
6. Discuss the use of Transrectal Ultrasound in the management of various GI malignancies. (10)
7. List the merits and demerits of Robotic Surgery. (10)
8. Briefly describe the newer options of laparoendoscopic abdominal wall hernia repairs. (10)
9. Compare and contrast the approach, merits and demerits of per oral esophageal myotomy with laparoscopic cardiomyotomy. (10)

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DEPARTMENT OF GENERAL SURGERY

S. No.	EPA	Competency Domains						Level of competency			
		MK	PC	PBLI	SBP	P	ICS	Day 1 of Residency	End of 1st year	End of 2nd year	End of 3rd year
1	Gather a history and perform a physical examination	*	*					1	3	4	4
2	Prioritize a differential diagnosis following a clinical outcome	*		*				1	2	3	4
3	Recommend and interpret common diagnostic and screening tests	*						1	2	3	4
4	Enter and discuss orders and prescriptions	*						1	2	3	4
5	Document a clinical encounter in the patient record.	*						1	2	3	4
6	Provide an oral presentation of a clinical encounter	*						1	2	3	4
7	Form clinical questions and retrieve evidence to advance patient care.	*		*				1	2	3	4
8	Give or receive a patients handover to transition care responsibility		*			*		1	2	3	4
9	Collaborate as a member of an interprofessional team					*		1	2	3	4
10	Recognize a patient requiring urgent or emergent care and initiate evaluation and management	*	*					1	2	3	4
11	Obtain informed consent for tests and procedures.						*	1	3	4	4
12	Perform general procedures of a physician	*			*			1	2	3	4
13	Identify system failures and contribute to a culture of safety and improvement				*			1	2	3	4
14	Effective communication with peers and superiors	*				*		1	3	4	4

S. No.	EPA	Competency Domains							Level of competency			
		MK	PC	PBLI	SBP	P	ICS	Day 1 of Residency	End of 1st year	End of 2nd year	End of 3rd year	
15	Attitudes towards patient, relatives, peers and Supervisors					*		I	3	4	4	
16	Effective relevant systemic Examination in OPD and bedside clinics	*	*				*	2	3	4	4	
17	Ability to make a diagnosis and DD	*						I	3	4	4	
18	Preoperative counselling of patient and attendant						*	I	2	3	4	
19	Basic Pre & post operative care	*	*					I	2	3	4	
20	Operative theatre techniques - Aseptic techniques, Scrubbing, Gowning, donning and drapping	*	*			*	*	1	2	3	4	
21	Handling instruments, Suture materials, meshes	*	*				*	1	2	3	4	
22	Suturing, Knotting techniques	*	*					1	2	3	4	
23	Use of drains and Drainage tubes	*	*					1	2	3	4	
24	Diathermy, Harmonic scalpel	*	*					1	2	3	4	
25	Performing simple swelling Excision	*		*				I	2	3	4	
26	Performing Appendicectomy Hydrocele, haemorrhoids Fissure	*		*				I	2	3	4	
27	Performing Hernia	*		*				I	2	3	4	
28	Basic trauma management	*	*		*			I	2	3	4	
29	Reading and interpreting all basic X-rays relevant to General surgery	*		*				I	2	3	4	
30	Laparotomy skill	*		*		*	*	I	2	3	4	
31	Reading and interpreting CT abdomen	*						I	2	3	4	

S. No.	EPA	Competency Domains						Level of competency			
		MK	PC	PBLI	SBP	P	ICS	Day 1 of Residency	End of 1st year	End of 2nd year	End of 3rd year
32	Endoscopy & Colonoscopy Basics	*	*			*	*	I	2	3	4
33	Laparoscopic Skill	*				*		I	2	3	4
34	To take UG classes(Clinics)	*				*	*	I	2	3	4
35	thyroid surgery	*				*		I	2	3	4
36	Breast surgery	*				*		I	2	3	4
37	Gastrectomy procedure	*				*		I	2	3	4
38	Hemicolectomy	*				*		I	2	3	4
39	pancreatic surgeries	*				*		I	2	2	2
40	Varicose vein Surgeries	*				*		I	2	3	4
41	Sterilisation Procedures	*						1	2	3	4
42	Able to write Scientific Papers	*						1	2	3	4
43	Able to Make podium Presentation	*						1	2	3	4
44	Hospital Infection	*						1	2	3	4

Abbreviations:

Competency Domains:

MK: Medical Knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I



HOSPITAL ADMINISTRATION

MD in Hospital Administration

COURSE NAME

MD in Hospital Administration

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

OBJECTIVES

The goal of MD programme in Hospital Administration (MHA) is to produce a competent Hospital Administrator who:

1. Is aware of contemporary advances & developments in medical sciences as related to the subject of hospital administration.
2. Has acquired the competencies pertaining to management science in general and hospital administration in particular for the purpose of application in the hospital and health services, that are required to be practiced in the community and at all levels of health system. In order to (i) improve the quality of patient care and (ii) ensure optimum utilization of the available resources and facilities.
3. Recognizes the health needs of subject and families and carries out professional obligations in keeping with principles of the National Health Policy and professional ethics. The student will acquire an understanding of the complex nature of health and hospital administration and to foresee the antagonizing and synergizing variables towards the role performance of the hospitals.
4. Is oriented to principles of research methodology.
5. Has acquired skills in educating medical and paramedical professionals.
6. Has acquired skills in effectively communicating with the person, family and the community.

7. Additionally, the student should have developed administrative and executive leadership skills founded on thorough understanding and knowledge of organizational problems, employee productivity and social responsibilities in the existing milieu.

The learning objectives of the MD Hospital Administration programme are broadly categorized as:

- General Administration and Management of Hospital
- Health Administration and Medical Care
- Hospital Administration and Hospital Planning
- Administration of Clinical and Non-Clinical Services

SYLLABUS

Module I - General Administration (GA)

- GA 1. General Management
- GA 2. Human Resource Management
- GA 3. Materials Management in a Hospital
- GA 4. Basic Accounting
- GA 5. Financial Management
- GA 6. Cost Accounting
- GA 7. Organizational behaviour
- GA 8. Marketing Services
- GA 9. Information Systems
- GA 10. Business Law and Regulations

Module II - Health Administration (HE)

- HE 1. Medical Sociology
 - HE 2. Health Economics
 - HE 3. Health Administration in India
 - HE 4. Medical Care Systems
 - HE 5. Biostatistics
 - HE 6. Research Methodology
 - HE 7. National Health Programs
 - HE 8. Epidemiology - General
 - HE 9. Health Information Systems
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- HE 10. Ethics & Legal Aspects of Health Care
 - HE 11. International Health
 - HE 12. Community Health Administration

Module III - Hospital Administration & Hospital Planning (HA)

- HA 1. Hospital Organisations
- HA 2. Hospital Planning
- HA 3. Nursing Service Administration
- HA 4. Quality Assurance
- HA 5. Ethics & Legal Aspects of Hospitals.
- HA 6. Human Relation in Hospitals
- HA 7. Hospital Hazards including Disaster Management and Fire-Safety management
- HA 8. Biomedical Waste Management
- HA 9. Equipment Management
- HA 10. Recent Trends

Module IV - Administration of Clinical & Non-Clinical Services (AS)

- AS 1. Hospital Planning - General consideration
- AS 2. Organization & administration of clinical services.
- AS 3. Organization & Administration of Supportive & Utility Services.
- AS 4. Project Management and related case studies

PRACTICALS

- Month wise schedule of clinical and non clinical areas posting
- Month wise duty allocation in control room
- Month wise teaching and OSCE training

TEACHING AND LEARNING METHODS

The following methods will be used by the departments of hospital administration to impart training in this course:

- Lectures by the faculty members and experts from different fields to update their knowledge of hospital/General Management. These may be a combination of both didactic and interactive types.
- Symposia/seminars to familiarize newer developments and emerging trends in hospital administration.
- Journal clubs to familiarize with research methodologies and analysis of the result. The resident to whom the journal is allotted should present the journal summaries (as photocopies) to the group where each article is fully discussed. They are expected to show their understanding of the aspect covered in the article and on which the other residents are questioned by each other and clarification sought by the faculty. Such discussion enables the residents to prepare for general discussion in the class.
- Practical Competencies/exercises: Under the supervision of faculty in charge, each candidate will be posted in different areas of the hospital, where he/she will have to critically examine the infrastructure and operational mechanism of the area, etc., find out the lacunae in the services and provide constructive suggestions to improve the services on the latest available guidelines/works which are nationally/internationally accepted. These observations will be presented by the post graduates at the end of their posting in the class room session.
- Case Studies
- Students will be individually attached in rotation to the different departments/services of affiliated hospitals. Students will spend 18 hours per week (3 hours daily on all days) except in the first 12 weeks.
- Each student will study the allotted department as comprehensively as possible and will

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- write out a case study report (minimum four dissertations) of approximately 3000 words, which shall be presented to the rest of the group and the subject will be discussed by members of the faculty and the students.
- A list of suggested departments for case studies is given below: This list is illustrative but not exhaustive.
 - Outpatient department including emergency services
 - Medical Superintendent's office
 - Stores-general including furniture
 - Medical Stores and Pharmacy
 - Dietary Services
 - Linen and Laundry Services
 - Nursing Services and ward management
 - OT, ICU, Specialized Service
 - Clinical Areas:
 - Imaging Services
 - Invasive/Non invasive Cardiac Diagnostic Laboratory
 - Medically Assisted Reproduction Centres
 - Bed Utilization.
 - Support services:
 - Blood Bank Services
 - Laboratory Services
 - Pharmacy and Manufacturing
 - Hospital Gas Supply
 - Medical Records, IT in health care, Engineering service
 - Behavioural and Sociological Aspects:
 - Absenteeism in Doctors/ Nursing/ sanitation / housekeeping Staff
 - Emergency call system and response pattern
 - Patient satisfaction
 - Visitors satisfaction
 - Communication to patients and their relatives
 - Patient Guidance System
 - Effectiveness of Medico Social Department
 - Operation Research Techniques:
 - Scheduling of patients for operations
 - Scheduling of patients for special investigations
 - Transmission of patient samples and reports
 - Administrative Areas:
 - Admission/discharge procedures
 - Investigation procedures of patient's complaints
 - Administrative office procedures
 - Decision making procedures in administrative areas
 - Waste disposal and universal precautions.
 - Financial Areas:
 - a. Billing Section
 - b. Pricing of diagnostic/therapeutic procedures
 - Legal:
 - Medico-legal cases ,RTI
 - Consumer forum cases
 - Legal cases relating to personnel matters
 - Attendance at Scientific meetings, CME programmes
 - The post graduate students are expected to attend meetings related to their discipline, present papers/posters in these meetings.
 - Paper/poster presentation:
 - A post graduate student of a post graduate degree course in broad specialities/super specialities would be required to present one poster presentation, to read one paper at a national/state conference and to present one research paper which should be published/accepted for publication/sent for publication during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.
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- Teaching skills:
 - The post graduate students shall be required to participate in the teaching and training programme of undergraduate students and interns.
 - A logbook should be maintained recording the duration of posting, the period of absence, if any, skills performed, and remarks if any by the teacher/faculty member. The logbook should also record journal clubs, seminars attended and partaken as well as undergraduate teaching activities the post graduate student has participated and should be signed by the faculty in charge.
 - Department would encourage e-learning activities
 - Special administrative attachments
 - The aim of the attachment is to familiarize the students with the special features and functioning of various types of medical institutions and medical administrative offices (Government / Non-Government). One, two or three or more days will be allotted depending upon the size and importance of the place.
 - Medical Institutions to be visited will be contacted in advance and purpose of the visit/attachment explained so that a responsible person conducts these students and explains things adequately.
 - Suggested Places of attachment
 1. Hospital for chest diseases
 2. Dental College
 3. Artificial Limb Centre
 4. Manufacturing Section
 5. School of Nursing
 6. A Taluk Hospital
 7. A Rural Health Centre and peripheral centres
 8. An Urban Health Centre
 9. A multi specialty/single specialty corporate hospital
 10. Maternity and Child Welfare Centre
 11. Government Hospital
 12. Taluk Office for Vital Registration
 13. ESI Hospital
 14. Transfusion Centres
 15. An Ayurveda Hospital
 16. Office of Drug Controller
 17. Any other Institutions decided by the Department.
- ASSESSMENT**
- Examination on Research Methodology & Biostatistics**
- Timing: End of 2nd Semester
 - Total marks: 100
 - Will be considered as an internal examination
 - Candidate should pass to appear in Final examination
 - No marks will be added to final / summative examination
 - Will be conducted by Examination Cell in the month of June & December
- Internal Examinations**
- Timeline: End of the 3rd, 4th, 5th semester, Prelims (2 month before the final examination)
 - Marks distribution:
 - Theory- 100 marks
 - Practical with viva and logbook
 - Practical - 70 marks Viva-20 marks
 - Logbook- 10 marks
 - The marks of the 4 internal examination will be averaged to 100 each of for theory and practical
- Summative/Final Examination**
- Theory- 4 papers (100 marks each)
 - One long question- 20 marks
 - Eight short questions/notes - 8 X 10 = 80 marks
 - Total marks in theory: 500 marks
 - Theory papers in the final examination - 400 marks
 - Average of 4 internal examinations - 100 marks
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Practical examination-

Total marks- 500 marks

- Practical and viva in the final examination- 400 marks
- Average of 4 internal examinations - 100 marks
- The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A** 200 marks	Long case (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

** Students should pass (secure 50% marks) separately in Part A

- Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 months before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

THESIS EVALUATION:

- The student should submit the completed thesis 6 months before the final examination.
- Plagiarism check: if more than 20% plagiarism is detected, the student will be asked to re-write and re-submit.
- Plagiarism checking will be done before the thesis is bound.
- The thesis will be sent to one external evaluator for approval.

RECOMMENDED BOOKS

1. Agarwal AK. Standard Operating Procedures(sop) For Hospitals In India: Atlantic Publishers & Distributors (P) Limited; 2007.
2. Anantpreet S, Sukhjit K. Biomedical Waste Disposal: Jaypee Brothers Medical Publishers; 2012.
3. Fallon LF, McConnell CR. Human Resource Management in Health Care: Principles and Practice: Jones and Bartlett Publishers; 2007.
4. Goel RKSL. Hospital Administration and Management: Theory and Practice: Deep & Deep Publications; 2007.
5. Goel SD. Textbook of Hospital Administration: Elsevier Health Sciences; 2014.
6. Koontz H, Weihrich H. Essentials of Management: An International, Innovation, and Leadership Perspective: McGraw-Hill Education.
7. Llewelyn-Davies RB, Macaulay HMC. Hospital Planning and Administration: World Health-Organization; 1966.
8. Mahajan B. Methods in Biostatistics: For Medical Students and Research Workers: Jaypee Brothers,Medical Publishers Pvt. Limited; 2008.
9. McGibony JR. Principles of Hospital Administration: Putnam; 1969.
10. Pacific WHOROfTW. Medical Records Manual: A Guide for Developing Countries: World Health Organization, Regional Office for the Western Pacific; 2002.
11. Park JE, Park K. Park's Textbook of Preventive and Social Medicine: M/S Banarsidas Bhanot; 2000.
12. Prakash A, Anjan P, Deepali B. Medical Audit: Jaypee Brothers,Medical Publishers Pvt. Limited; 2011.
13. Pütsep E. Modern Hospital: International Planning Practices: Lloyd-Luke; 1979.
14. Robbins SP, Judge TA. Organizational Behavior: Pearson Prentice Hall; 2009.
15. Sakharkar B. Principles of Hospital Administration and Planning: Jaypee Brothers,Medical Publishers Pvt. Limited; 2008.
16. Shakti G. Hospital Stores Management: An Integrated Approach: Jaypee Brothers Medical Publishers; 2004.
17. Singh G. Hospital Infection Control Guidelines: Principles and Practice: Jaypee Brothers Medical Publishers Pvt Limited; 2012.
18. Kant Lt Col Sunil,Chandrashekhar R, Gupta Shakti Kumar,Satpathy Sidhartha. Modern Trends in Planning and Designing of Hospitals: Principles and Practice. New Delhi. Jaypee Brothers Medical Publishers (P) Ltd. 2007

MODEL SAMPLE QUESTION PAPERS

PAPER 1

GENERAL ADMINISTRATION AND MANAGEMENT IN HOSPITAL ADMINISTRATION

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. List principle of management by Henry Fayol. Discuss their applicability in modern health care organizations (20)
2. Write notes on the following. (10x8)
 - a) Differentiate between Delegation and Decentralization.
 - b) Describe the procedures for import purchase.
 - c) Enumerate the Hospital Grievance Redressal Procedures.
 - d) Describe the Conflict resolutions techniques in Hospitals.
 - e) Write about privileging of staff in hospital.
 - f) Describe Activity Based Costing for hospitals.
 - g) Discuss about Strategic Planning applicable to Hospitals.
 - h) What is Management by objectives?

PAPER 2

HEALTH ADMINISTRATION & MEDICAL CARE

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. What do you understand by counselling? Enumerate steps of counselling. Briefly describe the role of counselling in context of HIV/AIDS. (20)
2. Write notes on the following. (10x8)
 - a) Discuss the National health Policy and implications.
 - b) Describe the Universal Health Coverage.
 - c) Write about the role of Third Party Administrators and its impact on health care utilization.
 - d) Discuss about Public Private Partnership in healthcare
 - e) What is RTI Act 2005 and its impact on healthcare administration?
 - f) Differentiate between Vaccine and Immunoglobulin.
 - g) Write the challenges in management of emergency services in rural sector.
 - h) Enumerate principle of ethics and its application in medical field.

PAPER 3

HOSPITAL ADMINISTRATION AND HOSPITAL PLANNING

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. What are the functions of Intensive Care Unit (ICU)? Describe the planning considerations for designing a 25 Bedded Respiratory ICU. (20)
2. Write notes on the following. (10x8)
 - a) Describe Architect's brief.
 - b) Discuss the applications of Green Technologies in hospitals.
 - c) Write about the concept of Zoning in Operation Theatre.
 - d) What are the peculiarities of HVAC system for Operation Theatre?
 - e) What is Total Quality Management for Hospitals?
 - f) Discuss the role of public relations department in Hospitals.
 - g) Describe the disaster preparedness for Hospitals.
 - h) Discuss the planning of day care services in Hospitals.

PAPER 4

MANAGEMENT OF CLINICAL AND NON CLINICAL SERVICES

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe salient features of the Bio-Medical Waste Management (Amendment) Rules, 2018 and your role in improving compliance and implementation of biomedical waste management in your hospital. (20)
2. Write notes on the following. (10x8)
 - a) What are the patient Safety measures in Hospital?
 - b) Write about Progressive patient care.
 - c) Enumerate Govt Financial Schemes for poor patients.
 - d) Describe the role of administrators in implementation of Pharmacovigilance in Hospitals.
 - e) What are latest methods of sterilization in CSSD?
 - f) Write about Condemnation and disposal of hospital equipment.
 - g) Describe the role of quality assurance practices in blood bank services.
 - h) Write about the kayakalp programme implementation in Hospitals.

**YEAR-WISE ENTRUSTABLE PROFESSIONAL ACTIVITIES (EPA)
MD-HOSPITAL ADMINISTRATION RESIDENTS**

S. No.	EPA	Competency domains						Level of competency				MSF
		MK	PC	PUS	PI	TE	Day 1 of Residency	End of 1st year	End of 2nd year	End of 3rd year		
1	Hospital Administration Overall Hospital Services supervision Hospital Statistics Nursing Services Grievances Control Room Do CAPA (Corrective and preventive actions)	*	*	*	*	*	1,2	2,3	3,5	5		S,P,PG,I,C,H
2	Support Services CSSD Laundry Dietary Housekeeping Security	*	*	*	*	*	1	2	3	4		S,PG,I
3	Hospital Planning and Designing	*	-	*	*	*	1,2	2	3	4,5		S,PG,I
4	Legal aspects Address legal requirements Verify/vet contracts Procure licenses Address labour issues	*	*	*	*	*	1	2	3	4,5		S,H,PG,I

S. No.	EPA	Competency domains						Level of competency				MSF
		MK	PC	PUS	PI	TE	Day 1 of Residency	End of 1st year	End of 2nd year	End of 3rd year		
5	Quality and Safety Coordinate the quality and safety programme of the hospital	*	*	*	*	*	1	2,3	3	4,5	S,PPG, C,H,I	
6	Human Resource Independently plan the staffing Training of the staff Performance appraisal iv.Disciplinary aspects	*		*	*		1	2	3	4	S,PG,I	
7	Financial Management Posting, Accounting	*		*			1	2	3	4	S,PG,I	
8.	Research Formulating a research Qs Collecting data Analysis and interpretation of data	*	*	*	*		1,2	3	3	4	S,PG,I	
9	Information Technology(IT) Implementation of HIS/ EMR/PACS in the Hospital	*	*	*			1	2	3	4	S,PG,I	
10	Control Room	*	*	*	*	*	1,2	2,3	4	5	S,PG,I, P, C, H	

Competency Domains:

MK - Must Know

PC- Professional Communication

PUS- Perform under supervision

PI- Perform Independently

TE - Teach as expert

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

Peers: PG

Community: C

Other health professionals: H

Self: I

The background of the page is a complex network diagram. It consists of numerous circular nodes of varying sizes, connected by thin, light-colored lines. The nodes are color-coded: yellow and orange nodes are concentrated in the upper left quadrant; green and teal nodes are scattered in the middle left and center; grey nodes are distributed in the lower left and bottom center; and blue nodes are prominent in the lower left and bottom right. The overall effect is a dense, interconnected web of points and lines, suggesting a network or molecular structure.

MICROBIOLOGY

MD in Microbiology

COURSE NAME

MD in Microbiology

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

PREAMBLE AND GOALS

The main aim of this course is to train students of Medicine in the field of Medical Microbiology. Theoretical as well as practical training is imparted to the students in various branches of Microbiology namely Bacteriology, Virology, Parasitology, Immunology and Mycology so that they can participate in good patient care and prevention of infectious diseases in the community, as well as the hospital, acquired infection. They are introduced to basic research methodology so that they can conduct fundamental and applied research. They are also trained in teaching methods in the subject which would enable them to take up teaching assignments in Medical Colleges/Institutes

OBJECTIVES

To impart training to postgraduates:

1. To acquire knowledge and skills in various branches of Microbiology, so as to enable them to become a competent Medical Microbiologist.
2. To apply their training inpatient care for early diagnosis of the disease
3. To utilize the knowledge acquired for preparation of guidelines regarding infection control and implementation of infection control methods.
4. To plan and carry out fundamental and specialized research.
5. To operate routine and sophisticated instruments in the laboratory

At the end of the course, the students should be able to:

1. Establish good clinical microbiological services in a hospital and in the community in the fields of bacteriology, virology, parasitology, immunology and mycology.
2. Plan, execute and evaluate teaching assignments in medical microbiology and
3. Plan, execute, analyze and present the research work in medical microbiology.

COURSE CONTENT (SYLLABUS)

Paper I	General Microbiology and Immunology
Paper-II	Systematic Bacteriology and Mycology
Paper III	Virology and Parasitology
Paper IV	Applied Microbiology and Recent Advances

General Microbiology

- History and pioneers in Microbiology
- Microscopy
- Bio-safety including universal precautions
- Morphology of bacteria and other microorganisms
- Nomenclature and classification of microbes
- Growth and nutrition of bacteria
- Bacterial metabolism
- Sterilization and disinfection
- Bacterial toxins
- Bacterial antagonism: Bacteriocins
- Bacterial genetics
- Molecular genetics relevant for medical microbiology including gene cloning
- Antibacterial substances used in the treatment of infections and drug resistance in bacteria
- Bacterial ecology
 - Normal flora of the human body
 - Hospital environment
 - Air, water and milk
- Host-parasite relationship

- Quality assurance, quality control and accreditation in microbiology
- Physical and Biological Containment
- Methods of antibiotic susceptibility testing (AST) including guidelines for interpretation of AST using CLSI and EUCAST guidelines
- Molecular typing methods

Immunology

- The immune system
- Innate and acquired immunity
- Cells involved in the immune response
- Antigens
- Immunoglobulins
- Complement
- Antigen and antibody reactions
- Hypersensitivity
- Cell-mediated immunity
- Immunodeficiency
- Autoimmunity
- Immune tolerance
- MHC complex & Transplantation immunity
- Tumour immunity
- Prophylaxis and immunotherapy
- Measurement of immunity
- Immunological techniques
- Immunopotential and immunomodulation
- Mucosal Immunity
- Cytokines
- Monoclonal antibodies

Systematic Bacteriology

- Isolation, description and identification of bacteria
- Gram positive cocci of medical importance including *Staphylococcus*, *Streptococcus*, *Enterococcus*, anaerobic cocci, etc.
- Gram negative cocci of medical importance including *Neisseria*, *Moraxella*, etc.

- Gram-positive bacilli of medical importance including *Lactobacillus*, Coryneform organisms, *Bacillus* & aerobic bacilli, *Actinobacillus* and other Actinomycetales, *Erysipelothrix*, *Listeria*, *Clostridium* and other spore-bearing anaerobic bacilli, etc.
- Gram-negative bacilli of medical importance including *Vibrio*, *Aeromonas*, *Plesiomonas*, *Haemophilus*, *Bordetella*, *Brucella*, *Gardnerella*, *Pseudomonas* & other non-fermenters, *Pasturella*, *Francisella*, *Bacteroides*, *Fusobacterium*, *Leptotrichia*, and other anaerobic Gram-negative bacilli, etc.
- *Helicobacter*, *Campylobacter* and *Spirillum*
- Mycobacteria
- The *Enterobacteriaceae*
- The Spirochaetes
- *Chlamydiae*
- *Rickettsia*, *Coxiella*, *Bartonella*
- Mycoplasmatales: *Mycoplasma*, *Ureaplasma*, *Acholeplasma*
- Actinomycetes and Nocardia
- Miscellaneous bacteria

Virology

- The nature of viruses
- Classification of viruses
- Morphology: virus structure
- Virus replication
- The genetics of viruses
- The pathogenicity of viruses
- Epidemiology of viral infections
- Laboratory diagnosis of viral infections
- Vaccines and anti-viral drugs
- Bacteriophages
- RNA viruses of medical importance including, Enteroviruses, Togaviridae, Flaviviruses, Orthomyxoviruses, Paramyxoviruses, Reoviridae, Rhabdoviridae, Arenaviridae, Bunyaviridae, Retroviridae, Filoviruses, Human immunodeficiency virus, Arboviruses, Coronaviridae, Calciviruses, etc.

- DNA viruses of medical importance including Poxviridae, Herpesviridae, Hepadnaviridae, Adenoviridae, Papova and Parvoviruses, etc.
- Hepatitis viruses
- Persistent viral infection
- Prions
- Human immunodeficiency viruses
- Oncogenic viruses
- Viruses of gastroenteritis
- Miscellaneous and newer viruses
- Viroids

Parasitology

- General characteristics and classification of parasites
- Pathogenesis and pathology of parasitic infections
- Protozoan parasites of medical importance including Entamoeba, Giardia, Balantidium coli, Blastocystis hominis, Trichomonas, intestinal coccidian parasites Toxoplasma, Sarcocystis, blood parasites including Plasmodium, Leishmania, Trypanosoma
- Cestodes and Trematodes of medical importance including, Diphyllbothrium latum, Spirometra, Taenia, Echinococcus, Hymenolepis, Dipylidium caninum, Schistosoma, Fasciola, Fasciolopsis buski, Paragonimus, Clonorchis, other trematodes
- Nematodes of medical importance including, nematodes such as Trichuris, Trichinella, Capillaria, Strongyloides, Ancylostoma, Necator, Enterobius, Ascaris, Toxocara, agents causing larva migrans, tissue nematodes including, Filarialworms, Dracunculus medinensis
- Ectoparasites: Common arthropods and other vectors viz. Mosquito, Sandfly, Ticks, Mite, Cyclops
- Common laboratory methods including common culture methods in Parasitology
- Antiparasitic agents
- Immunity mechanisms in parasitic infections

Mycology

- The morphology and reproduction of fungi and antimycotic agents
- Classification of fungi
- Contaminant and opportunistic fungi including Candida, Cryptococcus, Pneumocystis, Aspergillus, Zygomycetes, Penicillium marneffeii.
- Superficial mycotic fungi including Dermatophytes.
- Fungi causing subcutaneous mycoses including mycetoma and rhinosporidiosis.
- Fungi causing systematic infections including Histoplasma, Blastomyces, Coccidioides, Paracoccidioides, Sporothrix.
- Keratomycosis and otomycosis.
- Fungal toxicosis.
- Antifungal agents and in-vitro antifungal susceptibility testing.
- Prototheca
- Pythium insidiosum

Applied Microbiology

- Epidemiology of infectious diseases
- Hospital-acquired infections
- Principles of antimicrobial stewardship
- Surveillance of nosocomial infections
- Hand hygiene audit
- Hospital waste management
- Vaccinology: principle, methods of preparation, administration of vaccines
- Investigation of an infectious outbreak: Hospital and community
- Infections of various organs and systems of human body viz. sexually transmitted diseases, respiratory tract infections, urinary tract infections, central nervous system infections, congenital infections, reproductive tract infections, gastrointestinal infections, hepatitis, pyrexia of unknown origin, infections of eye, ear & nose, septicaemia, endocarditis, haemorrhagic fever, skin, soft tissue infections etc.

-
- Biomarkers for infectious diseases
 - Effectively use information technology (Computers) in microbiology
 - Demonstrate knowledge and applications of Automation in Microbiology
 - Demonstrate knowledge and applications about molecular techniques in the laboratory diagnosis of infectious diseases
 - Emerging and re-emerging infections.
 - Statistical analysis of microbiological data and research methodology.
 - Care & handling of animals and ethics
 - Demonstrate knowledge in safety in laboratory and Laboratory management

Skills for Postgraduate students in MD Microbiology (Psychomotor)

Bacteriology- Must Acquire

- Preparation and pouring of media-nutrient agar, blood agar, MacConkey agar, sugars, serum sugars, Triple Sugar Iron agar, Robertson's cooked meat, Lowenstein-Jensen's, Sabouraud's dextrose
- Operation of autoclave, hot air oven, distillation plant, filters like Seitz and membrane and sterility tests
- Washing and sterilization of glassware (plugging and packing)
- Preparation of reagents-oxidase, Kovac's, etc
- Disposal of contaminated materials like cultures
- Testing of disinfectants-phenol coefficient and "in use" tests
- Quality control of media, reagents, etc
- Aseptic practices in laboratory and safety precautions
- Care and maintenance of common laboratory equipment like water bath, centrifuge, refrigerator, incubator, thermocycler, automated BACTEC system, microcentrifuge, ELISA system etc.
- Preparation of antibiotic discs: performance antibiotic sensitivity tests by Kirby Bauer, Stokes method, etc. Estimation of minimal inhibitory/bactericidal concentration by tube/plate dilution methods
- Tests for β -lactamases, ESBL, AmpC, Metallobetalactamases
- Collection of specimens for microbiological investigations on blood, urine, throat swab, rectal swab, stool, pus (swabs), OT specimens
- Identification of bacteria of medical importance up to species level (except anaerobes which could be up to generic level)
- Techniques of anaerobiosis, anaerobic jars, evacuation and filling with CO_2 and H_2 , automated anaerobic system.
- Preparation of stains viz. Grams, Albert, capsule, spores, Ziehl-Neelsen etc. and performance of staining
- Care and operation of microscopes viz. light, dark ground, phase contrast and fluorescence microscopes
- Care and breeding of laboratory animals viz. mice, rats, guinea pigs and rabbits
- Bleeding techniques from animals including sheep
- Preparation, examination and interpretation of direct smears from clinical specimens viz. sputum for AFB-ZN, Auramine O, slit smears for *M. leprae* for ZN staining, conjunctival smears for Chlamydia by Giemsa/Iodine
- Quantitative analysis of urine by pour plate method and semiquantitative analysis by standard loop test for finding significant bacteriuria
- Plating of clinical specimens on media for isolation, purification, identification and quantification purposes
- Tests for motility: hanging drop, Craigie's tube, dark ground examination for spirochaetes-Treponema and Leptospira

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- In-vitro toxicity tests-Elek's test, Nagler's reaction
 - Special tests-bile solubility, chick cell agglutination, sheep cell haemolysis, niacin and catalase tests for Mycobacterium, satellitism, CAMP test, catalase, slide agglutination tests
 - Bacteriological test for air, water and milk.
 - Maintenance and preservation of bacterial cultures.

Bacteriology-Desirable to acquire

- Conjugation experiments for drug resistance
- Serum antibiotic assays e.g. Gentamicin
- Phage typing for Staphylococcus, S. typhi etc.
- Bacteriocin typing viz. Proteocin, etc.
- Enterotoxigenicity tests like rabbit ileal loop, intragastric inoculation of infant mouse, Sereny's test
- Performance of autopsy on the animals
- Animal pathogenicity/toxigenicity tests for C. diphtheriae, C. tetani, S.pneumoniae, S. typhimurium, K. pneumoniae etc.
- Serological grouping of Streptococcus
- Antibiotic susceptibility tests for Mycobacteria
- Molecular typing methods.
- Special staining techniques for Mycoplasma, Treponemes, Gardenerella.
- Mouse footpad test for M. Leprae
- Inoculation of infective material by different routes in the animals
- Skin tests like Mantoux test

Immunology-Must acquire

- Collection of blood by venepuncture, separation of serum and preservation of serum for short and long periods
- Preparation of antigens from bacteria or tissues like Widal, Weil-Felix, VDRL, etc and their standardization

- Performance of serological tests viz. Widal, Brucella tube agglutination, Weil-Felix, Cold agglutination, VDRL, Paul-Bunnell, ASO, IFA
- Enzyme-linked immunosorbent assay
- Latex and Staphylococcal Co-agglutination tests

Immunology-Desirable to acquire

- Radial immunodiffusion for estimation of serum immunoglobulins
- Immunoelectrophoresis
- Crossed immunoelectrophoresis
- Immunodiffusion in gels, (Ouchterlony) counter immunoelectrophoresis
- Haemolysis and complement fixation.
- Immunoblotting
- Leukocyte migration test
- T-cell resetting
- Separation of lymphocytes by centrifugation, gravity sedimentation, etc
- Preparation and preservation of complement and complement titration
- Raising of antisera in laboratory animals

Mycology-Must acquire

- Collection and transport of specimens
 - Processing of samples for microscopy and culture
 - Direct examination of specimens by KOH, Gram's, Kinyoun's, Giemsa, Lactophenol cotton blue stains
 - Calcofluor staining and examination under a fluorescent microscope.
 - Examination of histopathology slides for fungal infections
 - Isolation and identification of common laboratory contaminants, dermatophytes and others of medical importance (yeast, dematiaceous fungi)
 - Special techniques like Wood's lamp examination, hair baiting, hair perforation, paraffin baiting and slide culture
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- Maintenance of stock cultures

Mycology-Desirable to acquire

- Animal pathogenicity tests viz. intracerebral and intraperitoneal inoculation of mice for *Cryptococcus*
- Antigen and antibody-based serological test in fungal diseases including *Candida*, *Cryptococcus*, *Aspergillus*, etc.
- Skin test using aspergillin, candidin, histoplasmin, sporotrichin

Parasitology-Must Acquire

- Examination of faeces for parasitic ova and cysts etc. by direct and concentration methods (salt floatation and formal-ether methods)
- Egg counting techniques for helminthes
- Micrometry
- Examination of blood for protozoa and helminthes by wet mount and thin and thick stained smears
- Examination of other specimens e.g. urine, CSF, bone marrow etc. for parasites
- Histopathology sections-examination and identification of parasites
- Performance of stains- Leishman, Giemsa, Lugol's iodine
- In-vitro culture of parasites like *Entamoeba*, *Leishmania*, etc.
- Preparation of media-NIH, NNN, etc.
- Copro-culture of the larva of hookworms
- Identification of common arthropods and other vectors viz., mosquito, sandfly, tick, mite, Cyclops
- Collection and transport of specimens
- Preservation of parasites- mounting, fixing, staining, etc.
- QBC for malaria.

Parasitology-Desirable to Acquire

- Permanent staining techniques like iron haematoxylin
- In-vitro culture of *Plasmodium falciparum*
- Maintenance of *Toxoplasma gondii* in mice
- Antigen based and antibody-based serological diagnostic tests such as IHA, ELISA, Western blot, etc for cysticercosis, amoebiasis, hydatid disease, filariasis, etc.
- *Entamoeba*, *Leishmania*, *Acanthamoeba*, etc
- Maintenance of parasites by in vitro cultures
- Antigen preparation-viz. *Entamoeba*, filarial, hydatid for serological tests like IHA and skin tests like Casoni's test

Virology-Must acquire

- Preparation of glasswares for tissue cultures (washing, sterilization)
- Preparation of media like Hanks, MEM, viral transport media
- Processing and storage of clinical specimens for isolation of viruses
- Maintenance of continuous cell lines by subcultures.
- Cell line preservation in -70°C and liquid nitrogen
- Infection of cell line & Recognition of CPE producing viruses
- Serological tests-ELISA: Indirect ELISA, Sandwich ELISA, Capture ELISA, Biotin-Avidin ELISA etc. for detection of viral antigen and antibody (HIV, HBsAg, HCV, HAV, HEV, CMV, EBV, Dengue, JEV, Chikungunya etc.)
- Immunofluorescence: Direct IF and Indirect IF for detection of CMV pp65 antigen, RSV etc.
- Chick embryo techniques-inoculation and harvesting from various routes

Virology-Desirable to acquire

- Performance of haemadsorption for Parainfluenza, Haemagglutination for Influenza, Immunofluorescence, neutralization for Enteroviruses and Respiratory viruses, identification tests on tissue cultures and supernatants, etc.
- Handling of mice, guinea pigs, rats for collection of blood, pathogenicity tests, etc.
- Special staining procedures for viruses
- Molecular biology-Must acquire
- Extraction of nucleic acid (DNA, RNA)
- PCR protocols: DNA PCR, RTPCR, Real-time PCR
- Gel electrophoresis

Molecular biology-Desirable to acquire

- SDS PAGE
- Cloning
- Western blot
- Sequencing and LAMP assay

TEACHING-LEARNING METHODS

During a period of three years, intensive theoretical and practical training is imparted to the candidates as follows.

Cognitive:

- Attending didactic lectures: one lecture (followed by discussion) of 1h duration weekly.
- Seminar: one seminar (followed by discussion) of 1h duration weekly. This will alternate with Culture/ technique/ slide seminars (with discussion): 1 h duration
- Journal club: for 1h (including discussion) weekly. Speakers consisting of Faculty Member/ Senior Resident/Junior Resident present articles of recent importance.
- Tutorials/ group discussions/ case presentation/ review clubs: one of 1h duration weekly.
- Culture/ technique/ slide seminars (with discussion): 1 h duration weekly

Presentation (teaching) skill:

- Seminars: Junior Residents present seminars under the moderation of a Faculty Member. In three years each Junior Resident presents a minimum of 8 seminars (at least one seminar in each of five sub-specialities, viz bacteriology, serology, mycology, parasitology and virology).
- Journal club: Junior Residents present at least 8 journal clubs in three years.
- Joint symposium- one (one hour and a half including discussion) every three months where four Junior Residents make presentations on different aspects of a defined clinical problem under the guidance of a Faculty Member. A Junior Resident takes an active part in a minimum of five symposia in three-year tenure.

Training (Practical/ Theory)

- A Junior Resident is posted to work in rotation in various sections of Microbiology: Bacteriology, Virology, Mycology, Parasitology, Immunology, Infection control and actively participate in routine diagnostic and research activities of the laboratories daily during the working hours (40 hours a week).
- During the practical training, a Junior Resident carries out the practical exercises relevant to the section as per syllabus, takes active part in routine diagnostic services and has daily bench-side discussions on the topics with concerned members of the faculty.
- All first-year postgraduate students will attend the undergraduate classes

Thesis

Every candidate shall carry out work on an assigned research project under the guidance of a recognized postgraduate teacher, the project shall be written and submitted in the form of a Thesis. The student should submit the proof of communication of the manuscript (originated from his/her thesis) to an indexed peer-reviewed journal.

Every candidate shall submit the thesis plan to the institute as per the institute guidelines:

(i) The student will identify a relevant research question; (ii) conduct a critical review of literature; (iii) formulate a hypothesis; (iv) determine the most suitable study design; (v) state the objectives of the study; (vi) prepare a study protocol; (vii) undertake a study according to the protocol; (viii) analyze and interpret research data, and draw conclusions; (ix) write a research paper.

All the PG students will be encouraged to present their dissertation work in local scientific society meetings as well as national or regional conferences as suitable.

Thesis Evaluation

1. The student should submit the completed thesis 6 months before the final examination.
2. Plagiarism check: If more than 20% plagiarism is detected, the student will be asked to re-write and re-submit. Plagiarism checking will be done before the thesis is bound.
3. The thesis will be sent to one external evaluator for approval. Permission of the external evaluator will be sought by email before sending the thesis.
4. The external evaluator will be provided with an evaluation report form where the thesis will be evaluated as Accepted, Accepted with suggested modifications and Rejected.
5. If the thesis is accepted with suggested modifications, the comments of the evaluator will be intimated to the student and the guide for necessary correction/modifications. After modifications, the thesis will be evaluated by a departmental committee for final approval.
6. If the thesis is rejected, after necessary corrections, the thesis will be sent again to the evaluator for approval.
7. Approval of the thesis is mandatory to appear for the final examination.

THE TIME FRAME FOR MINIMUM SKILL ACQUISITION BY PG RESIDENTS OF MICROBIOLOGY DEPARTMENT

GENERAL MICROBIOLOGY AND BACTERIOLOGY

First-year

- Media and reagent preparation
- Operation of autoclave, hot air oven
- Washing and sterilization of glassware
- Laboratory waste management
- Aseptic practices in laboratory and safety precautions
- Care and maintenance of common laboratory equipment
- Preparation and performance of common bacterial stains
- Collection of specimens for microbiological investigations
- Care and operation of microscopes
- Preparation, examination and interpretation of direct smears from clinical specimens
- Motility testing of bacteria
- Plating of clinical specimens on media

Second-year

- Quality control of media and reagents
- Quantitative and semi-quantitative analysis of urine
- Skin tests
- Preparation of antibiotic discs
- Estimation of MIC, MBC, and tests for beta-lactamases
- Identification of bacteria of medical importance up to species level
- Care and breeding of laboratory animals

Third-year

- Techniques of anaerobiosis
- Bleeding techniques from animals
- Inoculation of infective material by different routes in the animals

-
- Performance of autopsy on the animals
 - Animal pathogenicity/toxigenicity tests and in-vitro toxicity tests
 - Special tests

IMMUNOLOGY

First-year

- Collection of blood by venepuncture
- Separation of serum and preservation of serum for short and long periods
- Preparation of antigens from bacteria or tissues like Widal, VDRL, etc and their standardization
- Latex and Staphylococcal Co-agglutination tests
- Preparation of adjuvants like Freund's adjuvant

Second-year

- Performance of serological tests viz. Widal, Brucella tube agglutination, Weil-Felix, Cold agglutination, VDRL, Paul-Bunnell, Rose-Waaler, IF
- Raising of antisera in laboratory animals
- Enzyme-linked immunosorbent assay
- Separation of lymphocytes by centrifugation, gravity sedimentation

Third-year

- Counter immunoelectrophoresis
- Haemolysin and complement titration
- Leukocyte migration test
- T-cell resetting
- Radial immunodiffusion for estimation of serum immunoglobulins
- Immunoelectrophoresis
- Crossed immunoelectrophoresis
- Neutrophil phagocytosis

MYCOLOGY

First-year

- Collection of specimens
- Direct examination of specimens by KOH, Gram's, Kinyoun's, Giemsa, Lactophenol cotton blue stains

Second-year

- Isolation and identification of common laboratory contaminants, dermatophytes and others of medical importance (yeast, dematiaceous fungi)
- Maintenance of stock cultures

Third-year

- Examination of histopathology slides for fungal infections
- Special techniques like Wood's lamp examination, hair baiting, hair perforation, paraffin baiting and slide culture
- Animal pathogenicity tests viz. intracerebral and intraperitoneal inoculation of mice for Cryptococcus

PARASITOLOGY

First-year

- Collection of specimens
- Examination of faeces for parasitic ova and cysts etc. by direct and concentration methods (salt floatation and formal-ether methods)
- Examination of blood for protozoa and helminthes by wet mount and thin and thick stained smears
- Performance of stains- Leishman, Giemsa
- Preservation of parasites- mounting, fixing, staining, etc.
- Preparation of media-NIH, NNN, etc.

Second-year

- Egg counting techniques for helminthes
- Examination of other specimens eg. urine, CSF, bone marrow etc. for parasites
- In-vitro culture of parasites like Entamoeba, Leishmania, etc.
- Copro-culture of the larva of hookworms
- Antigen preparation-viz. Entamoeba, filarial, hydatid for serological tests like IHA and skin tests like Casoni's test
- Serological tests like IHA, ELISA, Co-A

Third-year

- Histopathology sections-examination and identification of parasites
- Identification of common arthropods and other vectors viz., mosquito, sandfly, tick, mite, Cyclops
- Permanent staining techniques like iron haematoxylin
- Maintenance of *Toxoplasma gondii* in mice

VIROLOGY

First-year

- Preparation of glassware for tissue cultures (washing, sterilization)
- Preparation of media like Hanks, Eagle's MEM
- Preparation of clinical specimens for isolation of viruses
- Serological tests-ELISA for HIV, RPHA for HBsAg

Second-year

- Maintenance of continuous cell lines by subcultures.
- Preservation in -70°C and liquid nitrogen
- Handling of mice, rat, guinea pigs for collection of blood, pathogenicity tests, etc.

Third-year

- Recognition of CPE producing viruses
- Performance of viz. haemadsorption for Parainfluenza
- Haemagglutination for Influenza
- Immunofluorescence
- Neutralization for Enteroviruses and Respiratory viruses
- Identification tests on tissue cultures and supernatants, etc.

ASSESSMENT

All the PG residents are assessed daily for their academic activities and also periodically.

General Principles

- The assessment is valid, objective, and reliable.

- It covers cognitive, psychomotor and affective domains.
- Formative, and summative (final) assessment is conducted in theory as well as practicals/clinicals. In addition, the thesis is also assessed separately.

Examination on Research Methodology & Biostatistics

- Timing: End of 2nd Semester
- Total marks: 100
- Will be considered as an internal examination
- Candidate should pass to appear in Final examination
- No marks will be added to final/summative examination
- Will be conducted by Examination Cell in the month of June & December

Internal Assessment

There will be 4 Internal Examinations for the Postgraduate student- at the end of 3rd, 4th 5th Semesters and Pre-final Examination (conducted 2 month before the final Examination). The Internal Examinations will consist of Theory, Practical with viva and logbook. The timeline and marks distribution will be as follows:

Timeline: End of the 3rd, 4th and 5th semester, pre-final (2 months before final examination).

Marks distribution:

- Theory - 100 marks
- Practical with viva and logbook – 100 marks
Practical – 70, viva – 20, logbook – 10).

The marks of the 4 internal examinations will be averaged to 100 each for theory and practical.

LOGBOOK

The performance of the Postgraduate student during the training period will be monitored throughout the course and duly recorded in the logbooks as evidence of the ability and daily work of the student.

The purpose of the Log Book is to:

- Help to maintain a record of the work done during training.
- Enable the consultant to have first-hand information about the work done and to intervene whenever necessary.
- Use it to assess the clinical experience gained periodically.

Summative Assessment

A. Theory Paper, final MD Examination (Total marks=400, 4 papers of 100 marks each)

Question Paper Format

- One Long question – 20 marks
- Eight Short question/notes – 8 x 10 = 80 marks

So, Total marks in theory: 500 marks

[Theory papers in the final examination – 400 marks

Average of 4 internal examination – 100 marks]

Paper Marks

Paper-I General Microbiology and Immunology: 100

Paper-II Bacteriology + Mycology: 100

Paper-III Virology and Parasitology: 100

Paper-IV Applied Microbiology & Recent Advances: 100

B. Practical & Viva-Voce Examination, final MD Examination (Total marks=400)

So, Total marks in Practical: 500 marks

[Practical and viva in the final examination – 400 marks

Average of 4 internal examinations (Practical + viva + log book) – 100 marks]

Duration: Two days

The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A 200 marks	Longcase (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/ Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

** Students should pass (secure 50% marks) separately in Part A

Practical Examination

The examination will consist of the following exercises conjointly conducted and evaluated by four examiners, two internals and two externals.

1. Exercise in Bacteriology

- Exercise in Clinical Bacteriology:** Isolation and identification of bacteria from the clinical specimen
- Exercise in Bacteriological Techniques:** Isolation and identification of bacteria given in the pure culture

2. Exercise in Virology-

- Egg inoculation/ Sample inoculation in a cell line or Identification of unknown virus from clinical sample
- Serological test with interpretation: IF/ELISA/HA/HAI/ICT/EIA/CLIA
- Molecular: Qualitative/Quantitative viral assay

3. Exercise in Mycology: Identification of fungi

4. Exercise in Parasitology-

- Examination of stool for ova and cysts by direct and concentration techniques
- Blood sample/smear examination

5. Exercise in Immunology: Any one of the serological techniques used in clinical medicine

6. OSPE: Clinical specimen/slides/ mycobacteriology/Anaerobic bacteriology/ hospital infection control etc.

7. Pedagogy

Oral examination: The oral examination consists of questions on the dissertation and overall subject matter. It will be conducted by all the four examiners as in the case of the practical examination

Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

The decision related to passing marks are as follows:

- The student has to secure 50% marks in the internal examination (in both theory and practical) to be eligible to appear for the final examination.
- In the final theory examination, a student should secure 50% marks (200 out of 400) to pass.
- In the final practical examination, a student has to secure 50% marks (200 out of 400) overall and additionally they have to secure 50% marks (100 out of 200) in Part A separately.

RECOMMENDED BOOKS

1. Ananthanarayan R. Textbook Of Microbiology (7Th Edition): Universities Press; 2009.
2. Borriello SP, Murray PR, Funke G. Topley and Wilson's Microbiology and Microbial Infections: Bacteriology: Hodder Arnold; 2007.
3. Carroll KC, Butel JS, Morse SA. Jawetz Melnick & Adelbergs Medical Microbiology 27 E: McGraw-Hill Education; 2015.
4. Chander J. Textbook of Medical Mycology: Jaypee Brothers,Medical Publishers Pvt. Limited; 2017.
5. Chatterjee K. Parasitology, Protozoology and Helminthology in Relation to Clinical Medicine: CBS Publishers & Distributors; 2009.
6. Emmons CW. Medical Mycology: Lea and Febiger; 1970.
7. Forbes BA, Sahm DF, Weissfeld AS. Bailey & Scott's Diagnostic Microbiology: Elsevier Mosby; 2007.
8. John E. Bennett MDM, Dolin R, Blaser MJ. Mandell, Douglas, and Bennett's Principles and Practice of Infectious Diseases: 2-Volume Set: Elsevier Health Sciences; 2014.
9. Knipe DM, Howley P. Fields Virology: Wolters Kluwer Health; 2013.
10. Mackie TJ, Collee JG, McCartney JE. Mackie & McCartney Practical Medical Microbiology: Churchill Livingstone; 1996.
11. Murray PR, Microbiology ASf. Manual of Clinical Microbiology: ASM Press; 1995.
12. Roitt IM, Brostoff J, Male DK. Immunology: Mosby; 2001.
13. Sastry AS, K SB. Essentials of Medical Microbiology: Jaypee Brothers,Medical

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- Publishers Pvt. Limited; 2018.
14. Winn WC, Koneman EW. Koneman's Color Atlas and Textbook of Diagnostic Microbiology: Lippincott Williams & Wilkins; 2006.
15. Baijayantimala Mishra. Text Book of Medical Virology. New Delhi. CBS Publishers and distributors Pvt Ltd. 2018

MODEL SAMPLE QUESTION PAPERS

PAPER 1

GENERAL MICROBIOLOGY & IMMUNOLOGY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Define sterilization, disinfection and antiseptics. Classify the different methods of sterilization. Discuss methods of sterilization of heat-sensitive items in detail. **[20 marks]**

2. **Short Notes: -** **[8 × 10 marks]**
 - a. Differentiate between classical and alternative pathways of complement activation. Discuss the role of complement in health and diseases.
 - b. Discuss the genetic basis of drug resistance in bacteria.
 - c. Enlist important primary immunodeficiency diseases. Describe DiGeorge's syndrome.
 - d. What are histocompatibility antigens? Discuss HLA typing.
 - e. What is microarray? Describe its principle and applications in microbiology.
 - f. Explain hybridoma technology and give its applications in microbiology.
 - g. What is redox potential? Describe giving suitable examples.
 - h. Explain recombinant DNA technology and give its applications in microbiology

PAPER 2

BACTERIOLOGY AND MYCOLOGY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. A 24-year -old man on antitubercular therapy for the past 6 months develops a fever with cough. Sputum smear examination is positive for AFB and a chest X-ray shows left lower zone consolidation. What is the probable diagnosis? Discuss the laboratory diagnosis of the condition. **[20 marks]**

2. Short Notes: - **[8 × 10 marks]**

- Discuss aetiology, pathogenesis and laboratory diagnosis of brucellosis.
- Discuss briefly the mechanism and methods of detection of VRE.
- What are Penicillin-binding proteins? Discuss their role in bacterial drug resistance.
- Discuss aetiology, epidemiology, pathogenesis and laboratory diagnosis of Scrub typhus.
- Enumerate various dematiaceous fungi and discuss their pathogenicity.
- What are mycotoxins? Discuss mycotoxicosis.
- Classify antifungal agents. Discuss the methods of antifungal susceptibility testing.
- Enlist pathogens causing diarrhoea. Discuss the epidemiology, pathogenesis, and laboratory diagnosis of cholera.

PAPER 3

VIROLOGY & PARASITOLOGY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. A 10-year- old boy presented to the emergency with a history of 5 days of fever, chills, bleeding gum and abdominal pain with red patches on the body. Blood tests revealed severe thrombocytopenia (17,000 platelets per microliter). What is the most likely diagnosis? Discuss the laboratory diagnosis of the condition. **[20 marks]**

2. Short Notes: - **[8 × 10 marks]**

- Name various free-living amoebae. Discuss the life cycle, pathogenicity and laboratory diagnosis of any one of them.
- Discuss rapid diagnostic tests in parasitology along with their clinical applications.
- Discuss pathogenesis and laboratory diagnosis of Strongyloides stercoralis infection.
- Discuss the aetiology, pathogenesis and diagnosis of Tropical Pulmonary Eosinophilia.
- Discuss antigenic variation, pathogenesis and laboratory diagnosis of influenza A virus.
- What are Interferons? Explain their mechanism and clinical applications.

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- g. Define Prions. Classify Prion diseases and discuss their pathogenesis and diagnosis.
 - h. Enumerate various congenital viral infections and discuss their laboratory diagnosis.

PAPER 4

APPLIED MICROBIOLOGY AND RECENT ADVANCES IN MICROBIOLOGY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Define hospital-acquired infection. Mention the composition of Hospital Infection Control Committee. Describe the infection control procedures for the prevention of infection in the health care setting in detail. **[20 marks]**

2. **Short Notes: -** **[8 × 10 marks]**
 - a. What are DNA vaccines? Discuss the current status and future of DNA vaccines.
 - b. What is plasma sterilizer? Give its principle and uses in clinical microbiology.
 - c. Define transgenic mice and discuss their role in the study of microbial pathogenicity.
 - d. What is quality control in the Clinical Microbiology Laboratory? Describe various methods adopted for internal quality control in microbiology.
 - e. What are biofilms? Describe their significance in clinical microbiology.
 - f. Write briefly on Fecal Microbiota Transplantation and its application.
 - g. Define and categorize biomedical waste. Discuss its management.
 - h. Enumerate the automated methods for identifying bacteria in the laboratory. Describe the principle of anyone method and its uses in clinical microbiology.

ENTRUSTABLE PROFESSIONAL ACTIVITIES (EPA) FOR MD (MICROBIOLOGY) COURSE

Sr. No	Entrustable Professional Activities	COMPETENCIES							EXPECTED LEVEL		
		MK	PC	ISC	P	PBLI	SBP	Ist year	2 nd year	3 rd Year	
1	Should be able to perform the gross examination and selection of culture medium for clinical specimens received for culture	Y	Y		Y	Y	Y	II	IV	V	
2	Should be able to interpret gross colony characteristics and microscopic findings of growth in culture medium	Y	Y		Y	Y	Y	I	II	IV	
3	Should be able to process all clinical specimens as per test ordered	Y	Y		Y	Y	Y	III	IV	IV	
4	Should be able to prepare all routine media	Y			Y	Y	Y	II	IV	V	
5	Should be able to perform a Gram stain	Y	Y		Y	Y	Y	III	IV	V	
6	Should be able to decide appropriate special stain (Albert, Zeihl-Neelsen) and perform it whenever necessary	Y	Y		Y	Y	Y	III	III	IV	
7	Should be able to prepare wet-mounts of relevant clinical specimens	Y	Y		Y	Y	Y	II	III	V	
8	Should be able to interpret stains and wet-mounts	Y	Y	Y	Y	Y	Y	II	III	V	
9	Should be familiar with indications and interpretation of ancillary techniques like fluorescent microscopy, flow cytometry, PCR, electron microscopy	Y	Y		Y	Y	Y	I	III	III	
10	Should be able to interpret results of automated culture, identification and molecular systems like Bactec, VITEK, Gene Xpert	Y	Y	Y	Y	Y	Y	I	III	IV	
11	Should be able to perform different methods of antimicrobial susceptibility testing like disk diffusion, agar dilution, Etest	Y	Y		Y	Y	Y	II	III	IV	
12	Should be able to prepare, stain and interpret peripheral smear	Y	Y		Y	Y	Y	II	III	IV	
13	Should be able to interpret bone marrow smears	Y	Y		Y	Y	Y	I	III	IV	
14	Should be able to plan investigations in a clinical case	Y	Y	Y	Y	Y	Y	II	III	IV	
15	Should be able to perform and interpret Urine Examination	Y	Y		Y	Y	Y	II	III	IV	

Sr. No	Entrustable Professional Activities	COMPETENCIES								EXPECTED LEVEL		
		MK	PC	ISC	P	PBLI	SBP	Ist year	2 nd year	3 rd Year		
16	Should be able to perform and interpret CSF, Pleural Fluid, Peritoneal Fluid, Synovial fluid examination.	Y	Y		Y	Y	Y	II	III	IV		
17	Should demonstrate familiarity with routine laboratory investigations in Pathology and Biochemistry	Y	Y		Y	Y	Y	I	II	III		
18	Should be able to correlate the culture/ serology/ molecular findings with clinical significance in patients with help of relevant clinical, operative and radiological data and arrive at the diagnosis	Y	Y	Y	Y	Y	Y	I	II	III		
19	Should be able to plan and execute an internal quality control program for laboratory	Y	Y	Y	Y	Y	Y	I	II	III		
20	Should be able to participate in an external quality control program	Y	Y	Y	Y	Y	Y	I	I	II		
21	Should be able to perform and interpret routine serological investigations like VDRL, Widal	Y	Y		Y	Y	Y	III	IV	IV		
22	Should be able to perform and interpret rapid diagnostic tests like bacterial meningitis, CRP, malaria	Y	Y		Y	Y	Y	III	IV	IV		
23	Should be able to perform and interpret ELISA for infectious disease	Y	Y		Y	Y	Y	I	II	III		
24	Should be able to teach Microbiology to undergraduates (MBBS), and allied health sciences like BSc (Nursing), BSc (MLT)	Y	Y	Y	Y	Y	Y	-	II	III		
25	Should be able to participate in multidisciplinary meetings like CPCs, Institute academic programs	Y	Y	Y	Y	Y	Y	I	II	III		
26	Should be able to present oral and poster presentations, write the paper in conferences	Y	Y	Y	Y	Y	Y	--	II	III		
27	Should be able to supervise technicians	Y	Y	Y	Y	Y	Y	-	I	II		
28	Should have a thorough knowledge of Biomedical Waste disposal.	Y	Y	Y	Y	Y	Y	II	III	IV		
29	Should have a thorough knowledge of Hospital Infection Control Program	Y	Y	Y	Y	Y	Y	I	II	III		
30	Should be familiar with norms and requirements of NABL, NABH Accreditation	Y	Y	Y	Y	Y	Y	-	II	III		

Abbreviation:

EPAs- entrustable professional activities;

MK- Medical Knowledge

PC- Patient Care

ISC- Interpersonal Skills and Communication;

P- Professionalism

PBLI- Practice-Based Learning and Improvement

SBP- Systems-Based Practice

Levels of supervision for the EPA (5 levels):

1. Observation but no execution, even with direct supervision
2. Execution with direct, proactive supervision
3. Execution with reactive supervision, ie, on request and quickly available
4. Supervision at a distance and/or post hoc
5. Supervision provided by the trainee to more junior colleagues

The background of the page is a complex network diagram. It consists of numerous circular nodes of varying sizes, connected by thin, light-colored lines. The nodes are color-coded: yellow and orange at the top, green and teal in the middle, and blue and grey at the bottom. The overall effect is a dense, interconnected web of points and lines, suggesting a network or a molecular structure.

OBSTETRICS AND GYNAECOLOGY

MD in Obstetrics and Gynaecology

COURSE NAME

MD in Obstetrics and Gynaecology

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

AIMS

The aim of the MD course in Obstetrics & Gynaecology is to produce a competent obstetrician & gynaecologist who:

1. Recognizes the health needs of adolescents, women in reproductive age group & postmenopausal women. Course out professional delegations in keeping with principles of National Health Policy and professional ethics.
2. Is competent to manage the pathological states related to the reproductive system with knowledge of Anatomy, Physiology, Pharmacology & Pathophysiology.
3. Is aware of contemporary advances & developments in the field of maternal health & other related issues.
4. Is oriented to principles of research methodology.
5. Has acquired skills in educating medical and paramedical professionals.

OBJECTIVES:

1. Provide quality maternal care in the diagnosis and management of antenatal, intranatal & postnatal period of normal and abnormal pregnancy.
2. Provide effective & adequate care to the obstetric and early neonatal emergencies.

3. Provide counselling & knowledge regarding family planning methods & perform medical termination of pregnancy.
4. Organize & implement maternal components in the "National Health Programs".
5. Develop adequate surgical skills to manage common obstetrical & gynaecological problems.
6. Medical genetics – elementary genetics as applicable to obstetrics.
7. Normal & abnormal pregnancy during antenatal, intranatal & postnatal period.
8. Knowledge of gynaecological endocrinology & infertility.
9. Benign & malignant gynaecological disorder.
10. Operative procedures including endoscopy (diagnostic & therapeutic) & its related complications.
11. Knowledge of interpretation of various laboratory investigations & other diagnostic modalities in obstetrics & gynaecology.
12. Medical & surgical problems and anaesthesia-related to obstetrics & gynaecology.
13. Knowledge of essentials of pediatric & adolescent gynaecology.
14. Reproductive & child health, family welfare & reproductive tract infections.
15. STD, AIDS & Government of India perspective on women's health-related issues.
16. Demonstrate skills in the documentation of case details and of morbidity & mortality data relevant to the assigned situation.
17. Knowledge of medicolegal aspects in obstetrics & gynaecology.
18. To be familiar with research methodologies & use of newer information technologies.
19. To keep abreast with advances in the field of obstetrics & gynaecology.

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20. Facilitate learning of medical & nursing students, paramedical health workers as a teacher and trainer.
 21. Demonstrate empathy & human approach towards patients and their families.
 22. Function as a productive member of a team engaged in health care, research & education.

SYLLABUS

THEORY:

Basic Sciences

- Normal & abnormal development, structure and function of (female & male) urogenital system and female breast.
- Applied anatomy of the genitourinary system, abdomen, pelvis, pelvic floor, anterior abdominal wall, upper thigh (inguinal ligament, inguinal canal), rectum and anal canal.
- Physiology of spermatogenesis.
- Endocrinology related to male and female reproduction.
- Anatomy & physiology of urinary & lower GI (rectum / anal canal) tract.
- Development, structure & function of the placenta, umbilical cord & amniotic fluid.
- Anatomical & physiological changes in the female genital tract during pregnancy.
- Anatomy of the fetus, fetal growth & development, fetal physiology & fetal circulation.
- Physiological & neuroendocrine changes during puberty, adolescence, menstruation, ovulation, fertilization, climacteric & menopause.
- Biochemical and endocrine changes during pregnancy, including systemic changes in cardiovascular, haematological, renal, hepatic and other systems.
- Biophysical and biochemical changes in uterus and cervix during pregnancy & labour.
- Pharmacology of identified drugs used during pregnancy, labour, the postpartum period in reference to their absorption, distribution, excretion, (hepatic) metabolism, transfer of the drugs across the placenta, effect of the drugs (used) on labour, on fetus, their excretion through breast milk.
- Mechanism of action, excretion, metabolism of identified drugs used in obstetrics & gynaecology.
- Role of hormones in obstetrics & gynaecology.
- Markers in obstetrics & gynaecology – benign and neoplastic diseases.
- Pathophysiology of ovaries, fallopian tubes, uterus, cervix, vagina and external genitalia in healthy and diseased conditions.
- Normal and abnormal pathology of the placenta, umbilical cord, amniotic fluid and fetus.
- Normal and abnormal microbiology of genital tract - bacterial, viral, fungal, & parasitical infections responsible for maternal, fetal and gynaecological disorders
- Humoral and cellular immunology in Obstetrics & Gynaecology
- Gametogenesis, fertilization, implantation & early development of the embryo
- Normal pregnancy, physiological changes during pregnancy, labour & puerperium
- Immunology of pregnancy
- Lactation

Obstetrics

- The full range of obstetrics, including high-risk obstetrics and medical & surgical complications of pregnancy
- Genetics, including the performance and assistance of prenatal diagnostic and therapeutic procedures and patient counselling
- Learning and performing operative vaginal deliveries, including obstetric forceps or vacuum extractor

- Performing vaginal breech deliveries
- Performing vaginal births after previous cesarean delivery
- Obstetric anaesthesia: Principles of general and regional anaesthesia, along with management and complications of these techniques
- Experience in the management of critically ill patients
- Immediate care of the newborn: Resuscitation of the newborn, including tracheal intubation; principles of general neonatal complications
- The full range of commonly employed obstetrical diagnostic procedures, including imaging techniques especially ultrasonography.

Gynaecology

- The full range of the content of medical and surgical gynaecology
- Diagnosis and medical & surgical management of urinary incontinence
- Oncology, including radiation and chemotherapy
- Diagnosis and nonsurgical management of breast diseases, including fine needle aspirations
- Reproductive endocrinology and infertility
- Psychosomatic and psychosexual counselling
- The full range of commonly employed gynaecologic diagnostic and surgical procedures, including imaging techniques
- Experience in the management of critically ill patients

Contraception, Neonatology and Recent Advances

- Contraception (male & female)
- Medical termination of pregnancy: safe abortion, selection of cases, technique & management of complication of medical and surgical procedures, MTP law
- National health programmes

- Social obstetrics and vital statistics
- Care of the newborn: Normal and high-risk newborn (including NICU care)
- Asphyxia and neonatal resuscitation
- Neonatal sepsis: prevention, detection & management
- Neonatal hyperbilirubinemia: investigation & management
- Birth trauma: Detection & management
- Detection and management of fetal & neonatal malformation
- Management of common neonatal problems
- Emergency medicine
- Ethics and medical jurisprudence

PRACTICALS

Obstetrics

- Venepuncture
- Amniotomy
- Conduct of normal Vaginal delivery
- Perineal infiltration & Pudendal block
- Episiotomy
- Ventouse delivery
- Forceps delivery
- Management of Genital tract injuries
- Exploration of Cervix
- Lower Segment Caesarean Section
- Manual Removal of Placenta
- Vaginal breech delivery
- External Cephalic Version
- Delivery of twins & multi-fetal pregnancies
- Management of shock
- Management of Postpartum haemorrhage
- Cervical Cerclage
- Amnioinfusion
- Instillation of extra amniotic & intraamniotic drugs

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- Non-stress Test
 - Suction Evacuation
 - Dilatation & Evacuation
 - Repair of complete perineal tear
 - Repair of cervical tear
 - Caesarean Hysterectomy
 - Internal iliac artery ligation
 - Uterine & Ovarian Artery ligation
 - Destructive operations
 - Reposition of inversion uterus
 - Amniocentesis

Gynaecology

- Pap Smear
- Wet smear examination
- Post Coital Test
- Endometrial Biopsy
- Endometrial Aspiration
- Dilatation and Curettage, Fractional Curettage, Polypectomy
- Cervical Biopsy
- Cryo / Electrocautery of Cervix
- Hysterosalpingography
- Diagnostic Laparoscopy & Hysteroscopy
- Opening & closing of the abdomen
- Operations for uterovaginal prolapse
- Operations for Ovarian tumours
- Operations for Ectopic pregnancy
- Vaginal hysterectomy
- Abdominal Hysterectomy
- Myomectomy
- Colposcopy
- Loop Electro Surgical Excision Procedure
- Tuboplasties
- Paracentesis
- Culdocentesis
- Endoscopic surgery (Operative Laparoscopy & Hysteroscopy)

- Repair of genital fistulae
- Operations for Urinary incontinence
- Radical operations for gynaecological malignancies
- Vaginoplasty
- Intrauterine insemination
- Basic ultrasound & TVS
- Hydrotubation
- Vulval Biopsy
- Incision & drainage

Family Planning

- Intra Uterine contraceptive Device: Insertion & removal
- Female sterilization: Post-partum & Interval, Open & Laparoscopic
- MTP
- Male Sterilization

Research

- Information search and literature review
- Proposing a hypothesis; research design, bias and appropriate methods of measurement; data collection and storage; good record keeping
- Common statistical tests and application of statistics relevant to the project; interpretation of results
- Monitoring of studies and post-study surveillance
- Responsibilities of Institutional Review Board/ independent ethics committee, and of the investigator to the ethics committee; ethical principles
- Principles of writing a scientific paper, and of oral or poster presentation of a paper
- Principles of evidence-based medicine (including levels of evidence)
- The process of obtaining funding and writing a basic grant application

Thesis

- Every junior resident shall carry out work on an assigned research project under the guidance of a recognized postgraduate teacher; the project shall be written and submitted in the form of a thesis.
- Every candidate shall submit the thesis plan (protocol) within four months from the date of admission.
- The thesis shall be submitted six months before the commencement of final examination i.e. for examination May/June session, 30th November of the preceding year of examination and for November/December session 31st May of the year of examination.
- The student will identify a relevant research question; (ii) conduct a critical review of literature; (iii) formulate a hypothesis; (iv) determine the most suitable study design; (v) state the objectives of the study; (vi) prepare a study protocol; (vii) undertake a study according to the protocol; (viii) analyse and interpret research data, and draw conclusions; (ix) write a research paper.

TEACHING AND LEARNING METHODS

Acquisition of practical competencies being the keystone of postgraduate medical education, postgraduate training shall be skills-oriented. Learning in postgraduate program is essentially self-directed and primarily emanating from clinical and academic work. The formal sessions are meant to supplement this core effort.

- Clinical case discussions
 - a) PG bedside teaching
 - b) Teaching rounds
- Seminars & Journal Club
- Statistical meetings: weekly/ monthly
- Mortality meetings
- Interdepartmental Meetings: Neonatology, Pediatrics, Radiology, Anesthesiology, Pathology & Microbiology

- Others: Guest Lectures, Vertical Seminars & Central Statistical Meets

DEPARTMENTAL TRAINING SCHEDULE AND POSTING OF RESIDENTS:

The departmental schedule shall be as follows:

- Seminar / Symposium: Once a week
- Journal Club: Once a week
- PG Case discussion / Bed Side teaching: Once a week
- Intradepartmental Statistical Meet (with all the staff, in charge, residents & faculty): Once a month
- Interdepartmental meet which includes meeting with other specialities viz. medicine, pathology, microbiology, gastroenterology & anaesthesia: Twice a month
- Perinatology meet with neonatology and pediatric department: discussing neonatal mortality and morbidity in inborn babies and other topics of common interest: once a month
- Thesis meet to discuss thesis being done by the PG residents: once every three months
- Grand round of the wards: Once a month
- Interdepartmental meet with the radiology department: once a month
- Central session (held in hospital auditorium regarding various topics like CPC, Guest lecture: Once a week
- Lectures, student seminars, grand rounds, sessions on basic sciences.
- Biostatistics, research methodology, teaching methodology & health economics
- Medical ethics & legal issues

The posting of the junior residents shall be as follows:

Emphasis will be on self-directed learning, group discussions, case presentations & practical hands-on learning.

Residents shall be trained about proper history taking, clinical examination, advising relevant investigations, their interpretations and instituting

medical/ surgical management by posting the candidates in OPD, speciality clinics, wards, operation theatres, labour room, family planning clinics & other departments like neonatology, radiology, anaesthesia.

The candidates will be trained to manage all emergency situations seen frequently in Gynaecology Ward, Labour room, Emergency, Family Planning and Operation Theatre

Schedule of Posting:

The junior residents in obstetrics & gynaecology shall undergo the following rotation training

during their 3years course as follows:

- Obstetric ward: 1 yr
- Gynaecology ward: 1 yr
- Unit rotation: 3 months each in the other 2 unit (6 months)
- Labour room: 4 months
- Family planning: 1 month
- Radiotherapy: 2 wks
- Neonatology: 2 wks
- TEM: 1 months
(Rural posting - 1month)

ASSESSMENT

Examination on Research Methodology & Biostatistics

- Timing: End of 2nd Semester
- Total marks: 100
- Will be considered as an internal examination
- Candidate should pass to appear in Final examination
- No marks will be added to final/summative examination
- Will be conducted by Examination Cell in the month of June & December

Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

INTERNAL ASSESSMENT:

Timeline: End of the 3rd, 4th and 5th semester, pre-final (2 months before final examination).

Marks distribution:

Theory 100 marks

Practical with viva and logbook will carry 100 marks

(Practical – 70, viva – 20, logbook – 10)

The marks of the 4 internal examinations will be averaged to 100 each for theory and practical (to be added to the final summative examination).

SUMMATIVE ASSESSMENT

There shall be summative assessment, consisting of theory and practicals, conducted by the Examination cell of AIIMS Bhubaneswar at the end of the (3rd academic year).

Obtaining 50% marks in theory as well as practical shall be mandatory for passing as a whole.

A candidate shall be allowed to appear for the summative assessment only if the candidate's thesis has been accepted by the Department Thesis Committee and the external reviewer. (In case of non- acceptance of the thesis, the candidate shall modify the thesis as per the instructions of the external reviewer and resubmit it for acceptance).

Summative Assessment (THEORY)

Theory examination shall comprise of 4 papers of 3 hours' duration each.

Each theory paper shall be of 100 marks each.

Theory question paper format:

- One Long question – 20 marks
- Eight Short question/notes – 8 x 10 = 80 marks

Total marks in theory: 500 marks for MD Obstetrics and Gynaecology

Theory Paper	Topics	Marks
Paper 1	Basic sciences as related to Obstetrics &Gynaecology	100
Paper 2	Obstetrics including diseases of Neonates	100
Paper 3	Principles and Practice of Gynaecology and Gynaecological Pathology	100
Paper 4	Recent Advances in Obstetrics & Gynaecology	100
Internal assessment (theory)	Average of 4 formative internal assessments	100
Total		500

Summative Assessment (PRACTICAL)

- Practical examination: Total marks: 500 (Practical and viva in the final examination – 400 marks and an average of 4 internals- 100 marks) for MD
- The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A* 200 marks	Longcase (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/ Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

* Students should pass (secure 50% marks) separately in Part A

RECOMMENDED BOOKS

1. Holland And Brews Manual Of Obstetrics: Churchill Livingstone; 1998.
2. Practice Of Fertility Control: A Comprehensive Manual (7th Edition): Elsevier (A Division of Reed Elsevier India Pvt. Limited); 2007.
3. Arias F, Bhide AG, S A, Damania K, Daftary SN. Arias' Practical Guide to High-Risk Pregnancy and Delivery - E-Book: A South Asian Perspective: Elsevier Health Sciences; 2015.
4. Baliga BS. Principles and Practice of Colposcopy: Jaypee Brothers, Medical Publishers Pvt. Limited; 2010.
5. Baskett TF, Calder AA, Arulkumaran S. Munro Kerr's Operative Obstetrics: Elsevier; 2014.
6. Berek JS, Novak E. Berek & Novak's Gynecology: Lippincott Williams & Wilkins; 2007.
7. Bernstein C, Takoudes TC. Medical Problems During Pregnancy: A Comprehensive Clinical Guide: Springer International Publishing; 2017.
8. Burger H. Sex Hormone Replacement Therapy: Springer US; 2013.
9. Callen PW. Ultrasonography in Obstetrics and Gynecology E-Book: Elsevier Health Sciences; 2011.
10. Chu CS, Rubin SC. Manual of Gynecologic Oncology: World Scientific; 2011.
11. Davies M, Webber L, Overton C. Infertility: OUP Oxford; 2008.
12. Dawn CS. Undergraduate & Postgraduate Textbook of Gynaecology and Contraception: Described for Students, Teachers and Practitioners: Dawn Books; 1995.
13. Farghaly S. Gynecologic Cancers: Basic Sciences, Clinical and Therapeutic Perspectives: IntechOpen; 2016.
14. Fritz MA, Speroff L. Clinical Gynecologic Endocrinology and Infertility: Wolters Kluwer Health; 2012.
15. Hibbard J, Peterson E. Medical Disorders in Pregnancy, An Issue of Obstetrics and Gynecology Clinics, E-Book: Elsevier Health Sciences; 2018.
16. Jain N, Nutan J. Jaypee Gold Standard Mini Atlas Series® Laparoscopic Surgery in Infertility and Gynecology: Jaypee Brothers, Medical Publishers Pvt. Limited; 2011.
17. Jones HW, Rock JA. Te Linde's Operative Gynecology: Wolters Kluwer; 2015.
18. Konar H. DC Dutta's Textbook of Obstetrics: Jaypee Brothers, Medical Publishers Pvt. Limited; 2014.
19. kumar S, Padubidri VG, Daftary SN. Howkins & Bourne, Shaw's Textbook of Gynecology, 17 edition-EBOOK: Elsevier Health Sciences; 2018.
20. Leveno KJ, Spong CY, Dashe JS, Casey BM, Hoffman BL, Cunningham FG, et al. Williams Obstetrics, 25th Edition: McGraw-Hill Education; 2018.
21. Lopes T, Spirtos NM, Hilton P, Monaghan JM. Bonney's Gynaecological Surgery: Wiley; 2018.
22. Menon MKK, Devi PK, Rao KB. Postgraduate Obstetrics and Gynaecology: Orient Longman; 1986.
23. Mukherjee GG, Malhotra N. Medicolegal Aspects in Obstetrics and Gynaecology: Jaypee Brothers, Medical Publishers Pvt. Limited; 2008.
24. Rao KA. The Infertility Manual: Jaypee Brothers, Medical Publishers Pvt. Limited; 2018.
25. Rubin SC, Oncologists SG. Chemotherapy of Gynecologic Cancers: Society of Gynecologic Oncologists Handbook: Lippincott Williams & Wilkins; 2004.
26. Salhan S. Textbook of Obstetrics: Jaypee Brothers, Medical Publishers Pvt. Limited; 2016.
27. Setchell ME, Hudson CN. Shaw's Textbook of Operative Gynaecology - E-Book: Elsevier Health Sciences; 2013.
28. Shulman L. Year Book of Obstetrics, Gynecology, and Women's Health, E-Book: Elsevier Health Sciences; 2013.
29. Singh K, Malhotra N. Step by Step: 3D/4D Ultrasound in Obstetrics, Gynecology and

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- Infertility: Jaypee Brothers, Medical Publishers Pvt. Limited; 2013.
30. Singh M. Care Of The New Born Revised 8Ed (2017): CBS Publishers & Distributors; 2015.
31. Soderstrom RM. Operative Laparoscopy: Lippincott-Raven; 1998.
32. Soeters R, Dehaeck K. Basic Principles of Gynaecological and Obstetrical Surgery: University of Cape Town Press; 1998.
33. Sutton CJG, Diamond MP. Endoscopic Surgery for Gynaecologists: W.B. Saunders; 1993.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASIC SCIENCES AS RELATED TO OBSTETRICS & GYNAECOLOGY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. A term baby is born and cries immediately i) Describe the fetal circulation and illustrate with diagram ii) What are the changes that occur in fetal circulation at birth? iii) Remnants of the fetal circulation in adulthood **(10+5+5=20)**
2. Write short notes on **(8x10=80)**
 - a. Haematological changes during Pregnancy
 - b. Enumerate the causes of vault Prolapse. How will you manage vault prolapse?
 - c. Clinical application of vaginal cytology in pregnancy.
 - d. Describe the Prenatal diagnosis of chromosomal anomalies in a fetus.
 - e. What are the uses of methotrexate in obstetrics & gynaecology?
 - f. Give an account of changes in fetal circulation immediately after the birth of the baby.
 - g. Enumerate applications of colour doppler in obstetrics and describe the findings of colour doppler in placental insufficiency.
 - h. Aim & objectives of the PCPNDT Act. Enumerate the clauses for 2nd-trimester abortions.

PAPER 2

OBSTETRICS INCLUDING DISEASES OF NEONATES

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Classify hypertensive disorders in pregnancy. Describe the pathophysiological changes in pre-eclampsia in different organ systems. Enumerate the criteria for severity of the disease. **(5+10+5=20)**
2. Write short notes on **(8x10=80)**
 - a. Discuss the medical management of ectopic pregnancy.
 - b. Discuss management of primigravida with Rheumatic heart disease with mitral stenosis and grade II dyspnoea with fever at 30 weeks of gestation.
 - c. What are the criteria for the diagnosis of gestational trophoblastic neoplasia? Discuss its management.
 - d. Describe the selection criteria and explain the intrapartum monitoring of
 - e. vaginal birth after caesarean section.
 - f. What are the causes of occipitoposterior position? Discuss its management in second stage.
 - g. Explain the medical and surgical measures for prevention of parent to child transmission of HIV infection.
 - h. How will you manage a primipara presenting on 10th day of puerperium with a swollen left leg?

PAPER 3

PRINCIPLES AND PRACTICE OF GYNAECOLOGY AND GYNAECOLOGICAL PATHOLOGY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Enumerate types of epithelial ovarian tumours. Describe the FIGO classification of epithelial ovarian tumours. Discuss the principles of management of epithelial ovarian tumour stage IIIc. **(5+10+5=20)**
2. Write short notes on **(8x10=80)**
 - a. Give a detailed account on follow up of CIN 2.
 - b. Describe the tests of ovulation.
 - c. Explain the medical management of endometriosis.
 - d. What are the secondary changes and complications of fibroid uterus? Discuss the role of uterine artery embolisation in the management of fibroids.

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- e. Enumerate the supports of the uterus. Discuss the management of third-degree uterovaginal prolapse.
 - f. Classify abnormal uterine bleeding. How will you manage a case of puberty menorrhagia?
 - g. How will you manage a case of misplaced copper -T 380A?
 - h. Discuss bacterial vaginosis.

PAPER 4

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

- 1. Discuss the uses of misoprostol in labour induction & abortion. **(10+10=20)**
- 2. Write short notes on **(8x10=80)**
 - a. Describe the management of atonic PPH in 25 years old primipara.
 - b. Discuss the management of hirsutism in 22-year-old girl with PCOS.
 - c. Discuss recent advances in surgical & medical management of AUB.
 - d. Give the WHO criteria for semen analysis? How will you treat a 28 years old male with oligoasthenoteratozoospermia?
 - e. Describe various criteria for vaginal breech delivery.
 - f. Management of fetal growth restriction at 28 weeks of gestation in a second gravida with previous G2 P1 L1 A0 S0.
 - g. Enumerate sex cord tumours of the ovary. How will you manage a 22-year-old girl presenting with such tumours?
 - h. Discuss causes, pathophysiology diagnosis & treatment of HELLP Syndrome

S. No.	EPA	Competency Domains							Level of competency (Mile Stones)				MSF
		MK	PC	PBLI	P	ISC	SBP	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year		
General													
1	Gathering a history and performing a physical examination	*	*	*	*	*	*	*	2	3	4	5	S,I,PG,I
2	Prioritizing a differential diagnosis following a clinical encounter	*		*		*		1	2	4	5	S,PG,I	
3	Recommending and interpreting common diagnostic and screening tests	*	*	*	*	*	*	1	2	3	4	S,I	
4	Entering and discussing orders and prescriptions and giving the necessary instruction to the patients	*	*	*	*	*	*	1	2	3	4	S,PPG,I	
5	Documenting a clinical encounter in the patient record	*	*		*			2	2	3	4	S,PG,I	
6	Provide an oral presentation of a clinical encounter	*		*		*		1	2	3	4	S,PG,I	
7	Form clinical questions and retrieve evidence to advance patient care	*		*				1	2	3	4	S,I	
8	Give or receive a patient handover to transition care responsibility	*	*		*	*	*	1	2	3	4	S,PG,H,I	
9	Collaborate as a member of an interprofessional team	*		*	*	*	*	1	2	3	4	S,PG,H,P,I	
10	Recognize a patient requiring urgent or emergency care and initiate evaluation and management	*	*	*	*	*	*	1	2	3	4	S,P,PG,P,I	
11	Obtain informed consent for tests and/or procedure	*	*	*	*	*	*	1	2	3	4	S,PPG	
12	Perform a general procedure of a physician	*	*	*	*	*	*	1	2	3	4	S,PG,I	

S. No.	EPA	Competency Domains							Level of competency (Mile Stones)				MSF
		MK	PC	PBLI	P	ISC	SBP	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year		
13	Identify system failure and contribute to a culture of safety and improvement	*	*	*	*	*	*	1	2	3	4	S, P, G, I	
14	Interpretation of data and Test results	*	*	*				1	2	3	4	S, P, G, I	
15	Providing Pre, Per and Postoperative Care	*	*	*		*	*	1	2	3	4	S, P, P, G, H, I	
16	Securing an IV line	*	*	*				1	2	3	4	S, P, P, G, I	
17	Female catheterization	*	*	*				1	2	3	4	S, P, P, G, I	
18	General examination	*	*	*				1	2	3	4	S, P, P, G, I	
OBSTETRICS													
19	Counselling for VBAC / TOLAC	*	*		*	*	*	1	2	3	4	S, P, P, G, I	
20	Performing Obstetric palpation	*	*	*		*	*	1	2	3	4	S, P, P, G, UG, H, I	
21	Diagnosis of labour pain	*	*	*				1	2	3	4	S, PG,	
22	Performing Common Obstetrics Procedure (Normal delivery, Episiotomy repair, Repair of Episiotomy, I & II degree Perineal tear)	*	*	*				1	2	3	4	S, P, P, G, UG, H, I	
23	Performing Complicated obstetrics procedures (Repair of III degrees Perineal tear, Complete perineal tear, Assisted breech delivery, External cephalic version, Instrumental delivery, Caesarean Section, MROP, Shoulder Dystocia)	*	*	*			*	1	2	3	4	S, P, G, H, I	
24	Performing Cerclage operation	*	*	*				1	2	3	4	S, P, G, H, I	
25	Managing a case of PPH	*	*	*			*	1	2	3	4	S, P, G, H, I	

S. No.	EPA	Competency Domains						Level of competency (Mile Stones)				MSF
		MK	PC	PBLI	P	ISC	SBP	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year	
GYNAECOLOGY												
26	Performing Common Minor Gynaecological Procedure (Speculum, Bimanual and Rectal Examination, Obtaining Pap Smear;VIA,VILI, Cervical Biopsy, Colposcopy, Paracentesis, Colposcopy, D&C, FC, Polypectomy)	*	*	*	*	*		1	2	3	4	S,PG,H,UG
27	Performing Common Major Procedures(Opening and Closure of abdomen, Abdominal Hysterectomy, Vaginal hysterectomy, Ward Mayo's operation, Fothergill's operation, Sling operation for Pelvic Organ Prolapse)	*	*	*	*	*		1	2	3	4	S,PG,H
28	Performing Complex Surgery (Staging laparotomy, Radical hysterectomy, Tuboplasty, Vaginoplasty, Diagnostic and Operative Endoscopic procedures)	❖	❖			❖		1	1	2	2	S
FAMILY PLANNING												
29	Counselling for (Contraception &MTP)	❖	*		*	*		1	2	3	4	S,PI
30	Insertion of Cu-T/LNG-IUD	*	*	*		*		1	2	3	4	S,PG,H
31	Performing Minor family planning procedures (Suction & evacuation, Dilatation & Evacuation)	*	*	*		*		1	2	3	4	S,PG,H
32	Performing Sterilization (puerperal, interval, concurrent, laparoscopic)	*	*	*		*		1	2	3	4	S,PG,H

Entrustable Professional Activities (Epa) :

Competency Domains:	Levels of competence:	Multisource feedback (MSF):
MK: Medical Knowledge	Level 1: Knowledge only; can observe	Supervisor: S
PC: Patient Care		Patients/Relatives: P
PBLI: Problem Based Learning and Improvement	Level 2: Can do under strict supervision	Undergraduate students: UG
SBP: Systems-Based Practice	Level 3: Can do under loose supervision	Peers: PG
P: Professionalism	Level 4: Can do independently	Community: C
ICS: Interpersonal and Communication Skills	Level 5: Has the expertise to teach others	Other health professionals: H
		Self: I



OPHTHALMOLOGY

MS in Ophthalmology

COURSE NAME

MS in Ophthalmology

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

OBJECTIVES

1. BROAD OBJECTIVE

The Clinical postgraduate training programmes are intended at developing in a student a blend of qualities of a clinical specialist, a teacher and a researcher. They are organised such that a postgraduate should acquire adequate knowledge and skills to handle all ocular cases.

Basic Sciences

He/she should possess basic knowledge of the structure, function and development of the human body, and the pathophysiology of certain systemic diseases which affect the vision.

Clinical Knowledge

He/she should be able to practice and handle most day to day problems independently in ophthalmology.

He/she should understand the effect of the environment on health and be familiar with the epidemiology of at least the more common diseases in the field of ophthalmology.

He/she should be able to integrate the preventive and promotive methods with the curative and rehabilitative measures in the treatment of disease.

Community Ophthalmology

He/she should practice ophthalmology at the doorstep of community. He should be familiar with common eye problems occurring in rural areas and

be able to deal with them effectively. He should also be made aware of mobile ophthalmic Unit and its working & components.

Current Developments

He/she should be familiar with the current development and recent advances in Ophthalmic Sciences.

Teaching

He/she should be able to plan educational programmes in ophthalmology in association with his senior colleagues and be familiar with the modern methods of teaching and evaluation.

Research

He/she should be able to identify a problem for research of a clinical or experimental nature involving epidemiological studies, clearly state his objectives, plan a rational approach to its solution and execute it and critically evaluate his data in the light of existing knowledge.

2. INTERMEDIATE OBJECTIVES

The following overall objectives are expected to be achieved by the end of 3 years of instructions and residential training programme. The details are listed subject and clinical assignment wise. At the end of this training programme the students should be able to:

Basic Medical Sciences

- Attain understanding of the structure and function of the eye and the diseases associated with it.
- Attain understanding and application of knowledge of the structure and function of the parts of Central Nervous System and other parts of the body which influence of control the structure and function of the eye.
- Attain an understanding of and develop competence in executing common general laboratory procedures employed in diagnosis and research in ophthalmology.

Clinical Skills

- Acquire a scientific and rational approach to the diagnosis of ophthalmic cases presented.
- Acquire an understanding of and develop inquisitiveness to investigate, to establish cause and effect of the disease.
- To perform all routine and special ophthalmic investigations
(e.g. Slit-lamp examination, Gonioscopy, Ophthalmoscopy, perimetry, scotometry, intraocular pressure measurement by applanation tonometer, ERG, EOG, EMG, etc., Dark adaptometry, Darkroom procedures, Funds photography, Fluorescein angiography, Hess & Less screen, Synoptophore) and other procedures, of these investigations in the light of clinical presentation.
- To manage and treat all types of ophthalmic cases.
- Acquire competence in assessment of refractive errors (Static and dynamic) and prescription of glasses for all types of refraction problem.
- Acquire basic knowledge of manufacture and fittings of glass and competence of judging the accuracy and defects of the dispensed glasses.
- To demonstrate the knowledge of the pharmacological (including toxic) aspects of drugs used in ophthalmic practice and drug commonly used in general diseases affecting the eyes.
- To exhibit competence in the medical management of ophthalmic cases.
- To have knowledge on all routine surgical procedures on lens, glaucoma, lid, sac, adnexa, retina and muscle anomalies.
- To competently handle all ophthalmic medical and surgical emergencies.
- To be familiar with micro-surgery and special surgical techniques.
- Ophthalmic Specialists: Given an opportunity to work on a rotational basis in various especial clinics of Sub-specialties of ophthalmology.
- Community Ophthalmology :

- Given an opportunity to participate in surveys, eye camps and rehabilitation work.

- The students should be able to:

- Organize and conduct ocular examinations in rural, urban and industrial communities and in specialized groups of the population.
- Organize and conduct comprehensive eye camps covering promotive, rehabilitative and curative aspects of ophthalmic problems.
- Guide rehabilitation workers in the organization and training of the blinds.
- Write at least one scientific paper as expected of International Standards from the material of his thesis.

SYLLABUS CONTENT

THEORY

These are only broad guidelines and are illustrative, there may be overlap between sections.

1. Basic Sciences:

- Orbital and ocular anatomy
 - i. Gross anatomy
 - ii. Histology
 - iii. Embryology
- Ocular Physiology
- Ocular Pathology
- Ocular Biochemistry: General biochemistry, biochemistry applicable to the ocular function
- Ocular Microbiology: General Microbiology, specific microbiology applicable to the eye
- Immunology with particular reference to ocular immunology
- Genetics in ophthalmology
- Community Eye Health

2. Optics

- Basic physics of optics
- Applied ophthalmic optics
- Applied optics including optical devices
- Disorders of Refraction

3. Clinical Ophthalmology

- Disorders of the lids
- Disorders of the lacrimal system
- Disorders of the Conjunctiva
- Disorders of the Sclera
- Disorders of the Cornea
- Disorders of the Uveal Tract
- Disorders of the Lens
- Disorders of the Retina
- Disorders of the Optic Nerve and Visual Pathway
- Disorders of the orbit
- Glaucoma
- Neuro-ophthalmology
- Paediatric ophthalmology
- Ocular involvement in systemic disease
- Immune ocular disorders
- Strabismus and Amblyopia
- Ocular oncology

PRACTICAL

Essential diagnostic skills: (MUST KNOW)

1. Examination techniques along with interpretation

- Slit-lamp Examination i. Diffuse examination ii. Focal examination iii. Retroillumination – direct and indirect iv. Sclerotic scatter v. Specular reflection vi. Staining modalities and interpretation
- Fundus evaluation Direct/Indirect ophthalmoscopy• Fundus drawing• 3-mirror examination of the fundus• 78-D/90-D/60-D examination•Amsler’s charting•

2. Basic investigations along with their interpretation

- Tonometry - Applanation/Indentation/Non-contact
- Gonioscopy -Gonioscopy grading of the anterior chamber angle
- Tear/ Lacrimal function tests
 - i. Staining- fluorescein and Rose Bengal
 - ii. Schirmer test/tear film break up time
 - iii. Syringing
 - iv. Dacrocystography
- Corneal
Corneal scraping and cauterization
 - i. Smear preparation and interpretation (Gram’s stain /KOH)
 - ii. Media inoculation
 - iii. Keratometry - performance and interpretation
 - iv. Pachymetry
 - v. Corneal topography

3. The postgraduate must be well versed with the following investigative modalities although the student may or may not perform it individually. But, she/he should be able to interpret results of the following tests:

- Fundus photography
- Fluorescein angiography
- Ophthalmic ultrasound A-scan/B scan
- Automated perimetry for glaucoma and neurological lesions
- Radiological tests –
X rays - Anteroposterior/ Lateral view
PNS (Water’s view) / Optic canal views
The localisation of intra-ocular and intra-orbital FBs
Interpretations of -USG/ CT/ MRI Scans
- OCT and UBM
- ERG, EOG, and VEP

Surgical Skills(Must have performed)

1. Lids

- Entropion
- Ectropion (uncomplicated)
- Lid repair
- Electrolysis
- Tarsorrhaphy
- Chalazion

2. Sac

- Dacryocystectomy
- Dacryocystorhinostomy

3. Muscle- Recession/Resection

4. Conjunctiva

- cyst removal
- pterygium
- Paracentesis

5. Cataract- ECCE, SICS and Phacoemulsification

6. Glaucoma

- Yag laser Iridotomies
- Trabeculectomy
- Cyclodestructive procedures
- Optical iridectomy

7. Intravitreal injections

8. Peritomy

9. Repair of wounds

TEACHING AND LEARNING METHODS

The residents will be imparted training in teaching in several ways.

- Group Discussions -The residents are divided into small groups. Each group is composed of a resident from each semester.
- Symposia -The residents present the Symposium to the group where it is fully discussed. A free and fair discussion is encouraged. These discussions enable the residents to prepare for a general discussion in the class.

- Journal Clubs- The resident to whom the journal is allotted present the journal summaries (as cyclostyled and distributed) to the group where each article is fully discussed. These discussions enable the residents to prepare for a general discussion in the class.
- Case discussion conference- The residents present the case allotted to the group and discuss the case in the group and in the class.

Teaching Methodology:

The theoretical knowledge is imparted to the postgraduate student through distinct courses of lecture-demonstrations, seminars, symposia and inter- and intradepartmental meetings. The students are exposed to recent advances through discussions in journal clubs and participation in CMEs, and symposia. The postgraduate students are imparted clinical training in several ways: such as case discussion, demonstration and lectures.

Maintenance of **log book**: Logbooks shall be checked and assessed periodically by the faculty members imparting the training.

LIST OF THE SYMPOSIA AND SEMINARS

SECTION-I- RETINA and UVEA

1. a) Anatomy and Physiology of Retina.
b) Anatomy and Physiology of Vitreous.
2. Retinal detachment surgery
3. Endophthalmitis
4. Vitreous Substitutes
5. Lasers & posterior segment diseases.
6. Fluorescein Angiography.
7. Hypertensive Retinopathy
8. Diabetic Retinopathy
9. Retinal Degeneration

UVEA

1. Anterior Uveitis
2. Posterior Uveitis
3. Posterior Segment Trauma
4. Intraocular foreign bodies.

SECTION-II -CORNEA and CONJUNCTIVA

1. Anatomy and physiology of Cornea
2. Donor Corneal Tissue
3. Penetrating Keratoplasty
4. Corneal Graft Rejection
5. Conjunctivitis
6. Tear Film-Abnormalities and Management
7. Dry Eye & Keratomalacia
8. Bacterial Keratitis and Fungal Keratitis

SECTION-III-CATARACT

1. Cataract (a) Anatomy & Embryology (b) Physio Pathology. (c) Pathogenesis of age-related cataract.
2. Congenital Cataract
3. Traumatic Cataract
4. IOLS (a) History, Physical and Chemical Properties & Types (b) Techniques of IOL Implantation. (c) Complications related to IOL
5. Phacoemulsification Surgery
6. Contact Lens and Low vision aids
7. Refractive Errors

SECTION-IV-GLAUCOMA

1. Diagnosis of Glaucoma
2. Basics of Perimetry
3. Medical management of glaucoma

SECTION-V- Pediatric Ophthalmology, Strabismus and Oculoplasty

1. Pediatric Ophthalmology
2. Neurophthalmology: Papilloedema
3. Oculoplasty: Ptosis evaluation and management
4. Strabismus: Convergence insufficiency & intermittent divergent squint (c) Secondary deviations. 13. A-V Patterns (a) Etiology, classification (b) Clinical features, investigations (c) Management 14. Special forms of strabismus (a) Duane's retraction syndrome (b) Other restrictive squints (c) Myasthenia and Myopathies
5. Orbital Fractures

DEPARTMENTAL TRAINING SCHEDULE & POSTING OF RESIDENTS

Courses

The training programmes in the Centre are divided into theoretical, clinical and practical into all aspects of the delivery of the Ophthalmic medical and health care.

They provide training in the methodology of research and teaching. At the end of the prescribed period the students may submit a thesis on a research problem.

THEORETICAL

The theoretical knowledge is imparted to the candidate through distinct courses of lecture-demonstration and symposia. The students are exposed to recent advances through discussions in journal clubs Symposia

DIDACTIC TEACHING IN CLINICAL APPLIED BASIS AND PARA-CLINICAL SCIENCES

1. Knowledge in applied, basic and para-clinical and clinical science is imparted by the member of the staff of the Centre in respective disciplines or by clinicians themselves by conducting didactic courses-(Lecture & Demonstration)
2. Symposia: In each section which has two or more specialities the residents of 3rd and 4th semester are exposed to 14 symposia in each speciality over a 1 year period to cover the entire speciality.
3. Journal Clubs -Journals are reviewed in a particular speciality covering all articles in that subject over a 6 months period and 10 major articles presented and discussed by the resident. About 2 journal reviews per section are done every 3 months. 1) Aim 2) Methods 3) Observations 4) Discussions and 5) Conclusions

CLINICAL OPHTHALMOLOGY

For the purpose of clinical training, the Centre is divided into clinical sections, Proportionate number of residents are attached to each section.

The training is given in wards out-patient department, speciality clinics and operation theatres. Each Resident shall rotated through all the clinical sections & work in each section for proportionate period of his/her stay in the Centre.

1. Out-Patients

For the first six months of the training programme Residents are attached to a faculty member to be able to pick up methods of history taking and ocular examination in ophthalmic practice. After 6 months, the clinical resident is allotted a cubicle, where he receives new and old cases including refractions and prescribes for them. The residents are attached to a Senior Resident and faculty member whom they can consult in case of difficulty.

2. Wards

Each resident is allotted 3 to 5 beds in the in-patient sections of the Centre. The beds of each resident are approximately divided into two halves-general ophthalmic cases and speciality cases. The whole concept is to provide the resident increasing opportunity to work increasing responsibility according to seniority. A detailed history and case record is to be maintained by the resident and he is made familiar with coding and punch card system the Centre.

3. Speciality Clinics

The residents are provided with an opportunity to work in speciality clinics of the section he is working in at the time of his postings. The resident is provided with an opportunity to learn by actuality doing all investigative procedures, methods of diagnosis and principles of management of cases in the clinics. These clinics also provide him with an opportunity of learning and sifting proper referrals, fellow up cases over a long period and evaluate results.

4. Operations

The resident is provided with an opportunity to perform operations both extra-ocular & Intraocular with the assistance of the Senior Residents and/or under the direct supervision of a faculty member. He is provided with an opportunity to learn special and complicated

operations by assisting the Senior Resident or the Senior Surgeon in operations of cases of the speciality and be responsible for the post-operative care of these cases besides their earlier work up & pre-operative preparations.

A phased programme is gone through.

In the first phase, the resident is given training in regional anaesthetic block preparations of cases for operation and premeditation.

In the next phase, the resident assists the operating surgeon operates independently assisted by the senior resident or faculty member. He is required to be proficient in some operation and show familiarity with others. Some of the operative procedures are learnt by the residents by practising the same on artificial eyeballs or Goat's eye.

5. Case Discussions

Detailed ward rounds are conducted by each section where the work if the residents are scrutinized and cases are discussed. Case discussions are also held in the O.P.D. and the speciality clinics. Besides the above, a special case conference is held once a week. One case from each section is selected for discussion which is worked up discussed in the group and then presented in the case conference where the faculty of the Centre, resident, discuss the problem of diagnosis and management.

CAMPS

Eye camps are conducted where residents are posted for imparting training to the clinical residents according to a set methodology. The community and school surveys are conducted by residents.

RESEARCH

The methodology of research is given in the initial phase of training.

ASSESSMENT

The evaluation of the candidates at the end of the course may be under the following headings:

1. The resident shall be required to demonstrate comprehension of basic knowledge of the subject by being able to answer essay type or multiple choice type question in four papers of 3 hours each to the satisfaction of the board of examiners.
2. That the resident shall be evaluated in all fields of the instruction areas of work and demonstrate skills to elicit history, examine, diagnose and treat (medically or surgically or both) cases in the outpatient department and admitted cases including the relevance of investigative procedures in the case under discussion. The residents will be required to see and interpret X-ray charts and laboratory reports of special investigations pertaining to these case.
3. The resident may be required to demonstrate the use of appliances and specialized diagnostic techniques including their utility and limitations.
4. The resident will be required to report on specimens and slides of Pathology and give a pathological diagnosis from the clinicians understanding given relevant clinical data and history.
5. The resident will be required to answer oral questions on any aspect of the Specialty.
6. The evaluation shall be done by a board of examiners for adequate time. The number of days on which examinations to be conducted in 3 days.
7. The external examiners may be invited to deliver extension lectures and participate in a discussion on those delivered by other during their stay as examiners so that the faculty and students of this Centre can derive the advantage of their scientific knowledge and expertise.

RESIDENTS FORMAL ASSESSMENT FORM

1. Credibility & Reliability (3)
2. Punctuality & Regularity (3)
3. Ability to get along with peers (3)
4. Inter-personal relationship (3)

5. Humane & compassionate behaviour with patients & their families. Concern for the welfare of the patients & social obligations to the community (3)

Total = 15 marks.

Examination on Research Methodology & Biostatistics

Timing: End of 2nd Semester

Total marks: 100

Will be considered as an internal examination

Candidate should pass to appear in Final examination

No marks will be added to final/summative examination

Will be conducted by Examination Cell in the month of June & December

INTERNAL EXAMINATIONS

Timeline: End of the 3rd, 4th and 5th semester, pre-final (2 months before final examination).

Marks distribution: Theory 100 marks, and practical with viva and logbook will carry 100 marks (Practical – 70, viva – 20, logbook – 10).

The marks of the 4 internal examinations will be averaged to 100 each for theory and practical.

General Principles

Internal Assessment should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills. The Internal Assessment should be conducted in theory and clinical examination.

Quarterly assessment during the MD training should be based on the following educational activities:

1. Journal based / recent advances learning
2. Patient-based /Laboratory or Skill-based learning
3. Self-directed learning and teaching
4. Departmental and interdepartmental learning activity

5. External and Outreach Activities / CMEs

SUMMATIVE ASSESSMENT

The Post Graduate examination shall be in three parts:

1. Thesis:

Every postgraduate student shall carry out work on an assigned research project under the guidance of a recognised postgraduate teacher, the result of which shall be written in form of a thesis.

2. Theory Examination

The examinations shall be organised on the basis of 'Marking system' to evaluate and to certify postgraduate student's level of knowledge, skill and competence at the end of the training. Obtaining a minimum of 50% marks in 'Theory' as well as 'Practical' separately shall be mandatory for passing examination as a whole. The examination for M.D./ MS shall be held at the end of 3rd academic year.

There shall be four theory papers.

Paper I: Basic Sciences related to Ophthalmology, Refraction & Optics

Paper II: Clinical Ophthalmology

Paper III: Systemic Diseases in Relation to Ophthalmology

Paper IV: Recent Advances in Ophthalmology and Community Ophthalmology

Summative/Final Examinations:

Theory question paper format:

One Long question – 20 marks

Eight Short question/notes – 10 x 8 = 80 marks

Total marks in theory: 500 marks

- 4 papers in the final examination – 400 marks
- Average of 4 internal examination – 100 marks

3. Practical examination

- Practical examination: Total marks: 500 (Practical and viva in the final examination – 400 marks and an average of 4 internals- 100 marks).
- The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A* 200 marks	Longcase (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/ Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

* Students should pass (secure 50% marks) separately in Part A

Total Marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

RECOMMENDED BOOKS

1. Abrams D, Duke-Elder S. Duke-Elder's practice of refraction: Churchill Livingstone; 1993.
2. Agarwal A. Refractive Surgery Nightmares: Conquering Refractive Surgery Catastrophes: SLACK; 2007.
3. Albert DM. Principles and Practice of Ophthalmology: Basic Sciences: W.B. Saunders Company; 1994.
4. Alio JL, Azar DT. Management of Complications in Refractive Surgery: Springer International Publishing; 2018.
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6. Bartlett JD. Clinical Ocular Pharmacology: Elsevier Science; 2013.
7. Byrne SF, Green RL. Ultrasound of the Eye and Orbit: Jaypee Brothers, Medical Publishers Pvt. Limited; 2010.
8. Char DH. Thyroid Eye Disease: Butterworth-Heinemann; 1997.
9. Collin JRO. A Manual of Systematic Eyelid Surgery: Elsevier Health Sciences; 2006.
10. Coster D. Cornea: Fundamentals of Clinical Ophthalmology Series: Wiley; 2001.
11. Cummings TJ. Ophthalmic Pathology: A Concise Guide: Springer Customer Service Center GmbH; 2016.
12. Easty DL, Sparrow JM. Oxford Textbook of Ophthalmology: sections 1-2.10: Oxford University Press; 1999.
13. Forrester JV, Dick A, McMenamin PG, Lee WR. The Eye: Basic Sciences in Practice: W.B. Saunders; 2002.
14. Gass JDM. Stereoscopic Atlas of Macular Diseases: Diagnosis and Treatment: Mosby; 1997.
15. Gimbel HV, Penno EEA. LASIK Complications: Prevention and Management: SLACK; 2000.
16. Glaser JS. Neuro-ophthalmology: Lippincott Williams & Wilkins; 1999.
17. Helveston EM. Surgical management of strabismus: an atlas of strabismus surgery: Mosby; 1993.
18. Holladay JT. Quality of Vision: Essential Optics for the Cataract and Refractive Surgeon: SLACK; 2007.
19. Hoyt CS, Taylor D. Pediatric Ophthalmology and Strabismus: Elsevier Health Sciences; 2012.
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24. Mauger TF, Craig EL. Havener's Ocular Pharmacology: Mosby; 1994.
 25. Nema H, Nema N. Gems of Ophthalmology: Diseases of Uvea: Jaypee Brothers, Medical Publishers Pvt. Limited; 2018.
 26. Ophthalmology AAO, Ingraham HJ, Staff AAO, Ophthalmology EBo, Berlin AJ, Di Lorenzo AL, et al. 2018-2019 BCSC Basic and Clinical Science Course: American Academy of Ophthalmology; 2018.
 27. Peyman GA, Sanders DR, Goldberg MF. Principles and practice of ophthalmology: Saunders; 1980.
 28. Pratt-Johnson JA, Tillson G. Management of Strabismus and Amblyopia: A Practical Guide: Thieme; 2001.
 29. Probst LE, Tsai JH, Goodman G. Ophthalmology: Clinical and Surgical Principles: Slack; 2012.
 30. Rootman J. Diseases of the Orbit: A Multidisciplinary Approach: Lippincott Williams & Wilkins; 2003.
 31. Ryan SJ, Schachat AP, Wilkinson CP, Hinton DR, Wiedemann P, Sadda SVR. Retina: Elsevier Health Sciences; 2012.
 32. Shields JA, Shields CL. Eyelid, Conjunctival, and Orbital Tumors: An Atlas and Textbook: Wolters Kluwer Health; 2015.
 33. Shields JA, Shields CL. Intraocular Tumors: An Atlas and Textbook: Wolters Kluwer Health; 2015.
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 41. Wright KW, Hengst TC, Gilbert S, Spiegel PH, Cogswell F, Thompson L. Handbook of Pediatric Eye and Systemic Disease: Springer New York; 2007.
 42. Yanoff M, Duker JS, Augsburger JJ. Ophthalmology: Mosby Elsevier; 2009.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the inheritance pattern and clinical features of stromal dystrophies of the cornea? Discuss the principles and techniques of keratoplasty in these conditions? (20)
2. Describe AV pattern deviations. Discuss aetiology, Clinical features and management of these deviations. (10)
3. Define Astigmatism with diagrams. (10)
4. Describe the common agents and techniques for local anaesthesia for cataract surgery and their potential complications. (10)
5. Discuss the role of anti-metabolites and immunosuppressive drugs in Ophthalmology. (10)
6. How do you classify giant retinal breaks? Describe its aetiology, pre-operative evaluation and principles of management. (10)
7. Describe the aetiology, signs symptoms and treatment of trachoma. What is SAFE strategy? (10)
8. Discuss on Congenital nasolacrimal duct obstruction. (10)
9. Enumerate the complications of LASIK surgery in a myope of -8 D spherical in both eyes. (10)

PAPER 2

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Discuss the pathology, clinical features and management of pseudoexfoliation syndrome. (20)
2. Write a short note on (10)
 - a) Etiopathogenesis, clinical features and management of Sturge weber syndrome
 - b) Types of Macular Function tests done for diagnosis of macular diseases.
3. What are the causes of posterior capsular rupture and how you will manage it in a phacoemulsification surgery? (10)
4. Describe etiopathogenesis, clinical features, prevention and management of keratomalacia. (10)
5. Give clinical picture, complications and management of fungal corneal ulcer. (10)
6. Write down the clinical picture and management of congenital glaucoma. (10)
7. What are the causes, differential diagnosis and clinical implications of anisocoria? (10)
8. Intraocular drug implants – principle, types, uses, disadvantages. (10)
9. Define and classify Diabetic macular oedema. Management of diffuse diabetic macular oedema with visual acuity less than 6/60 in both eyes. (10)

PAPER 3

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. a) What is the Principle of Indirect Ophthalmology (IO)?
b) What are the Various Lenses used for doing IO and what are their advantages and disadvantages?
c) Describe the Lenses used for viewing the central retina on a slit lamp biomicroscope. (20)
2. Clinical features and management of thyroid ophthalmopathy. (10)
3. Definition, causes, pathogenesis and classification of amblyopia. (10)
4. What is Retinopathy of prematurity (ROP)? What are the criteria for screening of a case of retinopathy of prematurity? (10)
5. What are femtosecond LASERS? What are the current indications of femtosecond LASER in corneal refractive surgery? What is opaque bubble LASER? (10)
6. Discuss the clinical features, diagnosis and management of acanthamoeba keratitis? (10)
7. Discuss the differential diagnosis of unilateral optic disc oedema. How will you differentiate each condition? (10)
8. Discuss the role of genetics in Ophthalmology? (10)
9. What is Botulinum toxin? Discuss its use in the management of various ocular diseases. (10)

PAPER 4

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. What is refractive surgery? What are the commonly used phakic IOL in refractive surgery? What material are they made of? What are the indications and contraindications of these lenses? What are the complications that can occur? (3+3+2+8+4)
2. Discuss on rehabilitation of a blind person. (10)
3. Discuss the recent advances in amblyopia therapy. (10)
4. Describe the advantages and disadvantages of Stent Surgery in Glaucoma. (10)
5. Discuss the recent surgical management for Keratoconus. (10)
6. Discuss the recent treatment modalities for diabetic macular oedema. (10)
7. What are Light adjustable Intraocular lenses used in cataract surgery. (10)
8. Discuss small incision lenticule extraction (SMILE) procedure for myopia. (10)
9. Describe the recent classification for Dry eye syndrome. (10)

YEAR-WISE ENTRUSTABLE PROFESSIONAL ACTIVITIES (EPA)

S. No.	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of residency	End of 1st year	End of 2nd year	End of 3rd year	
1	Take a history and perform a physical examination	❖	❖	❖	❖			1	2	4	4	P, PG,S
2	Prioritize a differential diagnosis following a clinical encounter.	❖		❖	❖			1	2	3	3	S
3	Recommend and interpret common diagnostic and screening tests	❖		❖	❖			1	2	3	3	P,S
4	Enter and discuss orders and prescriptions	❖		❖	❖			1	2	3	3	S
5	Document a clinical encounter in the patient record.	❖		❖	❖			2	3	4	4	PG,P
6	Provide an oral presentation of a clinical encounter.	❖		❖	❖			2	3	4	5	PG
7	Form clinical questions and retrieve evidence to advance patient care.	❖	❖	❖	❖			2	2	4	4	S
8	Give or receive a patient handover to transition care responsibility	❖	❖	❖	❖			2	3	5	5	S,PG
9	Collaborate as a member of an interprofessional team.	❖		❖	❖			3	4	5	5	PG
10	Recognize a patient requiring urgent or emergent care and initiate evaluation and management	❖	❖	❖	❖			2	3	4	5	PG
11	Obtain informed consent for tests and / or procedures.	❖	❖	❖	❖			2	3	4	4	S, PG
12	Perform general procedures of a physician	❖	❖	❖	❖			2	4	4	5	PG,S
13	Identify system failures and contribute to a culture of safety and improvement.	❖		❖	❖			1	2	4	4	S
14	Vision testing /Refraction	❖		❖	❖			1	2	3	4	S,PPG

S. No.	EPA	Competency Domains							Level of competency					MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of residency	End of 1st year	End of 2nd year	End of 3rd year			
15	External Examination of the Eye	❖	❖	❖	❖			2	3	4	4	4	S,P,PG	
16	Ocular motility testing	❖		❖	❖			2	3	4	4	4	S,P,PG,H	
17	Pupil testing	❖	❖	❖	❖			1	2	4	4	5	S,P,PG,H	
18	• Slit lamp examination (Anterior segment)	❖	❖	❖	❖			0	2	4	4	5	S,P,PG,H	
	• Posterior Segment	❖	❖	❖	❖			0	2	4	4	5		
19	Measuring IOP Non Contact Tonometry(NCT) & Applanation Tonometry	❖	❖	❖	❖			1	3	4	4	5	S,P,PG,H	
20	Direct Ophthalmoscopy (Undilated)	❖	❖	❖	❖			1	3	4	4	5	S,P,PG,H	
21	Direct Ophthalmoscopy (dilated)	❖	❖	❖	❖			1	3	4	4	5	S,P,PG,H	
22	Indirect ophthalmoscopy(IO)	❖	❖	❖	❖			0	3	4	4	4	S,P,PG,H	
23	NLD Syringing	❖	❖	❖	❖			1	3	4	4	5	P,S	
24	Chalazion (I& C)	❖	❖	❖	❖	❖	❖	1	3	4	4	5	S,P,PG,H	
25	writing informed consent(MSF)		❖	❖	❖	❖	❖	0	1	3	3	5	S,,PG,H	
26	Perimetry methods & Interpretation	❖	❖	❖	❖			1	2	4	4	4	S,P	
27	Fundus Fluorescein Angiography	❖			❖			1	2	3	3	4	S, P	
28	Optical Coherence Tomography	❖			❖			0	1	3	3	4	S,P	
29	CT & MRI	❖		❖	❖			1	1	3	3	3	S,P	

S. No.	EPA	Competency Domains						Level of competency				MSF	
		MK	PC	PBLI	SBP	P	ICS	Day 1 of residency	End of 1st year	End of 2nd year	End of 3rd year		
30	Cataract surgery (steps)												
	1. Conventional ECCE	❖	❖	❖	❖	❖		1	2	3	4		
	2. SICS	❖	❖	❖	❖	❖		1	2	3	4		S,P,PG,H
	3. Phacoemulsification	❖	❖	❖	❖	❖		1	1	2	2		
31	Lid tear repair	❖	❖	❖	❖	❖		0	1	3	4		S,P,PG,H
32	Pterygium Surgery	❖	❖	❖	❖	❖		1	2	4	4		S,P,PG,H
33	Occulo Plastic & Lid Surgeries	❖	❖	❖	❖	❖		0	1	2	2		S,P,PG,H
34	Dry eye Diagnosis & Management	❖	❖	❖	❖	❖		0	1	3	4		S,P,PG,H
35	Repair of Open globe injuries	❖	❖	❖	❖	❖		0	1	2	3		s
36	Lacrimal sac surgeries	❖	❖	❖	❖	❖		1	1	2	4		s
37	Subspecialty surgeries - Vitreo-retinal, glaucoma Sx, keratoplasty, squint Sx	❖	❖		❖			0	1	1	1		S
38	Teaching Undergraduates	❖	❖		❖			0	2	4	4		s
39	Cadaver Enucleation	❖	❖		❖			1	3	4	5		s

Competency Domains:

MK: Medical Knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I



ORTHODONTICS

MDS in Orthodontics

COURSE NAME

MDS in Orthodontics

DURATION OF COURSE

3 years

ELIGIBILITY

BDS

GENERAL INSTRUCTIONS FOR STUDENTS

- Students are expected to be very punctual. They must reach the department before the start of working hours and they are expected to work beyond working hours.
- Students are expected to wear the dresses as per the dress code of AIIMS, Bhubaneswar.
- Students are expected to update themselves with an in-depth knowledge of undergraduate orthodontic syllabus by the end of the first month of preclinical duty.
- No leave will be granted without prior permission by Head of the Department.
- The preclinical curriculum is expected to be completed as per the scheduled dates.
- The students are instructed to possess all the instruments as prescribed in the list.
- Theoretical knowledge of the materials used for the respective preclinical exercises and a write up is expected before the student begins any exercise.
- Each wire bending exercise should be first approved by the senior resident. After completion of the preclinical exercises, the student should display the same to all the staff members and get final approval by the Guide.
- Students are expected to develop a sound theoretical background and operating skills for computer application and clinical photography.

- Students are expected to have basic information regarding the biostatics, research methodology and various statistical analysis.
- Before entering to clinics, the students are expected to have a thorough knowledge and practical experience of cephalometric tracing, study model trimming and model analysis.
- Any default in maintaining the patient records will be taken seriously and the same case will be transferred to other residents immediately.
- Students are instructed to actively participate in conferences or PG student convention and present papers and they have to forward their dissertation for publication in any index national or international journals.
- Periodic evaluation of the students will be done in every six months.
- In case of any issue and problem, students are requested to contact to Head of the Department immediately without any hesitation.

OBJECTIVES

The training programme in orthodontics is to structure and achieve the following four objectives

1. Knowledge

- On the dynamic interaction of biologic processes and mechanical forces acting on the stomatognathic system during orthodontic treatment.
- The aetiology, pathophysiology, diagnosis and treatment planning of various common orthodontic problems.
- Various treatment modalities in orthodontics i.e. preventive, interceptive and corrective.
- Basic sciences are relevant to the practice of orthodontics.
- Interaction of social, cultural, economic, genetic and environmental factors and their relevance to the management of orofacial deformities.

-
- Factors affecting the long-term stability of orthodontic corrections and their managements.
 - Personal hygiene and infection control, prevention of cross-infection and safe disposal of hospital waste, keeping in view the high prevalence of Hepatitis and HIV and other highly contagious diseases.
 - Concurrent clinical training – each student will be required to undergo compulsory concurrent clinical training for this purpose in Pediatric Surgery, Plastic Surgery, Otolaryngology and Radio-diagnosis.
 - Willingness to adopt, after a critical assessment, new methods and techniques of orthodontic management developed from time to time based on scientific research, which is in the best interest of the patient.
 - Respect the patient’s rights and privileges, including a patient’s right to information and the right to seek a second opinion.
 - Develop an attitude to seek an opinion from allied medical and dental specialists as and when required.

2. Skills

- To be competent enough in general dentistry including teeth extraction, various minor-surgical procedures and emergency management.
- To obtain proper clinical history, methodical examination of the patient, perform essential diagnostic procedures, and interpret them and arrive at a reasonable diagnosis about the dentofacial deformities.
- To be competent to fabricate and manage the most appropriate appliance – intra or extra oral, removable or fixed, mechanical or functional, and active or passive – for the treatment of any orthodontic problem to be treated singly or as a part of multidisciplinary treatment of oro-facial deformities.

3. Attitudes

- Develop an attitude to adopt ethical principles in all aspects of orthodontic practice.
- Professional honesty and integrity are to be fostered.
- Treatment care of the highest standard has to be delivered irrespective of the social status, cast, creed or colleagues.
- Willingness to share knowledge and clinical experience with professional colleagues.

4. Communication Skills

- Develop adequate communication skills particularly with the patients giving them the various options available to manage a particular dentofacial problem and to obtain a true informed consent from them for the most appropriate treatment available at that point of time.
- Develop the ability to communicate with professional colleagues, in orthodontics or other specialities through various media like correspondence, internet, e-video, conference, etc. to render the best possible treatment.
- Training in the methodology of teaching – the postgraduate will attend the undergraduate BDS/MBBS classes to learn the methodology of teaching and they will be encouraged to teach the undergraduate students after preparing lectures and getting it corrected by a faculty members under whom he will work.

SYLLABUS CONTENT: THEORY AND PRACTICAL

The program outlined, addresses both the knowledge needed in orthodontics and allied medical specialities in its scope. A minimum of three years of formal training through a graded system of education as specified will equip the trainee with skill and knowledge at its completion to be able to practice basic orthodontics and have the ability to intelligently pursue further apprenticeship towards advanced orthodontics.

The spread of the Curriculum:

The whole curriculum is divided into six (06) semesters of 6-months each. First and 2nd semester includes the teaching of basic subjects including research methodology, basic biostatistics and completion of preclinical exercises. Third to 6th-semester cover all the relevant topics in orthodontics, clinical training involving treatment of patients and submission of thesis. During 3rd and 6th semester, the student shall be posted in various Dept. like Pediatric Surgery, Plastic Surgery, ENT, Pulmonary Medicine and Radio-diagnosis for training in different subjects.

Log-Book

Every resident is expected to maintain a logbook where he/she record his / her active participation in academic activities. He/she records the progress in the thesis work and also records all preclinical works and clinical cases carried out by him / her during the entire course in the logbook.

First Semester

A. Basic and Applied Anatomy

- Prenatal growth of Craniofacial region: Stages of embryonic development, the origin of the head, origin of face, origin of teeth.
- Postnatal growth of Craniofacial region: Bones of the skull, the oral cavity, development of chin, the hyoid bone, general growth of the head, face growth.
- Bone growth and biology: Origin of bone, the composition of bone, units of bone structure, schedule of ossification, mechanical properties of bone, the roentgen graphic appearance of bone.
- Assessment of growth and development: Growth prediction, growth spurts, the concept of normality and growth increments of growth, differential growth, the gradient of growth, methods of gathering growth data. Theories of growth and recent advances, factors affecting physical growth. Various methods of growth estimation, carpal bones, carpal x – rays, cervical vertebrae, frontal sinus and dental maturation.

- Muscles of mastication: Development of muscles, muscle change during growth, muscle function and facial development, muscle function and malocclusion
- Development of dentition and occlusion: Dental development periods, the order of tooth eruption, chronology of permanent tooth formation, periods of occlusal development, the pattern of occlusion, factor affecting development of normal occlusion.

B. Applied Physiology

- Endocrinology and its disorders: Pituitary gland hormones, thyroid gland hormones, parathyroid gland hormones, ACTH, Insulin and ILGF.
- Calcium and phosphate metabolism: Hormonal regulation and factors affecting their metabolism.
- Nutrition-metabolism and their disorders: proteins, carbohydrates, fats, vitamins and minerals.
- Muscle and nerve physiology: Types of muscles, muscle contraction, reflexes, EMG activity of oro-facial muscles.
- Craniofacial Biology: Cell adhesion molecules and mechanism of adhesion
- Bleeding disorders in orthodontics: Hemophilia, purpura etc.

C. Dental Materials

- Gypsum products: Dental plaster, dental stone and their properties, setting reaction etc.
- Impression materials: Impression materials in general and particularly of alginate impression material.
- Acrylics: Chemistry, composition physical properties.
- Composites: Composition types, properties setting reaction.

- Banding and bonding materials: Resin cement and glass ionomer cement and its modifications.
- Wrought metal alloys: Deformation, strain hardening, annealing, recovery, recrystallization, grain growth, properties of metal alloys.
- Orthodontic archwires: Stainless steel, gold, wrought cobalt chromium-nickel alloys, alpha & beta titanium alloys, composite wires, various newer wires, nickel titanium wires etc.
- Elastics: Latex and non-latex elastics.
- Specification and tests methods used for materials used in orthodontics.
- Survey of all contemporary literature and recent advances on above materials i.e. orthodontic materials.

D. Genetics

- Cell structure: DNA, RNA, protein synthesis, cell division
- Molecular basis of genetics
- Principles of oro-facial genetics
- Chromosomal abnormalities
- Genetics in malocclusion
- Genetic studies related to malocclusion
- Twin studies
- Recent advances in genetics related to malocclusion
- Genetic counselling
- Bioethics and relationship to Orthodontic management of patients
- Genome project.

E. Physical Anthropology

- Evolution of man
- Evolutionary development of dentition
- Evolutionary development of jaws and TMJ
- Anthropological studies

F. General Pathology and Immunology

- Inflammation
- Necrosis
- Immunology

G. Orthodontic History

- Historical perspective
- History of orthodontics in India
- Evolution of orthodontic appliances

H. Concepts of Normal and Functional Occlusion

- Structure and function of all anatomic components of the occlusion
- Mechanics of articulation
- Recording of masticatory function (Face-bow recording)
- Diagnosis of occlusal dysfunction
- Relationship of TMJ anatomy and pathology and related neuromuscular physiology
- Characteristics of normal occlusion
- Concepts of functional occlusion
- Various occlusal schemes in non-extraction and various extraction treatments

I. Aetiology and Classifications of Malocclusions

- A comprehensive review of the local and systemic factors in the causation of malocclusion.
- Various classifications of malocclusion
- Anatomical, physiological and pathological characteristics of major groups of developmental defects of the oro-facial structures.

J. Applied Child and Adult Psychology

- Stages of child development.
- Theories of psychological development.
- Management of child in orthodontic treatment.
- Management of handicapped child.

- Motivation and psychological problems related to malocclusion/orthodontics
- Adolescent psychology
- Behavioural psychology and communication

K. Applied Pharmacology

- Pharmacodynamics and pharmacokinetics of various drugs used for systemic disorders and their effects on normal growth and development and on orthodontic tooth movement.

Second Semester

A. Research Methodology and Basic Biostatistics

- How to use the Library, CD, EOM
- Use of PC in medical research
- How to write a research proposal
- How to plan & design an experiment
- Hospital-based research
- Role of protocol book and how to write a thesis
- Epidemiological surveys and community research
- Biomedical communications
- Drug trials
- How to write and evaluate a paper
- Good lab practice
- Ethics and medical research
- Correct and safe handling of microorganisms
- Safe use and disposal of radioactive materials
- Animal experimentation technique I & II
- Medical certification of caused death
- Computer and Biostatistics

B. Diagnostic Procedures and Treatment Planning in Orthodontics

- Emphasis on the process of data gathering, synthesis and translating it into a treatment plan

- Problem cases – analysis of cases and its management
- Adult cases, handicapped and mentally retarded cases and their special problems
- Critique of treated cases.

Cephalometrics

- Instrumentation
- Image processing
- Tracing and analysis of errors and applications
- Radiation hygiene
- Advanced cephalometric techniques
- A comprehensive review of the literature
- Video imaging principles and application
- Digital imaging including various 3D imaging methods

Various Study-model Analyses

Various Photographic Analyses etc.

C. Orthodontic Practice Management

- Economics and dynamics of solo and group practices
- Personal management
- Materials management
- Public relations
- Professional relationship
- Dental ethics and jurisprudence
- Office sterilization procedures
- Community-based orthodontics

Third Semester

A. Myofunctional and Dentofacial orthopedics

- Evolution of various functional appliances
- Classifications of functional appliances
- Bite registration
- Mechanism of action of functional appliances
- Effects of various functional appliances
- Effects of functional appliances on upper airway
- Use of headgear, facemask etc.

B. Clinical Orthodontics

- Basic principles
- Contemporary appliances – their design and manipulation
- Case selection and evaluation of the treatment results
- Basic biomechanics in orthodontics

C. Biology of Tooth Movement

- Principles of tooth movement-review
- Review of contemporary literature
- Applied histo-physiology of bone, periodontal ligament
- Molecular and ultra cellular consideration in tooth movement
- Drugs affecting orthodontic tooth movement and bone metabolism

D. Ortho / Perio / Prosthodontics / Endodontics Inter-relationship

- Principles of interdisciplinary patient treatment
- Common problems and their management

E. Preventive Orthodontics

- Caries and periodontal disease prevention
- Oral hygiene measures
- Clinical procedures

F. Interceptive Orthodontics

- Principles
- Growth guidance
- Diagnosis and treatment planning
- Therapy emphasis on dento-facial problems
- Tooth material discrepancies (serial extraction)

Fourth Semester

A. Cleft lip and palate rehabilitation

- Diagnosis and treatment planning
- Mechanotherapy

- Special growth problems of cleft cases
- Speech physiology, pathology and elements of therapy as applied to orthodontics
- Team rehabilitative procedures

B. Orthodontic / Orthognathic surgery / Distraction Osteogenesis

- Orthodontist's role in conjoint diagnosis and treatment planning
- Pre and post-surgical orthodontics
- Participation in actual clinical cases, progress evaluation and post retention study
- Review of current literature

C. Orthodontics and Breathing Disorders

- Anatomy of upper airway
- Pathophysiology of breathing disorders
- Childhood and adult breathing disorders
- Role of orthodontics in managing the breathing disorders

D. Retention and Relapse

- Mechanotherapy–special reference to the stability of results with various procedures
- Post retention analysis
- Review of contemporary literature

E. Recent advances like

- Use of implants
- Lasers
- Aligners
- Application of Finite Element Method (FEM)
- Diagnostic aids
- Others

Fifth Semester

A. Clinical works

Sixth Semester

A. Clinical works

LIST OF INSTRUMENTS, ORTHODONTIC MATERIALS AND STATIONERY ITEMS TO BE PROCURED BY THE STUDENTS

INSTRUMENTS

1. Light wire bending pliers (139) - 02 No
2. Tweed Arch Bending pliers (442) - 02 No
3. Pin and Ligature cutter - 02 No
4. Distal end cutter with safety lock - 02 No
5. Heavy beak wire bending pliers - 02 No
6. Howe pliers (straight) - 02 No
7. Howe pliers (curved) - 02 No
8. Anterior Band forming pliers (Howlet) - 01 No
9. Posterior Band forming pliers (Peak) U/L and L/R - 01 No
10. Posterior Band forming pliers (Peak) U/R and L/L - 01 No
11. Johnson contouring pliers - 01 No
12. Mershon Band pusher - 02 No
13. Crown scissors - 01 No
14. Debonding pliers - 02 No
15. Band Remover Posterior - 01 No
16. Direct Bonding Tweezers - 01 No
17. Ligature tucking instrument - 01 No
18. Canine contouring pliers (hollow chop) - 01 No
19. Pliers for removable exercises - 01 No
20. Adams wire bending pliers - 01 No
21. Heavy wire cutter - 01 No
22. Three prong pliers - 01 No
23. Bracket positioning gauge - 01 No
24. Pliers stand - 01 No
25. Glass slab for cement mixing - 02 No
26. Steel cement mixing spatula - 02 No
27. GoldSmith file – half round - 01 No
28. Soldering torch - 01 No
29. Leone Turret (Zero torque)- 01 No
30. Cheek retractors (adult) - 01 No
31. Tongue guard - 01 No
32. Photographic mirror - 01 Set
33. Push scaler - 01 No
34. Amalgam plugger - 01 No
35. Wax knife - 02 No
36. Lecrontes carver - 01 No
37. Flask - 02 No
38. Clamp - 02 No
39. Dog bite articulator – 05 No
40. Spirit lamp - 01 No
41. Acrylic trimmer (flame) - 05 No
42. Acrylic trimmer (round) - 05 No
43. Denture grinding stones (conical)
 - Coarse grit - 05 No
 - Medium grit - 05 No
 - Fine grit - 05 No
44. Sand paper mandrel - 02 No
45. Cusp grinding stone - 05 No
46. Polishing cup and brush - 05 No

ORTHODONTIC MATERIALS

1. K.C. Smith stainless steel wire (18 G, 19 G, 20 G, 21 G, 23 G) - 02 Spools each
2. Stainless steel wire round straight lengths
 - 016” -10 No
 - 018” -05 No
 - 020” – 05 No
3. Rectangular wires stainless steel straight lengths
 - 016 x 022” - 10 No
 - 018 x 025” - 10 No
 - 022 x 028” - 05 No
4. Ligature wire (0.009”)-1 spool
5. Stainless Steel Band Material s
 - 0.125x.003”-1 spool
 - 0.150x.004”- 1 spool
 - 0.180x.005”- 1 spool
6. Std. Edgewise Bracket Set complete with tubes for 1st molars (0.018” Slot)- 01 Kit

-
7. Silver solder- 01 spool
 8. Flux for silver solder- 01 pkt

STATIONERY ITEMS

1. Pair of set squares
2. Divider
3. Metal scale 6" with .5mm graduations
4. Papercutting scissors
5. Pencil sharpener
6. Soft eraser
7. Pencils 3H, H, HB, Copying, glass marking pencil
8. Metal marker
9. OHP Pens
10. Ladies purse mirror
11. Tracing paper (Garware) 1 full roll
12. Millimetre graph paper
13. Pocket appointment diary
14. Paper cutter
15. Set of orthodontic mirrors
16. Metal marker

DIGITAL CAMERA & ITS ACCESSORIES (Suitable for Orthodontic Photography)

LAPTOP COMPUTER

EXTERNAL HARD DISK

TEACHING AND LEARNING METHODS

SKILLS

Pre - Clinical Exercises

Outline of the type of exercises to be completed prior to the start of clinical work would be as per the log book provided by the department. The basic pre-clinical exercise work for the MDS students in orthodontics to be completed in the first 6 months would be as follows.

1. Teeth setting exercises

- Ideal occlusion (According to Andrew's keys)

- With all first premolar extraction (Molars and canines with Class I relationship)
- With upper first premolar extraction only (Molars in Class II and canines in Class I relationship)
- With upper first premolar and lower incisor extraction (Molars in Class II relationship)

2. Wire bending exercises

- Wire straightening (0.036" SS wire)
- Circle (0.036" SS wire)
- Square (0.036" SS wire)

3. Soldering exercises

- Zigzag (0.036")

4. Intrusion arch (Rickett's Utility arch)

5. Sectional T-loop (T- Spring)

6. Multiple loops exercise (0.016" SS Wire)

- Set-1: (Molar stop, open vertical, double helical, horizontal, open helical, box)
- Set-2: (Molar stop, bull, open vertical, closed vertical, T-loop with helix, omega)

7. Ideal arch forms (BONWILL HAWLEY): SS Wire Upper and lower arches (Co-ordinated)

- - 0.018 inch prior to first-order bends
- - 0.018 inch after first order bends
- - 0.017×0.025 inch prior to first-order bends
- - 0.017×0.025 inch after first order bends
- - 0.017×0.025 inch after second order bends
- - 0.017×0.025 inch after third order bends

8. Typodont (Tweed's) exercise

(Using conventional Tweed's technique after extraction of 1st premolars)

- **Stage-1: Malocclusion setup** (as described by Tweed, In C.J. case, Clinical Orthodontics, Vol. 2, 1966, 836-861) The teeth in maxillary and mandibular arches set in Class II maxillary protrusion with crowding, rotation and the deep curve of Spee with about 10 mm of overjet.

Photographs of the malocclusion setup (Pre-treatment) to be recorded

- Frontal view
- Right lateral view
- Left lateral view
- Maxillary occlusal view
- Mandibular occlusal view

• **Stage-2:- Treatment of the malocclusion setup on the Typodont**

All the teeth banded and 0.018" x 0.025" slot Siamese twin brackets to be welded on the bands up to the first molar and buccal tubes to be welded on the bands of second molars. The Bonwill-Hawley diagram to be used to form the archwires.

Step-1:- Fabrication of bands

Step-2:- Leveling and alignment (Multiple loops wire)

Step-3:- Leveling and alignment (Plane wire)

Step-4:- Partial retraction of mandibular canines

Step-5:- Partial retraction of mandibular incisors

Step-6:- Partial maxillary canine retraction and molar correction

Step-7:- Partial retraction of maxillary incisors

Step-8:- Completed retraction of mandibular and maxillary canines

Step-9:- Completed retraction of maxillary and mandibular incisors

Step-10:- Final finishing

Photographs to be recorded (Post-treatment)

- Frontal view
- Right lateral view
- Left lateral view
- Maxillary occlusal view
- Mandibular occlusal view

9. Removable appliances

- Pinhead clasps
 - Deciduous teeth
 - Permanent teeth
- $\frac{3}{4}$ clasp (C-clasp)
 - Permanent teeth
- Adam's clasp
 - Maxillary 1st molars
 - Mandibular 1st molars
- Southend clasp
- Expansion appliance with 3-pin expansion screw
- Hawley's retainer with anterior bite plane
- Modified Begg's retainer
- Circumferential retainer (Wire bending only)
- Twin block appliance
- Activator appliance
- Bionator appliance

NOTE: Model preparation to be done prior to the wire bending. Relevant models to be evaluated and signed by the supervisor.

THESIS WORK

- Selection of topic and submission of protocol within 5 months of starting of session.
- The student will have to select a subject study in consultation with a guide from the faculty of orthodontics.
- Submission of thesis: 6 months before appearing in the examination or as per AIIMS, Bhubaneswar norm.
- Plagiarism check has to be done prior to finalization of the thesis work. If more than 20% plagiarism is detected, the student will be asked to re-write and re-submit.
- The thesis will be sent to one of the external evaluators for approval. If the thesis work needs modifications then the student has to modify the thesis work. After getting the approval letter from the external evaluator, the student will be allowed to appear in the final examination.

- It is desirable to submit the manuscript of the thesis work for publication prior to the final examination.

CLINICAL RECORDS

Each candidate must prepare complete records of their colleague and discuss prior to starting of clinical cases and the resident must have adequate knowledge on the following steps prior to the beginning of clinical work.

- Impression making in alginate
- Study model preparation
- Extra-oral and intra-oral photography
- Various study model analysis
- Various cephalometric analysis (Steiner’s analysis, Down’s analysis, Tweed analysis, Rickett’s analysis, Burrstone analysis, Rakosi’s analysis, Mc Namara analysis, Bjork analysis, Soft tissue analysis – Holdaway and Burstone and COGS)

MINIMAL CLINICAL WORKLOAD

- Fifty (50) self-started cases of various malocclusions
- Twenty (20) transferred cases
- The above count does not include cases related to thesis work

DETAILS OF PARTICIPATION IN ACADEMIC PROGRAMMES

- Paper / Poster presented in the conferences to be recorded in the logbook

PAPER PUBLICATIONS

- Students are encouraged to prepare and submit their thesis works for the publication before appearing in the final examination. They should involve in writing case reports and systematic review articles during their MDS tenure.

DEPARTMENT TRAINING SCHEDULE AND POSTING OF RESIDENTS

The works on a daily basis will be as described below.

Days	Duty Schedule		
	8.30 AM – 01.00 PM	02.00 PM – 4.00PM	4.00 PM – 5.00 PM
Monday	Clinical Works	Clinical Works	Case Presentation
Tuesday	Clinical Works	Clinical Works	Post-treatment Critical Evaluation
Wednesday	Clinical Works	Clinical Works	Journal Club
Thursday	Clinical Works	Clinical Works	Case Presentation
Friday	Clinical Works	Clinical Works	Seminar
Saturday	Clinical Works		

First Year (1st and 2nd Semester)

1. Seminars: One seminar per week to be conducted in the department. A minimum of eight seminars should be presented by each student each year.
2. Journal club: One journal club per week to be conducted in the department. A minimum of eight journal club should be presented by each student each year.
3. Protocol for dissertation to be submitted as per AIIMS, Bhubaneswar norm.
4. Thesis work: On getting approval from the institute ethics committee, work for the thesis to be started.
5. Case discussions of the allotted cases.
6. Basic subjects classes including all classes in research methodology and basic biostatistics.
7. Internal assessment of research methodology and basic biostatistics at the end of the 2nd semester.
8. Each resident would have to do general dentistry work for initial 6-months.
9. Every resident would be part of an emergency team as first on call.

Second Year:

The clinical cases taken up should be followed under the guidance. More case discussions and clinical cases to be taken up. Other routine work as follows:

1. Seminars: One seminar per week to be conducted in the department. Each student should present a minimum of eight seminars each year.
2. Journal club: One journal club per week to be conducted in the department. Each student should present a minimum of eight journal clubs each year.
3. Case discussions of the allotted cases
4. Internal assessment after every semester

Third Year:

The clinical cases taken up should be followed under the guidance. More cases discussions and clinical cases to be taken up. Other routine work as follows:

1. Seminars: One seminar per week to be conducted in the department. Each student should present a minimum of eight seminars each year.
2. Journal Club: One journal club per week to be conducted in the department. A minimum of eight seminars should be presented by each student each year.
3. Case discussions of the allotted cases
4. The completed thesis should be submitted as per AIIMS, Bhubaneswar norm i.e. by the end of 5th semester.
5. PTCE case presentation [minimum fifteen (15) cases]
6. Preparation of records of finished cases for presentation in the final examination.

ASSESSMENT

A. Examination on Research Methodology & Biostatistics

Timing: End of 2nd Semester

Total marks: 100

Will be considered as an internal examination

Candidate should pass to appear in Final examination

No marks will be added to final/summative examination

Will be conducted by Examination Cell in the month of June & December

B. Internal Examination

Total there will be four (04) formative examinations and one pre-final examination. Formative examinations will be held at the end of 3rd, 4th, 5th semesters and pre-final examination will be conducted 2-month before the final examination. All four internal examinations

will have a theory (100 marks) and practical including viva and log-book (100 marks; Practical=70, viva-20 and log book-10). The marks of four (04) internal examinations will be averaged to 100 each for theory and practical and will be added in the final examination.

C. Summative (Final) Examination

Total marks: 1000 (Theory: 400, Practical: 400, Internal Assessment: 100 theory + 100 practical)

Theory: 400 Marks

The written examination shall consist of four question papers each of three hours duration. Total marks in each paper will be 100. Each paper shall consist of one long question carrying 20 marks and 8 short note questions each carrying 10 marks. Distribution of topics for each paper will be as follows:

Paper-I: Basic and applied anatomy, Applied physiology, Dental materials, Genetics, General pathology and immunology, Physical Anthropology, Orthodontic history, Child and Adult Psychology, Applied Pharmacology.

Paper-II: Applied Research methodology and basic Bio-Statistics, Concepts of normal and functional occlusion, Etiology and classification of malocclusions, Biology of tooth movement, Diagnostic procedures and treatment planning in Orthodontics, Orthodontic practice management.

Paper III: Myofascial and Dentofacial orthopedics, Clinical Orthodontics, Ortho/

Perio/Prosthodontics/Pedo/Endo inter-relationship, Preventive Orthodontics, Interceptive Orthodontics.

Paper IV: Cleft lip and palate rehabilitation, Orthodontics/Orthognathic surgery/ Distraction osteogenesis, Retention and relapse, Orthodontics and breathing disorders Recent advances.

** The topics assigned to the different papers are generally evaluated under those sections. However, a strict division of the subject may not be possible and some overlapping of topics is inevitable. Students should be prepared to answer overlapping topics.*

Practical / Clinical Examination: 400 Marks

The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A* 200 marks	Longcase (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/ Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

* Students should pass (secure 50% marks) separately in Part A

The practical/clinical and Viva-voce examination would be conducted for two (2) days.

No	Time	Exercise	Approximate Time
1	09.00-11.00AM	Bonding and/or finishing archwire fabrication in the patient	1 hour
2	11.00-01.00AM	Functional appliance- Examination of allotted case and wax-bite registration	1 hour
3	02.00-05.00PM	Clinical review of self-treated cases (a minimum of 10 cases)	1 hour

4	09.00-10.00AM	Insertion of the functional appliance	30 minutes
5	10.00-11.00AM	Longcase (Diagnosis and Treatment planning)	1 hour
6	11.00-12.00PM	Display of PTCE records (minimum 05 cases)	1 hour
7	12.00-12.30PM	Thesis presentation	30 minutes
8	12.30-01.00PM	Grand viva	1 hour

* *Functional appliance to be constructed by the candidate and to be kept ready by the second day morning.*

Viva-Voce examination

All examiners will conduct viva-voce conjointly on candidate's comprehension, analytical approach, and expression and interpretation of data and communication skills. It includes all components of course contents.

Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

RECOMMENDED BOOKS

- Arnett GW, McLaughlin RP. Facial and Dental Planning for Orthodontists and Oral Surgeons: Mosby; 2004.
- Attanasio R, Bailey DR. Dental Management of Sleep Disorders: Wiley; 2013.
- Bardach J, Morris HL. Multidisciplinary Management of Cleft Lip and Palate: Saunders; 1990.
- Becker A. Orthodontic Treatment of Impacted Teeth: Wiley; 2012.
- Bishara SE. Textbook of Orthodontics: Saunders; 2001.
- Clark W, Clark WJ. Twin Block Functional Therapy: Jaypee Brothers, Medical Publishers Pvt. Limited; 2014.
- Enlow DH, Moyers RE, Merow WW. Handbook of facial growth: SPCK Publishing; 1982.
- Epker BN, Stella JP, Fish LC. Dentofacial Deformities: Integrated Orthodontic & Surgical Correction: Mosby; 1996.
- Graber TM, Rakosi T, Petrovic AG. Dentofacial Orthopedics with Functional Appliances: Mosby; 1997.
- Jacobson A, Jacobson RL. Radiographic Cephalometry: From Basics to 3-D Imaging: Quintessence Pub.; 2006.
- McLaughlin RP, Bennett JC, Trevisi H. Systemized Orthodontic Treatment Mechanics: Mosby; 2001.
- McNamara JA, Brudon WL. Orthodontic and orthopedic treatment in the mixed dentition: Needham Press; 1993.
- Nanda R. Biomechanics and Esthetic Strategies in Clinical Orthodontics: Elsevier Health Sciences; 2005.

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14. Okeson JP. Management of Temporomandibular Disorders and Occlusion: Elsevier Health Sciences; 2019.
15. Phulari BS. Orthodontics: Principles and Practice: Jaypee Brothers, Medical Publishers Pvt. Limited; 2011.
16. Proffit WR, Fields HW, Larson B, Sarver DM. Contemporary Orthodontics : Elsevier Health Sciences; 2018.
17. Timms DJ. Rapid maxillary expansion: Quintessence Pub. Co.; 1981.
18. Tweed CH. Clinical Orthodontics: Mosby; 1966.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Discuss the importance and practical considerations of 'Childs first visit to dental operator'.
(05+15 marks)
2. Short notes (8 × 10 = 80 marks)
 - a. Describe various growth trends and its clinical importance in Orthodontics.
 - b. Discuss the role of prostaglandins in orthodontic tooth movement.
 - c. Describe various types of Copper NiTi and its applications.
 - d. Enumerate growth rotations and its relevance to treatment planning.
 - e. Clinical features and management of hypersensitivity reactions to orthodontic materials.
 - f. Discuss the importance of twin studies in orthodontic reaserch.
 - g. Discuss about endocrine imbalance and its effects on craniofacial morphology.
 - h. Discuss the role of apoptosis in the tooth movement.

PAPER 2

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe etiology, pathogenesis, diagnosis and the role of an orthodontist in the management of obstructive sleep apnea. (2+3+5+10 marks)
2. Short notes (8 × 10 = 80 marks)
 - a. Mention various occlusal schemes and discuss mutually protected occlusion in detail.
 - b. Discuss about cephalometric errors and its clinical importance.
 - c. Describe various measures for infection control in day to day orthodontic practice
 - d. Enumerate the etiology of Class II Division 2 malocclusion.
 - e. Discuss the principles for designing an orthodontic clinic.
 - f. Discuss about Smile analysis and its importance to orthodontics.
 - g. Write a note on Index of Orthodontic Treatment and Need (IOTN).
 - h. Discuss various methods for the evaluation of hyoid bone position and describe its significance.

PAPER 3

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. What are orthodontic scars? Discuss the aetiology and management of white spot lesions. (05 + 15 marks)
2. Short notes (8 × 10 = 80 marks)
 - a. Describe the biomechanics of molar up-righting.
 - b. Discuss merits and demerits of 0.022² and 0.018² slot.
 - c. Describe various effects of rapid palatal expansion.
 - d. Classify anchorage systems in orthodontics and describe the biomechanics of high pull headgear.
 - e. Discuss the latest trends in molar distalization.
 - f. Discuss the role of Osteoprotegerin (OPG) in orthodontic tooth movement.
 - g. Describe two couple system with one clinical example.
 - h. Discuss the effects of mouth breathing on craniofacial morphology.

PAPER 4

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Discuss the management of protruded pre-maxilla in bilateral Cleft Lip and Palate patients.
(20 marks)

2. Short notes (8 × 10 = 80 marks)
 - a. Discuss torque in the base versus torque in the face.
 - b. Write a note on philosophy of nasoalveolar moulding.
 - c. Enumerate the pros and cons of self ligating bracket system.
 - d. Describe various generations of bonded retainers and their indications.
 - e. Discuss the philosophy of evolution of various generations of pre-adjusted edgewise systems.
 - f. Discuss the alveolar bone grafting in cleft palate patients.
 - g. Enumerate various theories of retention.
 - h. Describe various types of dental arch collapse in patients with cleft lip and palate deformities.

ENTRUSTABLE PROFESSIONAL ACTIVITIES (YEAR WISE)

S. No.	EPA	VARIOUS COMPETENCY DOMAINS*							LEVEL OF COMPETENCY				MSF
		DK	PC	PBLI	SBP	P	ICS	At joining time	End of 1 st Year	End of 2 nd Year	End of 3 rd Year		
1	Basic dental knowledge (LC=1)												S, PG
2	Basic knowledge of dental emergency management (LC=4)												S, PG
3	Skills in general dentistry (LC=4)												S, PG
4	Skills in dental emergency management (LC=4)												S, PG
5	Attitude to adopt ethical dental practices (LC=4)												S, P, PG
6	Attitude to adopt ethical dental and orthodontic practices (LC=4)												S, P, PG
7	Willingness to share knowledge and clinical experiences with professional colleagues (LC=4)												S, PG
8	Willingness to adopt a new method or technique (LC=3)												S
9	Communication skill with patients and their relatives (LC=4)												S, P, PG
10	Communication skill with professional colleagues (LC=4)												S
11	Classroom teaching skill (LC=2)												S
12	Podium presentation skill (LC=3)												S
13	Willingness for basic and clinical research (LC=3)												S
14	Attitude to write scientific papers (LC=4)												S
15	The practise of instrument sterilization (LC=4)												S, PG
16	Attitude towards hospital infection control (LC=3)												S, PG

S. No.	EPA	VARIOUS COMPETENCY DOMAINS*							LEVEL OF COMPETENCY				MSF	
		DK	PC	PBLI	SBP	P	ICS	At joining time	End of 1 st Year	End of 2 nd Year	End of 3 rd Year			
17	Ability to gather information from patients during history taking (LC=4)													S
18	Basic orthodontic knowledge (LC=4)													S, PG
19	Knowledge of various occlusion (LC=4)													S, PG
20	Wire bending skill (LC=4)													S, PG
21	Hand soldering skill (LC=4)													S, PG
22	Clinical photography skill (LC=4)													S, PG
23	Cephalometric skill (Analysis & interpretation) (LC=4)													S, PG
24	Impression making skill (LC=4)													S, PG
25	Study model preparation skill (LC=4)													S, PG
26	Skill on orthodontic record-keeping (LC=4)													S, PG
27	Ability in diagnosing an orthodontic problem (LC=4)													S
28	Ability in making an ideal orthodontic treatment plan (LC=4)													S
29	Laboratory skill (LC=4)													S, PG
30	Knowledge and skill on basic edgewise appliance (LC=4)													S, PG
31	Knowledge and skill on pre-adjusted edgewise appliances (LC=4)													S, PG
32	Knowledge and skill on light wire (Begg) appliance (LC=3)													S, PG
33	Knowledge and skill on functional appliances (LC=4)													S, PG
34	Bonding and banding skill (LC=4)													S
35	Patient management skill (LC=4)													S, PG
36	Ability to follow the orders of colleagues (LC=4)													S
37	Interest for various extracurricular activities (LC=4)													S, PG

Competency Domains:	Levels of competence(LC):	Multisource feedback (MSF):
DK: Dental Knowledge	Level 1: Knowledge only; can observe	Supervisor: S
PC: Patient Care	Level 2: Can do under strict supervision	Patients/Relatives: P
PBLI: Problem Based Learning and Improvement	Level 3: Can do under loose supervision	Undergraduate students: UG
SBP: Systems-Based Practice	Level 4: Can do independently	Peers: PG
P: Professionalism	Level 5: Has the expertise to teach others	Community: C
ICS: Interpersonal and Communication Skills		Other health professionals: H
		Self: I

The background of the page is a complex, abstract network of interconnected nodes and lines. The nodes are represented by circles of various sizes and colors, including yellow, green, teal, blue, and grey. The lines connecting them are thin and light grey, creating a web-like structure that is denser in some areas and sparser in others. The overall effect is that of a molecular or data network.

ORTHOPEDICS

MS in Orthopedics

COURSE NAME

MS in Orthopedics

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

PREAMBLE

The purpose of postgraduate education is to create specialists who would provide high-quality health care and advance the cause of science through research & training.

A postgraduate undergoing training MS in Orthopedics should be trained to identify and recognize various congenital, developmental, inflammatory, infective, traumatic, metabolic, neuromuscular, degenerative and oncologic disorders of the musculoskeletal systems. She/he should be able to provide competent professional services to trauma and orthopaedic patients at a primary/ secondary/tertiary healthcare centres.

SUBJECT SPECIFIC LEARNING

OBJECTIVES

This will be dealt with under the following headings:

1. Theoretical knowledge (Cognitive domain)
2. Practical and clinical skills (psychomotor domain)
3. Attitudes including communication skills (Affective Domain)
4. Writing thesis / Reviewing Research activities (Scholarly activity)
5. Training in Research Methodology (Practice-based learning, Evidence-based practice)
6. Professionalism
7. Teaching skills

SUBJECT SPECIFIC COMPETENCIES

A. Cognitive domain:

At the end of the M.S. Orthopedics programme, the postgraduate student should be able to:

1. Demonstrate sufficient understanding of the basic sciences relevant to the orthopaedic speciality through a problem-based approach.
 2. Describe the Principles of injury, its mechanism and mode, its clinical presentation, plan and interpret the appropriate investigations, and institute the management of the musculoskeletally injured patient.
 3. Identify and describe the surface anatomy and relationships within of the various bones, joints, ligaments, major arteries, veins and nerves of the musculoskeletal system of the spine, upper limb, lower limb and the pelvis, chest, abdomen and head & neck.
 4. Define and describe the pathophysiology of shock (circulatory failure).
 5. Define and describe the pathophysiology of Respiratory failure
 6. Describe the principles and stages of bone and soft tissue healing
 7. Understand and describe the metabolic, nutritional, endocrine, social impacts of trauma and critical illness.
 8. Enumerate, classify and describe the various bony/soft tissue injuries affecting the axial and appendicular skeletal system in adults and children.
 9. Describe the principles of internal and external fixation for stabilization of bone and joint injuries.
 10. Describe the mechanism of homeostasis, fibrinolysis and methods to control haemorrhage
 11. Describe the physiological coagulation cascade and its abnormalities
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12. Describe the pharmacokinetics and dynamics of drug metabolism and excretion of analgesics, anti-inflammatory, antibiotics, disease-modifying agents and chemotherapeutic agents.
 - Cerebral palsy
 - Muscular dystrophies and myopathies
 - Nerve Injuries
 - Entrapment neuropathies
 13. Understanding of biostatistics and research methodology
 14. Describe the clinical presentation, plan and interpret investigations, institute management and prevention of the following disease conditions
 - Nutritional deficiency diseases affecting the bones and joints
 - Deposition arthropathies
 - Endocrine abnormalities of the musculoskeletal system
 - Metabolic abnormalities of the musculoskeletal system
 - Congenital anomalies of the musculoskeletal system
 - Developmental skeletal disorder of the musculoskeletal system
 15. Describe the pathogenesis, clinical features plan and interpret investigations and institute the management in adults and children in
 - Tubercular infections of bone and joints (musculoskeletal system)
 - Pyogenic infections of the musculoskeletal system
 - Mycotic infections of the musculoskeletal system
 - Autoimmune disorders of the musculoskeletal system
 - Rheumatoid arthropathy, Ankylosing spondylitis, seronegative arthropathy
 - Osteoarthritis and spondylosis
 16. Describe the pathogenesis, clinical presentation, plan and interpret investigations and institute appropriate treatment in the following conditions
 - Post-polio residual paralysis
 17. Identify the diagnosis and describe management of musculoskeletal manifestation of AIDS and HIV infection
 18. Describe the aetiopathogenesis, identity, plan and interpret investigation and institute the management of osteonecrosis of bones.
 19. Identify situations requiring rehabilitation services and prescribe suitable orthotic and prosthetic appliances and act as a member of the team providing rehabilitation care
 20. Identify a problem, prepare a research protocol, conduct a study, record observations, analyse data, interpret the results, discuss and disseminate the findings.
 21. Identify and manage the emergency situation in disorders of musculoskeletal system
 22. Understanding of the basics of diagnostic imaging in orthopedics like:
 - Plain x-ray
 - Ultrasonography
 - Computerised axial tomography
 - Magnetic resonance imaging
 - PET scan
 - Radio Isotope bone scan
 - Digital Subtraction Angiography (DSA)
 - Dual-energy x-ray Absorptiometry
 - Arthrography
 23. Describe the aetiopathogenesis, clinical presentation, Identification, Plan investigation and institute treatment for oncologic problems of the musculoskeletal system both benign and malignancies, primary and secondary.
 24. Understand the basics, principles of biomaterials and orthopedic metallurgy.
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25. Describe the principles of normal and abnormal gait and understand the biomedical principles of posture and replacement surgeries.
 26. Describe social, economic, environmental, biological and emotional determinants of health in a given patient with a musculoskeletal problem.

B. Affective Domain

1. Should be able to function as a part of a team, develop an attitude of cooperation with colleagues, and interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.
2. Always adopt ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel and to respect the rights of the patient including the right to information and second opinion.
3. Develop communication skills to word reports and professional opinion as well as to interact with patients, relatives, peers and paramedical staff, and for effective teaching.

Attitudes including Communication skills and Professionalism

- **Communication skills:**
 - Exhibits participation in honest, accurate health-related information sharing in a sensitive and suitable manner
 - Recognizes that being a good communicator is essential to practice effectively
 - Exhibits effective and sensitive listening skills
 - Recognises the importance and timing of breaking bad news and knows how to communicate
 - Exhibits participation in discussion of emotional issues
 - Exhibits leadership in handling complex and advanced communication

- Recognizes the importance of patient confidentiality and the conflict between confidentiality and disclosure
- Able to establish rapport in therapeutic bonding with patients, relatives and other stakeholders through appropriate communication
- Able to obtain a comprehensive and relevant history from patients/relatives
- Able to counsel patients on their condition and needs

- **Teamwork:** Seek cooperation. Coordination and communication among treating specialities and paramedical staff
- **Counselling of relatives:** regarding patients condition, seriousness, bereavement and counselling for organ donation in case of brain stem death
- **Leadership:** Trauma prevention, education of the public, paramedical and medical persons. **Advocacy:** with the government and other agencies towards the cause of trauma care
- **Ethics:** The Code of Medical Ethics as proposed by the Medical Council of India will be learnt and observed.

C. Psychomotor domain

1. At the end of the first year of the M.S. Orthopedics programme, the student should be able to:

- Elicit a clinical history from a patient, do a physical examination, document in a case record, order appropriate investigations and make a clinical diagnosis
- Impart wound care where applicable
- Apply all types of POP casts/slabs, splints and tractions as per need
- Identify shock and provide resuscitation
- Perform aspiration of joints and local infiltration of appropriate drugs

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- Perform appropriate wound debridement
 - Perform arthrotomy of knee joint
 - Perform incision and drainage of abscess
 - Perform split-thickness skin grafting
 - Perform fasciotomies
 - Apply external fixators
 - Apply skeletal tractions including skull tongs
 - Triage a disaster situation and multiple trauma patients in an emergency room
 - Perform on bone models, interfragmentary compression screws, external fixation, Tension band wiring and Broad plating
 - Perform closed reduction of common dislocations like shoulder and common fractures like collar fracture, supracondylar fracture.
 - Perform on a cadaver standard surgical approaches to the musculoskeletal system

2. At the end of the second year of the M.S. Orthopedics course, the student should be able :

- Take an informed consent for standard orthopaedic procedures
- Perform closed/open biopsies for lesions of bone, joints and soft tissues
- Perform split-thickness skin grafting and local flaps
- Perform on bone models, internal fixation with k-wires, screws, plates. Dynamic hip/condylar screws/nailing.
- Perform sequestrectomy and saucerisation
- Perform arthrotomy of joints like hip/shoulder, ankle, elbow

- Perform repair of open hand injuries including tendon repair
- Perform arthrodesis of small joints
- Perform diagnostic arthroscopy on models and their patients
- Perform carpal tunnel/tarsal tunnel release
- Apply ilizarov external fixator
- Perform soft tissue releases in contractures, tendon lengthening and correction of deformities
- Perform amputations at different levels
- Perform corrective surgeries for CTEV, DDH, Perthes / skeletal dysplasia

3. At the end of the third year of the M.S. Orthopedics programme, the student should be able to:

- Assist in the surgical management of polytrauma patient
 - Assist in Arthroplasty surgeries of hip, knee, shoulder and the ankle
 - Assist in spinal decompressions and spinal stabilizations
 - Assist in operative arthroscopy of various joints
 - Assist /perform arthrodesis of major joints like hip, knee, shoulder, elbow
 - Assist in corrective osteotomies around the hip, pelvis, knee, elbow, finger and toes
 - Assist in surgical operations on benign and malignant musculoskeletal tumour including radical excision and custom prosthesis replacement.
 - Assist in open reduction and internal fixations of complex fractures of acetabular, pelvis, ipsilateral floating knee/elbow injuries, shoulder girdle and hand
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- Assist in spinal deformity corrections
- Independently perform closed/open reduction and internal fixation with DCP, LCP, intramedullary nailing, LRS
- Assist in limb lengthening procedures
- Assist in Revision surgeries
- Provide pre and post OP care
- Perform all clinical skills as related to the speciality.

COURSE CONTENTS

1. Basic Sciences

- Anatomy and function of joints
- Bone structure and function
- Growth factors and fracture healing
- Cartilage structure and function
- Structure and function of muscles and tendons
- Tendon structure and function
- Metallurgy in Orthopedics
- Stem Cells in Orthopaedic Surgery
- Gene Therapy in Orthopedics

2. Diagnostic Imaging in Orthopedics (Should know the interpretation and Clinical Correlation of the following): -

- Digital Subtraction Angiography
- MRI and CT in Orthopedics
- Musculoskeletal USG
- PET Scan
- Radio-isotope bone scan

3. Metabolic Bone Diseases

- Rickets and Osteomalacia
- Osteoporosis
- Scurvy
- Mucopolysaccharoidoses
- Fluorosis
- Osteopetrosis

4. Endocrine Disorders

- Hyperparathyroidism
- Gigantism, Acromegaly

5. Bone and Joint Infections

- Pyogenic Haematogenous Osteomyelitis - Acute and Chronic
- Septic arthritis
- Fungal infections
- Miscellaneous infections
- Gonococcal arthritis
- AIDS and the Orthopaedic Surgeon (universal precautions)
- Bone and joint brucellosis
- Musculoskeletal Manifestations of AIDS
- Pott's spine
- Tubercular synovitis and arthritis of all major joints

6. Poliomyelitis

- General considerations
- Polio Lower limb and spine
- Management of Post Polio Residual Palsy (PPRP)

7. Orthopedic Neurology

- Cerebral Palsy
- Myopathies

8. Peripheral Nerve Injuries

- Traumatic
- Entrapment Neuropathies

9. Diseases of Joints

- Osteoarthritis
- Calcium Pyrophosphate Dihydrate (CPPD), Gout
- Collagen diseases

10. Systemic Complications in Orthopedics

- Shock
- Crush syndrome
- Disseminated Intravascular Coagulation (DIC)

-
- Acute Respiratory Distress Syndrome (ARDS)

11. Bone Tumors

- Benign bone tumors
- Malignant bone tumors
- Tumor like conditions
- Metastatic bone Tumors

12. Miscellaneous Diseases

- Diseases of muscles
- Fibrous Dysplasia
- Unclassified diseases of bone
- Paget's disease
- Peripheral vascular disease
- Orthopaedic manifestations of bleeding disorders

13. Regional Orthopaedic Conditions of Adults and Children

- The spine
- The shoulder
- The elbow
- The hand
- The wrist
- The hip
- The knee
- The foot and ankle
- The pelvis

14. Biomaterials

- Orthopaedic metallurgy
- Bio-degradable implants in Orthopedics
- Bone substitutes
- Bone Banking

15. Fracture and Fracture-Dislocations

- General considerations
 - Definitions, types, grades, patterns and complications
 - Pathology of fractures and fracture healing

- Clinical and Radiological features of fractures and dislocations
- General principles of fracture treatment
- Recent advances in internal fixation of fractures
- Locking plate osteosyntheses
- Less Invasive Stabilisation System (LISS)
- Ilizarov technique
- Bone grafting and bone graft substitutes
- Open fractures and soft tissue coverage in the lower extremity
- Compartment syndrome
- Fractures of the upper extremity and shoulder girdle
- Fractures of the lower extremity
- Fractures of the hip and pelvis
- Malunited fractures
- Delayed union and non union of fractures
- Fractures/dislocations and fracture - dislocations of spine

16. Dislocations and Subluxations

- Acute dislocations
- Old unreduced dislocations
- Recurrent dislocations

17. Traumatic Disorders of Joints (Sports Injuries)

- Ankle injuries
- Knee injuries
- Shoulder and elbow injuries
- Wrist and hand injuries

18. Arthrodesis

- Arthrodesis of lower extremity and hip
- Arthrodesis of upper extremity
- Arthrodesis of spine

19. Arthroplasty

- Biomechanics of joints and replacement of the following joints.
- Knee

- Ankle
- Shoulder
- Elbow

20. Minimally Invasive Surgery (MIS) Arthroscopy

- General principles of Arthroscopy
- Arthroscopy of knee and ankle
- Arthroscopy of shoulder and elbow

21. Amputations and Disarticulations

- Amputations and disarticulations in the lower limb
- Amputations and disarticulations in the upper limb

22. Rehabilitation - Prosthetics and Orthotics

23. Pediatric Orthopedics:

- Fractures and dislocations in children
- Perthes' disease
- Slipped capital femoral epiphysis
- Congenital Dislocation of Hip (CDH)
- Neuromuscular disorders

24. Spine

- Spinal trauma: diagnosis and management including various types of fixations
 - Rehabilitation of paraplegics/quadriplegics
 - Management of a paralyzed bladder
 - Prevention of bed sores and management of established bed sores
 - Exercise programme and Activities of Daily Living (ADL)
 - Psychosexual counselling
- Degenerative disorders of the spine
 - Prolapsed Inter Vertebral Disc (PIVD)
 - Lumbar Canal Stenosis (LCS)
 - Spondylolysis/Spondylolisthesis
 - Lumbar Spondylosis
 - Ankylosing Spondylitis

- Spinal fusion: various types and their indications.

25. Triage, Disaster Management, BTLS and ATLS

26. Recent advances in orthopedics

- Autologous chondrocyte implantation
- Mosaicplasty
- Video assisted Thoracoscopy (VATS)
- Endoscopic spine surgery
- Metal on metal arthroplasty of hip
- Surface replacements of joints
- Microsurgical techniques in Orthopedics
- Designing a modern orthopaedic operation theatre
 - Sterilization
 - Theatre Discipline
 - Laminar air flow
 - Modular OTs

TEACHING AND LEARNING METHODS

- Emphasis should be given to various small group teachings rather than didactic lectures.
- **Case Presentation:** once a week in the ward, in the outpatient department and special clinics.
- **Seminars / Symposia:** Twice a month; Theme based student centered

Recommended to be held once a fortnight. All the PG students are expected to attend and actively participate in the discussion and enter in the logbook relevant details. Further, every candidate must present on selected topics as least four times a year and a total of 12 seminar presentations in three years. The presentations would be evaluated using checklists and would carry weightage for internal assessment (see checklist in chapter IV). A timetable for the subject with names of the student and the moderator should be announced in advance.

- **Journal club/Review:** once a week
Recommended to be held once a fortnight. All the PG students are expected to attend and actively participate in discussion and enter in the logbook relevant details. Further, every candidate must make a presentation from the allotted journal(s), selected articles at least four times a year and a total of 12 articles presentations in three years. The presentations would be evaluated using checklists and would carry weightage for internal assessment. A time table with the names of the student and the moderator should be announced in advance.
- **Academic grand ward rounds:** Twice a month presentation of cases by residents and clinically applicable discussions.
- **Service Rounds:** Postgraduate and interns should do every day for the care of the patients. Newly admitted patients should be worked up by the PGs and presented to the seniors the following day.
- **Ortho Radiology Meets:** Twice a month discussions amongst Ortho & Radiology Residents under the facilitation of faculty on various imaging modalities used and its interpretation
- **Ortho Surgical Pathological Meet:** Special emphasis on the surgical pathology radiological aspect of the case in the pathology department. The clinician (Ortho resident) presenting the clinical details of the case, radiology PG student describes the Radiological findings and its interpretation and Pathology student describes the morbid anatomy and histopathology of the same case.
- **Skills Lab Sessions:** Once a fortnight for all two years.
- **Clinical teaching** in the OPD, Emergency room, ICU, OR as per the situation.
- **Mortality & Morbidity meetings with surgical audit:** Once a month • Maintenance of logbook: to be signed by the faculty in charge
- **Teaching skills:** Postgraduate students must teach undergraduate students (eg. medical,

nursing) by taking demonstrations, bedside clinics, tutorials, lectures etc. Assessment is made using a checklist by surgery faculty as well students. Record of their participation is kept in Logbook. Training of postgraduate students in educational science and technology is recommended.

- **Publications and Conference Presentations:** A post-graduate student would be required to present one poster presentation, to read one paper at a national/state conference and to present one research paper which should be published/accepted for publication/sent for publication during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.
- Should have attended two conferences/CMEs/ Workshops during his tenure as a postgraduate
- Department should encourage e-learning activities.

Rotations:

Clinical postings

A major portion of posting should be in the Orthopedics department. It should include inpatients, out-patients, ICU, Dept. of TEM and speciality clinics.

Rotation of posting

- Inter-unit rotation in the department should be done for a period of up to 6 months.
- Rotation in appropriate related subspecialties for a total period not exceeding 06 months.

Clinical meetings:

There should be intra- and interdepartmental meetings for discussing the uncommon /interesting cases involving multiple departments.

Logbook: Each student must be asked to present a specified number of cases for clinical discussion, perform procedures/ tests/operations/present seminars/review articles from various journals in inter-unit/ interdepartmental teaching sessions. They

should be entered in a Log Book. The Logbooks shall be checked and assessed periodically by the faculty members

During the training programme, patient safety is of paramount importance; therefore, skills are to be learnt initially on the models, later to be performed under supervision followed by performing independently

ASSESSMENT

Internal should be comprehensive and objective assessing the competencies stated in the course. The assessment is both formative and summative. Formative is spread over the entire duration of the programme and the summative is as per university examination pattern.

INTERNAL ASSESSMENT

Formative assessment should be continual and should assess medical knowledge, patient care, procedural & academic skills, interpersonal skills, professionalism, self-directed learning and ability to practice in the system.

General Principles

Internal Assessment should be frequent, cover all domains of learning and used to provide feedback to improve learning; it should also cover professionalism and communication skills. The Internal Assessment should be conducted in theory and clinical examination.

Quarterly assessment during the MS training should be based on the following educational activities:

1. Journal based / recent advances learning
2. Patient-based /Laboratory or Skill-based learning
3. Self-directed learning and teaching
4. Departmental and interdepartmental learning activity
5. External and Outreach Activities / CMEs
6. The student to be assessed periodically as per categories listed in postgraduate student appraisal form (Annexure I).

Examination on Research Methodology & Biostatistics

- Timing: End of 2nd Semester
- Total marks: 100
- Will be considered as an internal examination
- Candidate should pass to appear in Final examination
- No marks will be added to final/summative examination
- Will be conducted by Examination Cell in the month of June & December

Internal Assessment

Timeline: End of the 3rd, 4th and 5th semester, pre-final (2 months before final examination).

Marks distribution: Theory 100 marks, and practical with viva and

logbook will carry 100 marks

(Practical – 70, viva – 20, logbook – 10).

The marks of the 4 internal examinations will be averaged to 100 each for theory and practical.

SUMMATIVE ASSESSMENT

The postgraduate examination shall be in three parts: -

1. Theory:

The examinations shall be organized on the basis of marking system to evaluate and to certify postgraduate student's level of knowledge, skill and competence at the end of the training. Obtaining a minimum of 50% marks in 'Theory' as well as 'Practical' separately shall be mandatory for passing examination as a whole. The final examination shall be held at the end of 3rd academic year.

There shall be four theory papers as follows:

Paper I: Basic Sciences as applied to Orthopedics

Paper II: Traumatology and Rehabilitation

Paper III: Orthopaedic diseases

Paper IV: Recent advances in Orthopedic surgery

Total marks in theory: 500 marks

Theory papers in the final examination – 400 marks

Average of 4 internal examinations – 100 marks

2. Practical / Clinical examination :

Total marks: 500

Practical and viva in the final examination – 400 marks

Average of 4 internals (practical + viva + logbook) examinations – 100 marks

- The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A* 200 marks	Longcase (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/ Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

* Students should pass (secure 50% marks) separately in Part A

PASSING MARKS:

- The student has to secure 50% marks in the internal examination to be eligible to appear for the final examination.
- In the final theory examination, a student should secure 50% marks (200 out of 400) to pass.
- In the final practical examination, a student has to secure 50% marks (200 out of 400) overall and additionally, they have to secure 50% marks (100 out of 200) in Part A separately.

3. Thesis evaluation :

Every postgraduate student shall carry out work on an assigned research project under the guidance of a recognised Post Graduate Teacher, the result of which shall be written up and submitted in the form of a Thesis. Work for writing the Thesis is aimed at contributing to the development of a spirit of enquiry, besides exposing the postgraduate student to the techniques of research, critical analysis, acquaintance with the latest advances in medical science and the manner of identifying and consulting available literature.

The thesis shall be submitted at least six months before the final examination. Plagiarism check: If more than 20% plagiarism is detected, the student will be asked to re-write and re-submit. Plagiarism checking will be done before the thesis is bound.

The thesis will be sent to one external evaluator for approval. A post-graduate student shall be allowed to appear for the final examination only after the acceptance of the Thesis by the external evaluator.

RECOMMENDED BOOKS

1. Apley AG, Solomon L. Concise System of Orthopedics and Fractures: Butterworths; 1988.
2. Azar FM, Canale ST, Beaty JH. Campbell's Operative Orthopedics: Elsevier Health Sciences; 2016.
3. Beaty JH, Kasser JR. Rockwood and Wilkins' Fractures in Children: Text Plus Integrated Content Website (Rockwood, Green, and Wilkins' Fractures): Wolters Kluwer Health; 2012.
4. Chaurasia BD, Publishers C, Distributors, Garg K, Mittal PS, Chandrupatla M, et al. Bd Chaurasia Human Anatomy 7e Vol 3 & 4: CBS Publishers & Distributors Pvt. Limited; 2016.
5. Dandy DJ, Edwards DJ. Essential Orthopedics and Trauma E-Book: Elsevier Health Sciences; 2009.
6. Duthie RB, Mercer W, Bentley G. Mercer's Orthopaedic Surgery: Taylor & Francis; 1996.

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7. Enneking WF, Association AO. Limb salvage in musculoskeletal oncology: Churchill Livingstone; 1987.
 8. Gill TJ. Arthroscopic Techniques of the Knee: A Visual Guide: Slack; 2009.
 9. Golyakhovsky V, Frankel VH. Textbook of Ilizarov Surgical Techniques: Bone Correction and Lengthening: Bone Correction and Lengthening: Jaypee Brothers, Medical Publishers Pvt. Limited; 2010.
 10. Hamblen DL, Simpson H. Adams's Outline of Fractures: Including Joint Injuries: Elsevier Health Sciences; 2007.
 11. Hamblen DL, Simpson H. Adams's Outline of Orthopedics: Elsevier Health Sciences; 2009.
 12. Herring JA. Tachdjian's Pediatric Orthopedics E-Book: From the Texas Scottish Rite Hospital for Children: Elsevier Health Sciences; 2013.
 13. Kulkarni G. Textbook of Orthopedics and Trauma (4 Volumes): Jaypee Brothers, Medical Publishers Pvt. Limited; 2016.
 14. Lewis JR. The Art of Aesthetic Plastic Surgery: Little, Brown; 1989.
 15. Magee DJ. Orthopedic Physical Assessment: Elsevier Health Sciences; 2014.
 16. Miller MD, Chhabra AB, Park JS, Shen FH, Weiss DB, Browne JA. Orthopaedic Surgical Approaches: Elsevier Health Sciences; 2014.
 17. Natarajan MV. Textbook of Orthopedics & Traumatology: Lippincott Williams & Wilkins; 2011.
 18. Randelli P, Dejour D, van Dijk CN, Denti M, Seil R. Arthroscopy: Basic to Advanced: Springer Berlin Heidelberg; 2016.
 19. Reckling FW, Reckling JAB, Mohn MP. Orthopaedic anatomy and surgical approaches: Mosby Year Book; 1990.
 20. Sawhney GS. Current Techniques in Total Knee Arthroplasty: Ane Books Pvt Ltd; 2010.
 21. Weinstein SL, Buckwalter JA. Turek's Orthopedics: Principles and Their Application: Lippincott Williams & Wilkins; 2005.
 22. West JB. Best and Taylor's Physiological Basis of Medical Practice: Williams and Wilkins.; 1997.
 23. Wolfe SW, Pederson WC, Hotchkiss RN, Kozin SH, Cohen MS. Green's Operative Hand Surgery E-Book: Elsevier Health Sciences; 2016.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

APPLIED BASIC SCIENCES

FULL MARKS -100

Time: 3 hrs

Attempt all questions

Answer each question and its parts in sequential order

The first question carries 20 marks and other 10 marks each.

Illustrate your answer with suitable diagrams

1. What is osteoporosis? How can you diagnose osteoporosis? Elaborate in details about dual-energy x-ray absorptiometry scan. What are the recent advances in the management of osteoporosis?
2. What are the parts of a cortical and cancellous screw? Draw a labelled diagram of the cortical and cancellous screw. Write in details about how a cortical screw can work as a lag screw?
3. Classify bedsore. Write about Management of bedsores.
4. What are the different types of bone cement? What is the different generation of cementing technique?
5. Enumerate different types of plates used for internal fixation of bone. Draw a labelled diagram of locking compression plate?
6. Draw a labelled diagram of blood supply of a long bone. Justify why osteomyelitis is common in metaphysis of a long bone.
7. Write about chronic osteomyelitis and its radiological features. Management of chronic osteomyelitis.
8. What are visco-supplements? Role of visco-supplementation in Osteoarthritis?
9. Dial test and its significance? Draw a labelled diagram of the posterolateral corner of knee.

PAPER 2

TRAUMATOLOGY AND REHABILITATION

FULL MARKS -100

Time: 3 hrs

Attempt all questions

Answer each question and its parts in sequential order

The first question carries 20 marks and other 10 marks each.

Illustrate your answer with suitable diagrams

1. Draw a labelled diagram of the meniscus in relations to its parts, blood supply, and fibre arrangement. What are the types of meniscus tear and write about ramp lesion?
2. Classify proximal humerus fractures. Management of proximal humerus fractures. Write about reverse shoulder prosthesis.
3. Classify acromioclavicular dislocation. Enumerate its different management options with advantages and disadvantages.
4. Define Damage control Orthopedics. How it is important in present Orthopaedic management.

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5. Classify femoral neck fracture and its management options.
 6. Write about fractures of a distal end of Radius and enumerate in detail about evaluation and management of Colle's fracture.
 7. Enumerate the role of weight-bearing in fracture healing.
 8. Enumerate the Association of Osteosynthesis principles of management of intra-articular fractures. How will you manage a 24 hours old compound (Grade III – B Gustilo and Anderson) intra-articular fracture of proximal tibia in a 24 years healthy male adult?
 9. Write about Posterior Hip dislocation clinical features and its management.

PAPER 3

ORTHOPAEDIC DISEASES

FULL MARKS -100

Time: 3 hrs

Attempt all questions

Answer each question and its parts in sequential order

The first question carries 20 marks and other 10 marks each.

Illustrate your answer with suitable diagrams

1. Grafts used for reconstruction of Anterior Cruciate Ligament. Write the advantages and disadvantages of different grafts?
2. Write the signs and symptoms of Thoracic outlet syndrome and management options.
3. Draw a Radiological and histological labelled diagram of Giant Cell tumor.
4. What are the different Non-operative modalities in management of limb length discrepancy? What are the Indications for operative management of limb length discrepancy?
5. Define Lumbar spondylolisthesis, enumerate the clinical features and radiological finding of lumbar spondylolisthesis.
6. Write the stages of Tuberculosis of the hip joint.
7. Enumerate the steps of Ponseti's method in Club foot deformity correction.
8. Enumerate the causes of Failed Back syndrome.
9. Define Cauda Equina Syndrome. Enumerate the clinical features of Cauda Equina Syndrome.

PAPER 4

RECENT ADVANCES IN ORTHOPAEDIC SURGERY

FULL MARKS -100

Time: 3 hrs

Attempt all questions

Answer each question and its parts in sequential order

The first question carries 20 marks and other 10 marks each.

Illustrate your answer with suitable diagrams

1. How will you manage the limb length and acetabular cup orientation in total hip arthroplasty? What is combined anteversion?
2. Differentiate between computer-assisted navigation TKR and robotic surgery in TKR.
3. Enumerate the role of Autologous chondrocyte implantation (ACI) in early osteo arthritis of knee.
4. Describe Role of hip arthroscopy in femoral-acetabular impingement.
5. Enumerate the indications and complications of Minimally invasive spine surgery (MISS).
6. Write the recent advances in fixation of Osteoporotic vertebral compression fracture.
7. Enumerate the principles of limb salvage surgery in bone tumor. Write the uses of mega prosthesis
8. Enumerate the Recent advances in the prosthetic hand.
9. What is a Radial head prosthesis? Write the indication and operative principles of radial head prosthesis.

ENTRUSTABLE PROFESSIONAL ACTIVITIES (EPA)

EPA	Competency Domains							Level of competency			
	MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year	
Gather a history and perform a physical examination	*	*					I	II	III	IV	
Prioritize a differential diagnosis following a clinical outcome	*		*				I	II	III	IV	
Recommend and interpret common diagnostic and screening tests	*						I	II	III	IV	
Enter and discuss orders and prescriptions	*						I	II	III	IV	
Document a clinical encounter in the patient record.	*						I	II	III	IV	
Provide an oral presentation of a clinical encounter	*						I	II	III	IV	
Form clinical questions and retrieve evidence to advance patient care.		*			*		I	II	III	IV	
Give or receive a patients handover to transition care responsibility					*		I	II	III	IV	
Collaborate as a member of an interprofessional team	*	*					I	II	III	IV	
Recognize a patient requiring urgent or emergent care and initiate evaluation and management						*	I	II	III	IV	
Obtain informed consent for tests and procedures.	*			*			I	II	III	IV	
Perform general procedures of a physician				*			I	II	III	IV	
Identify system failures and contribute to the culture of safety and improvement								II	III	IV	
RADIOLOGY											
Reading basic Xrays	*	*			*	*	I	II	III	IV	

Positioning the patient for Xrays										I	II	IV	IV
Filling of radiology requisition forms	*									I	III	IV	IV
Critically analyzing post-op x-rays of simple fractures	*									I	III	IV	IV
Reading CT and MRI	*									I	III	III	IV
Critically analyzing post-op x rays of spine surgeries and complex trauma	*									I	II	III	IV
POP Application													
Simple slab and cast	*	*							*	I	II	III	IV
Functional cast bracing	*	*							*	I	II	III	IV
Derotation boot cast application	*	*							*	I	II	III	IV
Hip spica, CTEV cast and shoulder spica application	*	*							*	I	II	III	IV
Splints and Traction													
Thomas splint application, Bucks traction, Kramer wire splint application	*	*	*						*	I	III	IV	IV
Skeletal traction application for long bone fractures.	*	*							*	I	III	IV	IV
Skull tong and special traction	*	*							*	I	II	III	IV
Dressings													
Dressing of simple and infected cases Post-op dressings		*								I	III	IV	V
Post-op dressings of complex trauma		*							*	I	III	IV	V
VAC dressings		*							*	I	II	III	IV
Consent for OPD procedures	*	*	*						*	I	III	IV	IV
Consent for surgical procedures	*	*	*						*	I	III	IV	IV

Obtaining High-risk consents/ DIL		*	*	*	*	*	*	*	I	II	III	IV
Case sheet writing		*	*	*	*				I	III	IV	IV
Writing of OT procedures		*							I	III	IV	IV
Special clinics proforma					*				I	III	IV	IV
Discharge summaries					*				I	II	III	IV
OT												
The positioning of the patient		*	*	*	*				I	III	IV	IV
Surgical approaches												
Preop planning		*	*	*	*				I	II	III	IV
Painting and drapping		*	*	*	*				I	III	IV	IV
Assisting		*	*	*	*				I	II	III	III
Procedures												
Joint aspiration		*	*	*	*				I	II	III	IV
Steroid injection		*	*	*	*				I	II	III	IV
k- wire fixation		*	*	*	*				I	II	III	IV
External fixator application		*	*	*	*				I	II	III	IV
Wound debridement		*	*	*	*				I	II	III	IV
Reduction of simple fractures and dislocations		*	*	*	*				I	II	III	IV
Hemiarthroplasty		*	*	*	*				I	II	III	IV
Fixation of long bone fractures by plating/ nailing		*	*	*	*				I	II	III	IV
Triaging in ER		*	*	*	*		*		I	II	III	IV
Assessment and resuscitation of polytrauma and spine patients		*	*	*	*		*		I	II	III	IV

Basic/ Essential management of polytrauma and spinal injuries											I	II	III	IV
Spine surgeries														
Spine surgeries														
Surgical approaches and positioning of spine patients	*	*									I	II	III	IV
Preop planning Painting and drapping Assisting	*	*	*								I	II	III	IV
Exposing the spine	*	*									I	II	III	III
Arthroplasty														
Surgical approach and position of patients in Arthroplasty	*	*	*								I	II	III	IV
Preop planning Painting and drapping Assisting	*	*	*								I	II	III	IV
Exposing the knee /hip joint	*	*	*								I	II	III	IV
Arthroscopy														
Surgical approach and position of the patient in Arthroscopy	*	*	*								I	II	III	IV
Preop planning Painting and rapping Assisting	*	*	*			*	*				I	II	III	IV
Making entry portals Visualization of knee joint	*	*	*			*	*				I	II	III	IV
MSK TUMOURS														
History and Clinical evaluation of benign and Malignant tumour	*	*									I	II	III	IV
Ordering Appropriate investigation and their interpretation (Haematological and Radiology)	*	*									I	II	III	III
Surgical workup counselling with regard to disease condition and prognosis and biopsy	*	*									I	II	III	III

Ordering and Interpretation of appropriate investigation	*								I	II	III	IV
Identification and diagnosing Common Congenital condition (CTEV, DDH, Kyphosis / Scoliosis)	*								I	II	III	III
Approach to Musculoskeletal infection (Pyogenic & TB)	*								I	II	III	III
Approach to Metabolic bone disorder (Rickets Osteomalacia Osteoporosis)	*								I	II	III	III

Levels of competence:

- Level I: Knowledge only; can observe
- Level II: Can do under strict supervision
- Level III: Can do under loose supervision
- Level IV: Can do independently
- Level V: Has expertise to teach others

Multisource feedback (MSF):

- Supervisor: S
- Patients/Relatives: P
- Undergraduate students: UG
- Peers: PG
- Community: C
- Other health professionals: H
- Self: I



PATHOLOGY

MD in Pathology

COURSE NAME

MD in Pathology

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

OBJECTIVES

1. To produce trained pathologists who are capable of taking independent decisions in running a routine laboratory diagnostic service in a teaching hospital/ Laboratory in the following speciality –
 - Histopathology
 - Hematology
 - Cytopathology
 - Laboratory Medicine
 - Immunopathology
 - Molecular Pathology
2. To provide training in various methods/ modalities of medical education and experience as teachers especially for the undergraduate students.
3. To impart familiarity with the recent advancement in the field of Pathology and modern methods of scientific investigation.
4. To incorporate among the students, a rational scientific approach in designing as well as performing medical research. The students must have the ability to reason and critically analyse a set of scientific data.

COURSE CONTENT

Theory:

Paper 1: General Pathology

Paper 2: Clinical Pathology, including immunopathology, Molecular Pathology

Paper 3: Systemic Pathology and Cytopathology

Paper 4: Hematology, Transfusion Medicine and recent advances

Practical:

Histopathology techniques, grossing, cytopathology techniques, special tests in hematology, autopsy, immunohistochemistry, immunofluorescence and Clinical Pathology

TEACHING AND LEARNING METHODS

- Seminar: Slide seminar
 - Seminar/Discussion: Topic seminar
 - Discard conference
 - Clinicopathological presentation
 - Autopsy
 - Journal Club: Critical appreciation and discussion of research articles in indexed journals
 - The PG student shall be required to participate in the teaching of undergraduate students.
 - The PG student must have attended Mandatory training in Research Methodology during his tenure.
 - A postgraduate student of a postgraduate degree course would be required to present one poster presentation, to read one paper at a national/ state conference and to present one research paper which should be published/accepted for publication/sent for publication during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.
 - Special Seminars / Workshop:.
 - Log Book: Postgraduate students shall maintain a logbook of the work carried out by them and the training programme undergone during the period of training including details of work experience during their postings, including programs implemented under supervision and those performed independently. The logbook shall be checked and assessed periodically by the faculty members imparting the training.
-

DEPARTMENTAL TRAINING SCHEDULE AND POSTING OF RESIDENTS

SURGICAL PATHOLOGY

- Given the adequate clinical and operative information, the student will be able to identify, and systematically describe the gross anatomic alterations in the surgically removed specimens and be able to correctly diagnose at least 75 per cent of the lesions received on an average day from the surgical specialities of a teaching hospital.
- A student must have the ability to perform a systemic gross examination of the tissues including the taking of appropriate representative tissue sections.
- Given the relevant clinical, operative and radiological data, the student shall be able to identify and systematically and accurately describe the chief histomorphologic alterations in the tissue received in the surgical pathology service, and correctly interpret and as far as possible, correlate with the clinical data to diagnose at least 90% of the routine surgical material received on an average day. He/ She should be able to diagnose at least 75% of the classical lesions being commonly encountered in the Surgical Pathology service without the aid of the clinical data.
- The student should have an understanding of the histogenetic and pathophysiologic processes associated with various pathological lesions.
- The student should be able to satisfactorily and independently perform the following -
 - a. Process a tissue, make a paraffin block and cut sections of good quality on a rotary microtome
 - b. Start the automatic tissue processing machine and verbally demonstrate his/ her understanding of the principles of its running.
 - c. Cut a frozen section of tissues received from the operating room for quick diagnosis, stain and interpret the slide in correlation with the clinical data provided, and correctly diagnose

at least 75 per cent of the lesions within 10-15 minutes.

- d. Stain paraffin sections with at least the following:
 - haematoxylin and eosin
 - stains for collagen
 - elastic fibres and reticulin
 - iron stain
 - PAS stain
 - AFB stain (both for tuberculosis and lepra bacilli)
- Demonstrate an understanding of the principles of:
 - a. fixation of tissues
 - b. processing of tissues and section cutting
 - c. maintenance of related equipment
 - d. various stains and their utility
 - Troubleshoot common problems in routine histology laboratory and offer viable solutions.

CYTOPATHOLOGY

- Independently be able to perform fine-needle aspiration of palpable superficial lumps in patients; make good quality smears, and be able to decide on the type of staining in a given case.
- Independently able to perform the techniques for the concentration of specimens and be conversant with the principles and preparation of solutions of stains.
- Independently prepare and stain good quality smears for cytologic examination
- Demonstrate verbal familiarity with, and guide the clinical residents in the following, keeping in view the special requirements of each case -
 - a. choice of the site from which smears may be taken
 - b. types of smear
 - c. methods of obtaining various specimens etc.
- Given the relevant clinical data, he/she should be able to independently and correctly

-
- a. diagnose the status of malignancy or otherwise in at least 90% of the cases received in a routine laboratory and categorize them into negative, inconclusive and positive.
 - b. indicate correctly the type of tumour, if present, or the exact pathology in at least 75% cases.

HEMATOLOGY

- Correctly plan a strategy for investigating at least 90% of the cases referred for special investigations in the Hematology Clinic and give ample justification for each step in consideration of the relevant clinical data provided.
- Correctly and independently perform the following special tests, in addition to doing the routine blood counts:-
 - a. Bone marrow staining including stain for iron
 - b. Blood smear staining
 - c. Cytochemical characterization of leukaemias with special stains like peroxidase, leucocyte alkaline phosphatase, PAS, Sudan Black, oil Red O, acid phosphatase and non-specific esterases.
 - d. Haemogram including Reticulocyte and Platelet counts
 - e. Osmotic fragility
 - f. Foetal haemoglobin
 - g. Sickling phenomenon
 - h. Bleeding time
 - i. Clotting time
 - j. Coagulation and mixing studies
 - k. Haemoglobin HPLC
 - l. Serum protein electrophoresis
 - m. Flow-cytometry
- Demonstrate, verbally and in writing, his/her understanding of the principles of the above tests, their utility in diagnosis and interpretation of results.

- Perform a successful bone marrow aspiration/ biopsy and stain the peripheral and bone marrow smears with Romanowsky stains.
- Describe accurately the morphologic findings in the peripheral blood and bone marrow smears/ biopsy sections, identifying and quantitating the morphologic abnormalities in disease states and arriving at a correct diagnosis in at least 90% of the cases referred to the Hematology Clinic, given the relevant clinical data.

LABORATORY MEDICINE

- Plan a strategy of laboratory investigation of a given case, given the relevant clinical history and physical findings in a logical sequence, with a rational explanation of each step. He should be able to correctly interpret the laboratory data of such studies, and discuss their significance with a view to arriving at a diagnosis.
- Demonstrate familiarity with and successfully perform a routine urine analysis including physical, chemical and microscopic, the examination of the sediment.
- Demonstrate familiarity with and successfully perform the macroscopic and microscopic examination of FAECES and identify ova and cysts of common parasites.
- Independently and successfully perform a complete examination, physical, chemical and cell content of C.S.F, pleural and peritoneal and other body fluids.
- Successfully perform an examination of peripheral blood for the commonly occurring parasites.
- Independently perform a semen analysis
- Independently and correctly perform at least the following quantitative estimation.

BY MANUAL TECHNIQUE

- a. Blood urea
- b. Blood sugar
- c. Serum proteins total & fractional
- d. Serum bilirubin total & fractional

BY AUTOMATION

- a. Serum cholesterol
 - b. Uric Acid
 - c. SGOT & SGPT
 - d. Serum Alkaline phosphatase
 - e. Creatinine
 - f. Serum Calcium & Phosphorus
 - g. Serum Electrolyte (Na⁺ and K⁺)
- Prepare standard solutions and reagents relevant to the above tests including the preparation of the normal solution, molar solution and Buffers.
 - Explain the biochemical principles involved in the above estimations.
 - Demonstrate familiarity with the normal range of values of the chemical content of body fluids, significance of the altered values and interpretation thereof.
 - Possess knowledge of the principles of the following specialized organ function tests. Relative utility and limitations of each and significance of the altered values.
 - a. Renal function test
 - b. Liver function test
 - c. Gastric and pancreatic function
 - d. Endocrine function test
 - e. Test for malabsorption
 - Explain the principles of instrumentation, use and application of the following instruments.
 - a. Colorimeter/ Photometer
 - b. Spectrophotometer
 - c. pH meter
 - d. Centrifuge
 - e. Analytical balances
 - f. Electrophoresis apparatus
 - g. Blood gas analyzer
 - Know the principles, advantages and disadvantages scope and limitation of Automation in the laboratory.

- Learn the principles and methodology of quality assurance in the laboratory

AUTOPSY PATHOLOGY

- Demonstrate the ability to perform a complete autopsy independently with some physical assistance, correctly following the prescribed instructions.
- Correctly identify all major lesions, which have caused, or contributed to the patients' death, on macroscopic examination alone in at least 90% of the autopsies in an average teaching hospital. In exceptional circumstances, help of a frozen section may be obtained.
- Identify and correctly diagnose at least 90% of the microscopic lesions found in most autopsies, and be able to correlate the pathologic changes with the patients' clinical history and events of a few days preceding death.
- Write correctly and systematically Provisional and Final Anatomic Diagnosis Reports, the major findings at autopsy, and the Autopsy Protocol as per prescribed instructions, of a standard fit for an international journal.

TRANSFUSION MEDICINE

Correctly and independently perform the following:-

- Selection and bleeding of donors
- Preparation of blood components i.e. cryoprecipitates, platelet concentrate, fresh frozen plasma, single donor plasma, RBC concentrates.
- ABO and Rh grouping
- Resolving ABO grouping problems by secretory status in saliva and expanded panel
- Antibody screening by
 - a. LISS
 - b. Enzyme
 - c. AHG
- Crossmatching by
 - a. LISS

- b. Enzyme
- c. AHG
- Antenatal and neonatal work
 - a. Direct antiglobulin test
 - b. Antibody screening and titre
 - c. Selection of blood for exchange transfusion
- Demonstrate familiarity with the principle and procedures involved in a. Resolving ABO grouping problems
 - a. Procedures involved in ----
 - Identification of RBC antibodies
 - Investigation of transfusion reaction
 - Testing of blood for the presence of TTI

- a. Fluorescence In Situ Hybridization (FISH)
- b. PCR
- c. ELISA

Section/subjects	Duration in months
Orientation/biosafety	01
Surgical Pathology	12
Hematology	10
Cytopathology	07
Autopsy/IHC/IF/Thesis	03
Laboratory medicine	02
Blood bank & Biochemistry	01
Total	36

BASIC SCIENCE AND IMMUNOPATHOLOGY

- HISTOCHEMISTRY
 - a. Operate the cryostat, and demonstrate familiarity with the principles of its working and be able to stain tissue sections for some cell constituents.
 - b. Demonstrate familiarity with the commonly used enzyme histochemical procedures.
- IMMUNOHISTOCHEMISTRY
 - a. Demonstrate familiarity with the principles and exact procedures of various immunohistochemical stains using both PAP and ABC systems; employing monoclonal and polyclonal antibodies.
 - b. Be able to perform Immunohistochemical staining using paraffin section with at least one of the commonly used antibodies using PAP method.
- IMMUNOFLUORESCENCE

Demonstrate familiarity with the principles and exact procedures of immune fluorescence technique and fluorescence microscopy
- MOLECULAR PATHOLOGY

Demonstrate understanding and ability to interpret the result of the following techniques

Academic activity:

- Slide Seminar – once in every week
- Topic seminar-once in every week
- Journal club – once in every week
- Interdepartmental clinicopathology conference – twice in every week
- Discard/ gross conference – once in a month
- Autopsy conference – within three working days of performing the autopsy

Each student is expected to present in at least 75% of the academic activity during his/ her total residency period.

Undergraduate teaching

- It is mandatory for the postgraduate student to attend the undergraduate practical and take active participation in demonstration of the Gross specimens, microscopic slides and pathological tests.
- All the junior residents joining the department will attend the undergraduate classes for the first 6 months.

ASSESSMENT

Examination on Research Methodology & Biostatistics

Timing: End of 2nd Semester

Total marks: 100

Will be considered as an internal examination

Candidate should pass to appear in Final examination

No marks will be added to final/summative examination

Will be conducted by Examination Cell in the month of June & December

Internal Examinations Timeline:

- Examination on research methodology and biostatistics
- End of the 3rd, 4th and 5th semester, pre-final (2 months before final examination).
- Marks distribution: Theory 100 marks, and practical with viva and logbook (Practical –70, viva –20, logbook –10).
- The marks of the 4 internal examinations will be averaged to 100 each for theory and practical.

Summative/Final Examinations:

Theory :

- 4 papers (100 marks each)
- Question Paper Format :
- One Long question –20 marks
- Eight Short question/notes –10 x 8 = 80 marks

Total marks in theory: 500 marks

Theory papers in the final examination –400 marks

Practical examination:

Total marks: 500

Practical and viva in the final examination –400 marks

Average of 4 internals (practical + viva + logbook) examinations –100 marks

The format of the practical examination (400 marks)

The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A* 200 marks	Longcase (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/ Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

* Students should pass (secure 50% marks) separately in Part A

Day 1: Hematology and Clinical Pathology

Hematology techniques
(Special stains, OSPE, special tests for hemolytic anaemia, Flow cytometry)

Transfusion Medicine

Clinical Pathology (short case) and immunopathology

Hematology slides

Critical appraisal of a scientific paper

Thesis presentation and evaluation

Viva

Day 2: Histopathology, Cytopathology and Autopsy

Grossing and section processing
(including section cutting and staining,)

IHC, IF, Molecular

Cytotechniques (Slide interpretation, PAP stain, CSF/Sputum, smear preparation, etc)

Histopathology slides

Autopsy

Viva

Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100S	100	100	100	400	500

RECOMMENDED BOOKS

1. Atlas and Synopsis of Lever's Histopathology of the Skin: Wolters Kluwer Health; 2013.
2. Bain BJ, Bates I, Laffan MA. Dacie and Lewis Practical Hematology E-Book: Elsevier Health Sciences; 2016.
3. Bancroft JD, Gamble M. Theory and Practice of Histological Techniques: Churchill Livingstone; 2008.
4. Burt AD, Ferrell LD, Hubscher SG. MacSween's Pathology of the Liver E-Book: Elsevier Health Sciences; 2017.
5. Goldblum JR, Lamps LW, Myers JL, McKenney JK. Rosai and Ackerman's Surgical Pathology: Elsevier; 2017.
6. Horvai AE, Link T. Bone and Soft Tissue Pathology: Elsevier/Saunders; 2012.
7. Ioachim HL, Medeiros LJ. Ioachim's Lymph Node Pathology: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2009.
8. Jennette JC, Heptinstall RH. Heptinstall's Pathology of the Kidney: Lippincott Williams & Wilkins; 2007.
9. Kocjan G, Gray W, Vielh P, Levine T, Kardum-Skelin I. Diagnostic Cytopathology Essentials E-Book: Elsevier Health Sciences; 2013.
10. Lever WF, Elder DE, Elenitsas R, Johnson BL, Murphy GF. Lever's Histopathology of the Skin: Wolters Kluwer Health; 2009.
11. Mills SE, Carter D, Greenson JK, Reuter VE, Stoler MH. Sternberg's Diagnostic Surgical Pathology: Wolters Kluwer Health; 2012.
12. Nikiforov YE, Biddinger PW, Thompson LDR. Diagnostic Pathology and Molecular Genetics of the Thyroid: A Comprehensive Guide for Practicing Thyroid Pathology: Wolters Kluwer Health; 2012.
13. Novak E. Novak's gynecology and obstetric pathology with clinical and 1979.
14. Orell SR, Sterrett GF. Orell, Orell and Sterrett's Fine Needle Aspiration Cytology E-Book: Expert Consult: Online and Print: Elsevier Health Sciences; 2011.
15. Tavassoli FA. Pathology of the Breast: McGraw-Hill Professional Publishing; 1999.
16. Weiss SW, Goldblum JR, Folpe AL. Enzinger and Weiss's Soft Tissue Tumors: Elsevier Health Sciences; 2007.
17. Wintrobe MM, Greer JP. Wintrobe's Clinical Hematology: Lippincott Williams & Wilkins; 2008.
18. Tejinder Singh. Atlas and Text of Hematology. New Delhi. APC Books. 2019

MODEL SAMPLE QUESTION PAPERS

PAPER 1

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the autopsy findings of a 35 year old female who had malar rash, arthritis and renal dysfunction. Describe the renal changes with emphasis on immunofluorescence and electron microscopic findings. (20)
2. Discuss the mechanism of invasion and metastasis with a labelled diagram. (10)
3. Write in brief about microsatellite instability (MSI), methods for its detection and its clinical significance. (10)
4. Describe the mechanism of cell injury with illustrations. (10)
5. Briefly discuss about epithelial mesenchymal transition. (10)
6. Write in brief about Toll like receptors and there role in disease. (10)
7. Mention the role of arachidonic acid and its metabolites in inflammation. (10)
8. Write in short about antiphospholipid antibody syndrome. (10)
9. Discuss the principle and utility of phase contrast microscopy. (10)

PAPER 2

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe briefly about autologous stem cell transplant and its application in therapy. (20)
2. Describe briefly on the role of automation in the diagnosis of malaria. (10)
3. Discuss briefly the role of liver enzymes in the differential diagnosis of neonatal jaundice. (10)
4. Describe in brief the Immunopathology of leprosy. (10)
5. Classify vasculitis. Write in brief the pathogenesis and a note on small vessel vasculitis. (10)
6. Describe briefly the recent updates in antibody mediated transplant rejection. (10)
7. Discuss the role of CSF study in infectious disease of central nervous system. (10)
8. Write in short the role of epigenetics in cancer. (10)
9. Write briefly about effector mechanisms of humoral immunity. (10)

PAPER 3

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Discuss the pathogenesis, molecular diagnosis and differential diagnosis of follicular lymphoma. (20)
2. Write a short note on targeted therapy in lung carcinoma. (10)
3. Describe the Milan system for reporting salivary gland cytology. (10)
4. Briefly describe the role of colonic biopsy in diagnosis of inflammatory bowel disease. (10)
5. Write in short the WHO 2016 modification in classification of astrocytomas. (10)
6. Describe the mechanism of blister formation in skin with examples. (10)
7. Write in brief the role of immunohistochemistry in diagnosis of ovarian tumors. (10)
8. Write in brief the recent updates and changes in Bethesda system of thyroid cytology. (10)
9. Write in brief about atypical lipomatous tumors as per WHO 2013. (10)

PAPER 4

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the role of flow cytometry and cytogenetics in the diagnosis of acute leukemia. (20)
2. Enumerate the mechanisms used by neutrophils to neutralize microbial organisms and add a note on neutrophil extracellular trap. (10)
3. Discuss the transfusion reaction types and its prevention. (10)
4. Discuss the approach to a 10 year old girl with a platelet count of 20,000/cumm. (10)
5. Briefly discuss the recent update in hemophagocytic lymphohistiocytosis. (10)
6. Write in short the Philadelphia chromosome negative myeloproliferative neoplasms. (10)
7. Classify lymphoproliferative neoplasm. Discuss role of immunophenotyping in their diagnosis. (10)
8. Write in brief the approach to microcytic hypochromic anemia. (10)
9. Discuss the chromosomal breakage syndromes. (10)

ENTRUSTABLE PROFESSIONAL ACTIVITIES(EPA)

S. No.	Entrustable Professional Activities	Competencies						Expected level		
		MK	PC	ISC	P	PBLI	SBP	Ist year	2 nd year	3 rd Year
1	Should be able to perform gross examination and sampling of surgical pathology specimens							III	IV	IV
2	Should be able to interpret gross and microscopic histomorphological alterations in tissue.	Y	Y		Y	Y	Y	I	II	IV
3	Should be able to correlate histomorphological alterations with relevant clinical, operative and radiological data and arrive at the diagnosis.	Y	Y	Y	Y	Y	Y	I	II	IV
4	Should be able to process tissue bits	Y	Y		Y	Y	Y	III	IV	IV
5	Should be able to take sections using a microtome							II	III	IV
6	Should be able to perform H and E stain	Y	Y		Y	Y	Y	II	III	IV
7	Should be able to decide appropriate special stain and perform it whenever necessary	Y	Y		Y	Y	Y	--	II	III
8	Should be able to decide appropriate immunohistochemical markers, perform and interpret	Y	Y		Y	Y	Y	---	II	III
9	Should be able to interpret frozen sections	Y	Y		Y	Y	Y	--	II	III
10	Should be familiar with indications and interpretation of ancillary techniques like Karyotyping, FISH, PCR, electron microscopy	Y	Y		Y	Y	Y	--	I	II
11	Should be able to interpret and diagnose cytological smears	Y	Y		Y	Y	Y	II	III	IV
12	Should be able to interpret cytology of sputum, bronchial washings, serous effusions, etc.	Y	Y		Y	Y	Y	II	III	IV
13	Should be able to prepare, stain and interpret peripheral smear	Y	Y		Y	Y	Y	II	III	IV
14	Should be able to interpret bone marrow smears	Y	Y		Y	Y	Y	II	III	IV
15	Should be able to perform and interpret routine haematological investigations like haemoglobin, TLC, DLC, ESR PCV, Blood indices	Y	Y		Y	Y	Y	II	III	IV

S. No.	Entrustable Professional Activities	Competencies						Expected level		
		MK	PC	ISC	P	PBLI	SBP	1st year	2 nd year	3 rd Year
16	Should be able to perform and interpret special investigations like Retic count, a Sickling test, Osmotic fragility test, haemoglobin electrophoresis, Fetal Haemoglobin, etc.	Y	Y	Y	Y	Y	Y	II	III	IV
17	Should be able to plan investigations in a clinical case	Y	Y	Y	Y	Y	Y	II	III	IV
18	Should be able to perform and interpret Urine Examination	Y	Y		Y	Y	Y	II	III	IV
19	Should be able to perform and interpret CSF, Pleural Fluid, Peritoneal Fluid, Synovial fluid examination.	Y	Y		Y	Y	Y	II	III	IV
20	Should be able to perform and interpret semen analysis.	Y	Y		Y	Y	Y	II	III	IV
21	Should be able to perform urgent investigations like CSF, Platelet count during emergency duties.	Y	Y	Y	Y	Y	Y	II	III	IV
22	Should demonstrate familiarity within laboratory investigations in Microbiology and biochemistry	Y	Y		Y	Y	Y	-	II	III
23	Should be able to plan and execute internal quality control programme for laboratory	Y	Y	Y	Y	Y	Y	--	I	II
24	Should be able to participate in the external quality control programme	Y	Y	Y	Y	Y	Y	--	I	II
25	Should be able to perform blood grouping and Rh typing	Y	Y		Y	Y	Y	III	IV	IV
26	Should be able to perform cross-matching	Y	Y		Y	Y	Y	III	IV	IV
27	Should be able to perform ELISA for infectious disease, Coomb's test	Y	Y		Y	Y	Y	I	II	III
28	Should be able to separate blood components and have knowledge of indications of using blood components	Y	Y		Y	Y	Y	II	III	IV
29	Should have knowledge of criteria of selection of blood donors	Y	Y	Y	Y	Y	Y	III	IV	IV
30	Should be able to manage adverse donor reactions	Y	Y	Y	Y	Y	Y	I	II	III
31	Should be familiar with FDA regulations for blood bank	Y	Y		Y	Y	Y	--	II	III
32	Should be able to investigate a case of mismatched blood transfusion	Y	Y	Y	Y	Y	Y	I	II	III

S. No.	Entrustable Professional Activities	Competencies						Expected level		
		MK	PC	ISC	P	PBLI	SBP	1st year	2 nd year	3 rd Year
33	Should be able to participate in multidisciplinary meetings like tumour boards, CPCs, Dermatopathological conferences	Y	Y	Y	Y	Y	Y	I	II	III
34	Should be able to present oral and poster presentations, write a paper in conferences	Y	Y	Y	Y	Y	Y	--	II	III
35	Should be able to teach pathology to undergraduates (MBBS), and allied health sciences like BDS, BSc (Nursing), BSc (MLT), BSc (Radiology), etc.	Y	Y	Y	Y	Y	Y	--	II	III
36	Should be able to supervise technicians	Y	Y	Y	Y	Y	Y	-	I	II
37	Should have a thorough knowledge of Biomedical Waste disposal.	Y	Y	Y	Y	Y	Y	II	III	IV
38	Should be familiar with norms and requirements of NABL, NABH Accreditation	Y	Y	Y	Y	Y	Y		II	III



PEDIATRICS

MD in Pediatrics

COURSE NAME

MD in Pediatrics

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

GOAL

The goal of MD course in Pediatrics is to produce a competent pediatrician who would provide high quality health care and advance the cause of science through research & training. A post graduate student after undergoing the required training should be able to deal effectively with the needs of the community and should be competent to handle the problems related to his specialty including recent advances. She/he should also acquire skills in teaching of medical/paramedical students.

OBJECTIVES

Subject specific objectives

1. To recognize the health needs of infants, children and adolescents and carries out professional obligations in keeping with principles of the National Health Policy and professional ethics.
2. To acquire the competencies pertaining to Pediatrics that are required to be practiced in the community and at all levels of health system.
3. To acquire skills in effectively communicating with the child, family and the community.
4. To be aware of contemporary advances and developments in medical sciences as related to child health.
5. To be oriented to principles of research methodology

6. To acquire skills in educating medical and paramedical professionals.
7. To be able to recognize childhood behavioural and psychiatric disorders and collaborate with Psychiatrists/Child Psychologists for the treatment of such patients

SUBJECT SPECIFIC COMPETENCIES

A. Cognitive domain

After completion of the masters course (MD) in Pediatrics, the student should be able to:

1. Recognize the importance of pediatric health in the context of the health priorities of the country
 2. Practice the Pediatrics specialty keeping within the principles of professional ethics
 3. Identify important determinants of child and adolescent health, and incorporate rehabilitative, preventive, and promotive measures to provide holistic care to children
 4. Recognize the two important foundations of Pediatrics i.e. growth and development; and help every child realize his/her optimal potential in this regard
 5. Take a proper history, perform a detail physical examination (including neuro-development and behavioral assessment and anthropometric measurements) of the child, and make a clinical diagnosis
 6. Perform relevant laboratory investigations and interpret laboratory results and radiology images
 7. Perform common therapeutic procedures for the pediatric patient
 8. Plan for appropriate treatment for illness in children using principles of rational drug therapy
 9. Plan measures for the prevention of childhood disease and disability
 10. Plan for rehabilitation of children with chronic illness and those with special needs
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11. Manage childhood emergencies efficiently
 12. Provide comprehensive care to normal and sick neonates
 13. Demonstrate effective communication skills while managing children with chronic and/or terminal illness
 14. Develop skills to use appropriate learning resources and analyze relevant published literature for practice of evidence based medicine
 15. Demonstrate competence in basic concepts of research methodology and epidemiology
 16. Facilitate learning of medical/ nursing students, practicing physicians, paramedical health workers, and other providers as a teacher/trainer
 17. Play the assigned role in the implementation of national health programs/policy, effectively and responsibly
 18. To develop managerial and leadership skills

B. Affective domain

1. Should be able to function as a part of a team, develop an attitude of cooperation with colleagues, and interact with the patient and the clinician or other colleagues to provide the best possible diagnosis or opinion.
2. Always adopt ethical principles and maintain proper etiquette in dealings with patients, relatives and other health personnel and to respect the rights of the patient including the right to information and second opinion.
3. Develop communication skills to word reports and professional opinion as well as to interact with patients, relatives, peers and paramedical staff, and for effective teaching.

C. Psychomotor domain

At the end of the course, the student should have acquired the following skills:

1. History and Examination

The student must gain proficiency in eliciting, processing and systemically presenting pediatrics history and examination findings with due emphasis of the important and minimization of less important facts. The following skills must be achieved:

- Recognition and demonstration of physical findings
- Recording of height, weight, head circumference and mid arm circumference and interpretation of these parameters using growth reference standard assessment of nutritional status and growth (growth charts)
- Assessment of pubertal growth
- Complete development assessment by history and physical examination, and recognizing developmental disabilities, including autism
- Systemic examination
- Neonatal examination including gestation assessment by physical and neurological criteria
- Examination of the fundus and the eardrum
- Skills related to IMNCI, INAP, and IYCF

2. Monitoring Skills

Non-invasive monitoring of vital parameters including blood pressure, pulse and respiratory rates, capillary refill time (CRT) oxygen saturation (SpO₂), ECG etc. and their interpretation in different age groups

3. Investigative Procedures

- Venous, capillary and arterial blood sampling using appropriate precautions

- Pleural, peritoneal, pericardial aspiration; subdural, ventricular and lumbar puncture
- Tuberculin test
- Bone marrow aspiration and biopsy
- Biopsy of liver and kidney
- Urethral catheterization and suprapubic tap
- Gastric content aspiration

4. Therapeutic Skills

- Breast feeding assessment and counseling; management of common problems
- Establishment of central and peripheral vascular access; CVP monitoring
- Administration of injections using safe injection practices
- Determination of volume and composition of intravenous fluids and their administration
- Neonatal and pediatric basic and advanced life support (NALS, PALS)
- Oxygen administration, CPAP and nebulization therapy
- Blood and blood component therapy
- Intraosseous fluid administration
- Intrathecal administration of drugs
- Phototherapy, umbilical artery and venous catheterization and exchange transfusion
- Nasogastric feeding
- Common dressings and abscess drainage; intercostal tube insertion
- Subdural and intraventricular tap
- Basic principles of rehabilitation
- Peritoneal dialysis
- Mechanical ventilation

5. Bed side investigations, including

- Complete blood counts, micro ESR, peripheral smear

- Urinalysis (routine & microscopy, specific gravity with refractometer, pH, dipstick and multistix)
- Stool microscopy and hanging drop
- Examination of CSF and other body fluids
- Blood sugar
- Shake test on gastric aspirate
- Whole blood clotting time (WBCT)
- Gram stain and ZN stain

6. Patient Management Skills

- Proficiency in management of pediatric emergencies, including emergency triaging
- Drawing and executing patient management plan and long term care
- Documenting patient records on day to day basis and problem oriented medical record
- Care of a normal and sick newborn, management of neonatal disorders hypothermia, sepsis, convulsions, jaundice, metabolic problems
- Identifying need for timely referral to appropriate departments/health facility and pre-transport stabilization of the sick child

7. Communication Skills; Attitudes; Professionalism

- Communicating with parents/child about nature of illness and management plan prognostication, breaking bad news
- Counseling parents on breast feeding, nutrition, immunization, disease prevention, promoting healthy life style
- Genetic counseling
- Communication and relationship with colleagues, nurses and paramedical workers
- Appropriate relation with pharmaceutical industry
- Health economics
- Professional and research ethics

8. Interpretation of Investigations

- Plan x-ray chest, abdomen, skeletal system
- Contrast radiological studies: Barium swallow, barium meal, barium enema, MCU
- Ultrasound cranium and abdomen
- Routine histopathological, biochemical and microbiological investigations
- CT Scan and MRI (cranium, abdomen, chest)
- Electrocardiogram, electroencephalogram
- Arterial and venous blood gases
- Desirable: Interpretation of radio-isotope studies, audiogram, neurophysiological studies, (BERA, VER, Electromyography [EMG], Nerve Conduction Velocity[NCV]), lung function tests

9. Academic Skills

- Familiarity with basic research methodology, basic IT skills.
- Planning the protocol of the thesis, its execution and final report
- Review of literature
- Conducting clinical sessions for undergraduates medical students
- Desirable: writing and presenting a paper. Teaching sessions for nurses and medical workers

COURSE CONTENT

General Guidelines – during the training period effort must always be made to spent adequate time in discussing child health problems of public health importance in the country or a particular region.

The major components of the post-graduate curriculum shall be:

- Theoretical knowledge
- Practical and clinical skills
- Writing thesis/ research articles
- Attitude including communication skills
- Training in research methodology, medical ethics & medicolegal aspects.

1. Topics

Basic sciences:

<ul style="list-style-type: none"> • Principles of inheritance, chromosomal disorders, single gene disorders, multifactorial / polygenic disorders, genetic diagnosis and prenatal diagnosis, pedigree drawing. 	<ul style="list-style-type: none"> • Normal biochemical pathways. • Inborn errors of metabolism
<ul style="list-style-type: none"> • Embryogenesis of different organ systems especially heart, genitourinary system, gastro-intestinal tract. Applied anatomy and functions of different organ systems. 	<ul style="list-style-type: none"> • Hematopoiesis, hemostasis, bilirubin metabolism
<ul style="list-style-type: none"> • Physiology of micturition and defecation; placental physiology; fetal and neonatal circulation; regulation of temperature, blood pressure, acid base balance, fluid electrolyte balance and calcium metabolism. 	<ul style="list-style-type: none"> • Growth and development at different ages, growth charts; puberty and its regulation
<ul style="list-style-type: none"> • Nutrition: requirements and sources of various nutrients • Vitamins and their functions 	<ul style="list-style-type: none"> • Pharmacokinetics of common drugs, microbial agents and their epidemiology
<ul style="list-style-type: none"> • Basic immunology, biostatistics, clinical epidemiology, ethical and medico-legal issues 	<ul style="list-style-type: none"> • Teaching methodology and managerial skills

Growth and development:

<ul style="list-style-type: none"> Principles of growth and development 	<ul style="list-style-type: none"> Normal growth and development,
<ul style="list-style-type: none"> Normal growth and development in childhood and adolescence 	<ul style="list-style-type: none"> Sexual maturation and disorders related to it
<ul style="list-style-type: none"> Normal newborn 	<ul style="list-style-type: none"> Disorders of growth including failure to thrive

Neonatology:

<ul style="list-style-type: none"> Perinatal care, high risk newborn 	<ul style="list-style-type: none"> Anemia and bleeding disorders
<ul style="list-style-type: none"> Care in the labour room and resuscitation 	<ul style="list-style-type: none"> Newborn screening
<ul style="list-style-type: none"> Understanding of perinatal medicine 	<ul style="list-style-type: none"> Congenital malformations
<ul style="list-style-type: none"> Gastrointestinal disorders 	<ul style="list-style-type: none"> Thermoregulation and its disorders
<ul style="list-style-type: none"> Hypoxic ischemic encephalopathy (HIE) 	<ul style="list-style-type: none"> Renal disorders
<ul style="list-style-type: none"> Jaundice (physiological & pathological) 	<ul style="list-style-type: none"> Neurologic disorders
<ul style="list-style-type: none"> Apnea of prematurity 	<ul style="list-style-type: none"> Infections in a newborn
<ul style="list-style-type: none"> Newborn feeding 	<ul style="list-style-type: none"> Respiratory distress (including HMD, TTNB)
<ul style="list-style-type: none"> Low birth weight 	<ul style="list-style-type: none"> Common transient phenomena
<ul style="list-style-type: none"> Prematurity 	<ul style="list-style-type: none"> Retinopathy of prematurity (ROP)

Nutrition:

<ul style="list-style-type: none"> Maternal nutritional disorders; impact on fetal outcome 	<ul style="list-style-type: none"> Infant feeding
<ul style="list-style-type: none"> Protein energy malnutrition (including marasmus, kwashiorkor) 	<ul style="list-style-type: none"> Complementary feeding
<ul style="list-style-type: none"> Nutrition for the low birth weight babies 	<ul style="list-style-type: none"> Adolescent nutrition
<ul style="list-style-type: none"> Breast feeding 	<ul style="list-style-type: none"> Nutritional management of systemic illness (celiac disease, hepatobiliary disorders, CKD, Heart disease etc)

<ul style="list-style-type: none"> Parenteral and enteral nutrition in neonates and children 	<ul style="list-style-type: none"> Vitamin and mineral deficiencies
<ul style="list-style-type: none"> Balanced diet 	<ul style="list-style-type: none"> Obesity

Cardiovascular:

<ul style="list-style-type: none"> Congenital heart diseases (cyanotic and acyanotic) recognition and management 	<ul style="list-style-type: none"> Infective endocarditis Kawasaki disease
<ul style="list-style-type: none"> Systemic hypertension 	<ul style="list-style-type: none"> Disease of myocardium (cardiomyopathy, myocarditis)
<ul style="list-style-type: none"> Rheumatic fever and rheumatic heart disease 	<ul style="list-style-type: none"> Arrhythmias
<ul style="list-style-type: none"> Diseases of pericardium 	

Respiratory:

<ul style="list-style-type: none"> Congenital and acquired disorders of upper airway 	<ul style="list-style-type: none"> Tonsils and adenoids
<ul style="list-style-type: none"> Bronchiolitis & Bronchitis 	<ul style="list-style-type: none"> Pulmonary air leaks
<ul style="list-style-type: none"> Mediastinal mass 	<ul style="list-style-type: none"> Pleural effusion
<ul style="list-style-type: none"> Bronchiectasis 	<ul style="list-style-type: none"> Bronchial asthma
<ul style="list-style-type: none"> Lung cysts and other congenital malformations of the lung 	<ul style="list-style-type: none"> Recurrent and Persistent pneumonia
<ul style="list-style-type: none"> Gastro-esophageal reflux disease (GERD) 	<ul style="list-style-type: none"> Chronic lung disease / BPD
<ul style="list-style-type: none"> Allergic rhinitis and sinusitis 	<ul style="list-style-type: none"> Acute inflammatory upper airway obstruction
<ul style="list-style-type: none"> Acute pneumonia 	<ul style="list-style-type: none"> Obstructive sleep apnea
<ul style="list-style-type: none"> Infections of the upper respiratory tract 	<ul style="list-style-type: none"> Foreign body in the airways
<ul style="list-style-type: none"> Pulmonary edema 	<ul style="list-style-type: none"> Neoplasm of larynx and trachea
<ul style="list-style-type: none"> Suppurative lung diseases 	<ul style="list-style-type: none"> Interstitial lung disease
<ul style="list-style-type: none"> Aspiration pneumonia 	<ul style="list-style-type: none"> Emphysema and hyper-inflation
<ul style="list-style-type: none"> Cystic fibrosis 	

Gastrointestinal and liver disease

• Diseases of mouth (oral cavity & tongue)	• Disorders of deglutition and esophagus
• Acute and chronic pancreatitis	• Acute liver failure
• Inflammatory bowel disease (Ulcerative colitis & Crohn's disease)	• Anorectal malformations
• Intestinal obstruction	• Acute and persistent/ chronic diarrhea
• Peptic ulcer disease	• GI Bleeding (Upper and Lower)
• Cirrhosis and portal hypertension	• Recurrent pain abdomen including cyclic vomiting
• Chronic liver disease and liver transplantation	• Budd-Chiari syndrome
• Acute/subacute/ chronic hepatitis	• Constipation
• Irritable bowel syndrome	• Hirschsprung's disease
• Malabsorption syndrome including Celiac disease	• Congenital hypertrophic pyloric stenosis
• Wilson's disease	• Metabolic diseases of liver
• Cholestasis in infancy	• Foreign body ingestion

Nephrologic & Urologic disorders:

• Acute and chronic glomerulonephritis	• Nephritic syndrome
• Hemolytic uremic syndrome	• Urinary tract infection
• Vesico-ureteric reflux (VUR) and renal scarring	• Renal involvement in systemic disease
• Congenital anomalies of the kidney and urinary tract (CAKUT)	• Renal and bladder stones
• Posterior urethral valves	• Voiding dysfunction
• Undescended testis	• Wilm's tumor
• Antenatal hydronephrosis	• Nephrotic syndrome
• Renal tubular acidosis and other tubulopathies	• Polyuria, oliguria and hematuria

Neurologic disorders:

• Seizure and non-seizure paroxysmal events	• Epilepsy and epileptic syndromes of childhood
• Meningitis	• Coma
• Brain abscess	• AIDP including Guillain- Barre syndrome
• Acute encephalitis and febrile encephalopathies	• Floppy infant
• Neuro-cysticercosis and other chronic Neuro-infestations	• Cerebral palsy
• SSPE	• Neurodegenerative disorders
• Neurometabolic disorders	• Mental retardation
• Neuromuscular disorders	• Autoimmune encephalitis
• Learning disabilities	• Muscular dystrophies
• Acute flaccid paralysis and AFP surveillance	• Occupational therapy
• Movement disorders of childhood	• CNS tumors
• CNS Malformations	• Stroke
• Peripheral neuropathy	• Hydrocephalus

Hematology & Oncology:

• Deficiency anemias	• Hemolytic anemias
• Aplastic anemia	• Pancytopenia, disorders of hemostasis
• Thrombocytopenia (immune & non-immune)	• Transfusion related infections
• Blood component therapy	• Acute and chronic leukemia
• Bone marrow transplant/ stem cell transplant	• Hodgkin and Non-Hodgkin lymphoma
• Myelodysplastic syndrome	• Neuroblastoma
• Disorders of coagulation & Hypercoagulable states	• Oncological emergencies

Endocrinology:

• Hypopituitarism / Hyperpituitarism	• Diabetes insipidus
• Pubertal disorders	• Hypo- and hyperthyroidism
• Adrenal insufficiency	• Cushing's syndrome
• Pheochromocytoma	• Diabetes mellitus
• Recurrent / persistent Hypoglycemia	• Short stature and Tall stature
• Ambiguous genitalia	• Obesity
• Hypocalcemia/ parathyroid disorders	• Congenital adrenal hyperplasia (CAH)

Infections:

• Bacterial	• Viral
• Fungal	• Parasitic
• Rickettsial	• Mycoplasma
• Vaccines	• Tuberculosis
• Lab diagnosis of infections	• Nosocomial infections
• HIV	• Monitoring for nosocomial infections
• Control of epidemics and infection prevention	• Safe disposal of infective material
• Fever without focus	• Febrile neutropenia

Emergency & Critical care:

• Identification & Emergency care of different types of shock	• Cardio-respiratory arrest
• Respiratory distress and failure	• Oxygen delivery devices
• Status epilepticus	• Acute severe asthma
• Fluid and electrolyte disturbances and their management	• Acid-base disturbances
• Poisoning and Envenomation (Scorpion and snake bites)	• Accidents and Trauma
• Emergency triage	• Pediatric advanced life support
• Recognition and management of raised intracranial pressure	• Non invasive ventilation and Heated Humidified High flow nasal cannula (HHHFNC)

Immunology & Rheumatology:

• Arthritis (acute and chronic)	• Connective tissue disorders
• Evaluation of a child with suspected immunodeficiency	• Primary Immunodeficiency Disorders
• Kawasaki disease	

ENT:

• Acute and chronic otitis media	• Conductive / sensorineural hearing loss
• Foreign body in ear and nose	• Epistaxis
• Stridor in infants	• Hearing assessment in infants and children

Skin Diseases:

• Fever with exanthem	• Vascular lesions
• Pigment disorders	• Vesicobullous disorders
• Bacterial infections of skin	• Fungal and parasitic skin and hair infections / infestations
• Steven- Johnson syndrome	• Eczema and other skin allergy
• Seborrheic dermatitis	• Drug rash
• Urticaria	• Alopecia
• Ichthyosis	• Neurocutaneous markers
• Diaper rash	• Skin manifestations of systemic illness

Eye problems:

• Disorders of Refraction and accommodation	• Congenital cataract
• Night blindness	• Chorioretinitis
• Strabismus	• Conjunctival and corneal disorders
• Congenital malformations of the eye	• Retinoblastoma
• Optic atrophy	• Papilledema

Behavioral & Developmental disorders:

• Rumination	• Pica
• Enuresis	• Encopresis
• Sleep disorders	• Habit disorders
• Breath holding spells	• Anxiety disorders
• Mood disorders	• Temper tantrums
• Attention deficit hyperactivity disorders (ADHD)	• Autism spectrum disorders
• Play therapy	• Specific learning disorders
• Behavioral therapy	• IQ assessment
• Somatic symptom disorders	• Conduct disorders

Community and social pediatrics:

• National health programs related to child health (including IMNCI, INAP, IYCF, INAP, RBSK)	• Child abuse and neglect
• Child labor	• Adoption
• Disability and rehabilitation	• Rights of the child
• National policy of child health and population	• Juvenile delinquency
• Investigation of adverse events following immunization in the community	• Nutrition screening of the community
• Government and non-government support services for children	• Investigation of an outbreak in a community
• Prevention of sexually transmitted infection	• Contraception

Genetics:

• Principles of inheritance	• Pedigree drawing
• Chromosomal disorders	• Single gene disorders
• Multifactorial/polygenic disorders	• Genetic counselling
• Prenatal diagnosis	• Screening
• New diagnostic methods	• Gene therapy

Orthopedics

• Major congenital orthopedic deformities	• Bone and joint infections: pyogenic
• Tubercular infections	• Common bone tumors
• Skeletal dysplasia	• Pulled elbow

2. Approaches to important clinical problems

Growth and development:

• Normal growth & development	• Developmental delay
• Impaired learning	• Cerebral palsy

Neonatology:

• Normal newborn	• Low birth weight newborn
• Sick newborn	• Prematurity

Nutrition:

• Lactation management and complementary feeding	• Protein energy malnutrition (underweight, wasting, stunting) and micronutrients deficiencies
• Failure to thrive	• Obesity

Cardiovascular:

• Murmur	• Cyanosis
• Congestive heart failure	• Systemic hypertension
• Arrhythmia	• Pulmonary arterial hypertension

GIT and liver:

• Acute diarrhea	• Persistent and chronic diarrhea
• Abdominal pain and distension	• Ascites
• Vomiting	• Constipation
• Gastrointestinal bleeding	• Jaundice
• Hepatosplenomegaly	• Hepatic failure and encephalopathy

Respiratory:

• Acute and Chronic cough	• Noisy breathing
• Wheezy child	• Respiratory distress
• Hemoptysis	• Persistent and recurrent pneumonia

Infections:

• Acute onset pyrexia	• Pyrexia of unknown origin (PUO)
• Recurrent infections	• Nosocomial infections

Renal:

• Hematuria/ Dysuria / Proteinuria	• Recurrent UTI
• Voiding dysfunctions	• Acute kidney injury (AKI) and chronic kidney disease (CKD)

Hemato-oncology:

• Lymphadenopathy	• Anemia
• Recurrent bleeding	• Hepato-splenomegaly
• Childhood solid tumors	• Lymphoreticular malignancies

Neurology:

• Limping child	• Convulsions
• Abnormality of gait	• Paraplegia, quadriplegia
• Macrocephaly & microcephaly	• Floppy infant
• Acute flaccid paralysis • Headache	• Cerebral palsy and other • neuromotor disability

Endocrine:

• Thyroid swelling	• Ambiguous genitalia
• Obesity	• Short stature
• Precocious & delayed puberty	• Persistent hypoglycemia/ hyperglycemia

Skin/ Eye/ ENT:

• Skin rash	• Pigmentary lesions
• Pain/ discharge from ear	• Hearing loss
• Epistaxis	• Refractory errors

• Blindness	• Cataract
• Eye discharge	• Redness
• Squint	• Proptosis

Rheumatology :

• Arthralgia and Arthritis	• Vasculitis
	• SLE , JDM

Miscellaneous:

• Sexual abuse	• Multiple congenital anomalies
	• Non-accidental injury / Child abuse

TEACHING AND LEARNING METHODS**General principles**

Acquisition of practical competencies being the keystone of PG medical education, PG training should be skills oriented. Learning in PG program should be essentially self-directed and primarily emanating from clinical and academic work. The formal sessions are merely meant to supplement this core effort.

Teaching methodology

This should include regular bedside case presentations and demonstrations, didactic lectures, seminars, journal clubs, clinical meetings, and combined conferences with allied departments. The post graduate student should be given the responsibility of managing and caring for patients in a gradual manner under supervision. Department should encourage e-learning activities.

DEPARTMENTAL TRAINING SCHEDULE AND POSTING OF RESIDENTS

Formal teaching sessions

In addition to bedside teaching rounds, at least 5-hr of formal teaching per week are necessary. Following sessions may be selected:

Activity*	Frequency	Preceptor	Evaluator
1. Journal club	Once a week	SR & Faculty	Other faculties
2. Case discussion Bedside	Morning (non-admission days) Evening (admission days)	Faculty Unit SR	Faculty Unit SR
3. Other Specialties			
(a) Hematology	Once in 4 weeks	Hematology faculty	Hematology faculty
(b) Pediatric cardiology	Once in 4 weeks	Cardiology faculty	Cardiology faculty
(c) Pediatrics radio-conference	Once in 2 weeks	SR & Faculty	Radiology faculty
(d) Biostatistics	Once in 6 months	Biostatistics faculty	
4. Mortality audit	Once in a week	SR & Faculty	Other faculties
5. Statistics PICU	Once in 3 months	PICU faculty	Other faculties
6. Statistics NICU	Once a year	SR & NICU faculty	Other NICU faculties
7. Perinatal meeting	Once a month	SR & NICU faculty	Other NICU faculties
8. Interesting/ difficult cases	Once a month	SR	Other faculties
9. Seminar	Once a week	SR & Faculty	Other faculties
10. Faculty Teaching	Once a month		
11. Communication			
(a) Skills	1 in each semester		
(b) Ethical & Legal Issues	1 in each year		
(c) Departmental Symposium	1 in each semester	Resident & Faculty	Other faculties

*Additional activities include: attending accredited scientific meetings (CME, symposia, and conferences), once a fortnight telemedicine conference with other INI, additional sessions on resuscitation, basic sciences, teaching methodology, hospital waste management, health economics, lecture by guest faculty once a year, participation in the teaching and training programme of undergraduate students and interns.

Rotations

Postgraduate students must rotate through all clinical units of the department every 6 months. This is especially important for him to get pediatric sub-specialty training. Besides this, the student has to undergo posting in other specialties in the following manner:

Hematology – 15 days, Pediatric cardiology – 1 month, Pediatric surgery – 15 days, Dermatology – 15 days, and Psychiatry/child psychology – 15 days.

PG students should also attend sub-specialty clinics during their respective unit postings.

THESIS

A candidate registered for MD Pediatrics has to submit a thesis. This will be a pre-requisite for appearing for the MD examination. The thesis will be done under the guidance and full satisfaction of the post-graduate teacher/guide.

Objectives

By carrying out a research project and presenting his/her work in the form of thesis, the student will be able to:

1. identify a relevant research question;
2. conduct a critical review of literature;
3. formulate a hypothesis;
4. determine the most suitable study design;
5. state the objectives of the study;
6. prepare a study protocol;
7. analyze and interpret research data, and draw conclusion,
8. write a research paper.

Guidelines

While selecting thesis topics, following should be kept in mind:

1. the scope of study should be limited so that it is possible to conduct it within the resources and time available to the student;
2. the emphasis should be on the process of search of research rather than the results;
3. the protocol, interim progress as well as final presentation must be made formally to the entire department;
4. only one student per teacher/ thesis guide;
5. periodic department review of the thesis work as per following schedule:

• End of 4 months	- Submission of protocol
• End of 18 months	- Mid term thesis progress report
• 6 months prior to examination	- Final presentation and submission

ENTRUSTABLE PROFESSIONAL ACTIVITIES

Background:

Entrustable Professional Activities (EPAs) collectively define a type of care that the residency graduate can be trusted to deliver to the public. EPAs are the next step in Competency Based Graduate Medical Education (CBGME). EPAs provide an integrated assessment of competencies and milestones by offering an opportunity for resident evaluation focusing on performance in real-world activities that require specific competencies. EPAs are designed to link competencies to clinical practice and make them feasible. The power of EPAs is their clarity in describing the activities of our profession and the linking or mapping to competencies. The EPAs and their associated sub-competencies and milestones can be used in a number of ways in resident education, including resident evaluation, the development of resident education plans, and curriculum planning. Entrustment at level 4 suggests achievement of specific milestones. EPAs lend themselves well to the final summative evaluation for each resident. Mapping EPAs to milestones and incorporating EPA language in evaluation tools demonstrates formative support for the final summative evaluation. EPA for postgraduate students has been given in the table (vide infra).

ASSESSMENT

General Principles

- The assessment should be valid, objective, and reliable.
- It must cover cognitive, psychomotor and affective domains.
- Formative, and summative assessment should be conducted in theory as well as practical/clinical. In addition, thesis should be assessed separately.

Examination on Research methodology & Biostatistics:

- Examination on Research Methodology & Biostatistics will be conducted at the end of 2nd Semester.

- This examination will be considered as an internal examination but no marks will be added to the final/summative examination.
- Students have to pass (obtaining >50% marks) this examination as an eligibility criterion to appear in the Final examination.
- If someone secures <50%, he/she will appear in the next examination. The examination will be conducted by Examination Cell in the month of June & December every year.

Internal assessment

- The internal assessment should be continuous as well as end-of-term. The former should be based on the feedback from the senior residents and the unit faculty concerned.
- A total of 4 internal examinations will be conducted at end of the 3rd, 4th and 5th semester, and pre-final (2 month before final examination).
- Marks distribution: Theory 100 marks, and Practical with viva and logbook (Practical = 70, viva = 20, logbook = 10) 100 marks. The marks of the 4 internal examinations will be averaged to 100 each for theory and practical.
- Internal assessment/examination pattern

a. Theory:Semester-wiseinternal assessment

Semester	Topics
3 rd Semester (18 th month) (1 st Internal exam)	Nutrition, Growth and Development, Immunization, Fluid & Electrolytes, Infections disease, Research Methodology, and Neonatology
4 th Semester (24 th month) (2 nd Internal exam)	Gastroenterology, Hemato-oncology, Respiratory, Cardio-vascular, Renal, Pediatric emergencies & critical care, ENT, Ophthalmology, Dermatology
5 th Semester (30 th month) (3 rd Internal exam)	Rheumatology & Immunology, Endocrine, CNS, Genetics, Inborn error of metabolism, Adolescent & behavioral sciences

Pre-professional (2 month before final exam) (4 th Internal exam)	Complete syllabus
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b. Practical:Semester-wise internal assessment

Long case (1)	40
Short case (1)	20
OSCE/OSPE stations (10): Imaging, specimen, slides, charts, therapeutics, communication skills, etc	10
Viva	20
Log book	10
Total	100

Summative Assessment

- Ratio of marks in theory and practical's will be equal.
- The student has to secure 50% marks in the internal examination to be eligible to appear for the final examination.
- In the final theory examination, a student should secure 50% marks (200 out of 400) to pass.
- In the final practical examination, a student has to secure 50% marks (200 out of 400) overall and additionally they have to secure 50% marks (100 out of 200) in Part A of practical examination separately.
- Theory Examination: 4 papers (100 marks each)
- Question Paper Format: In each paper, One Long question carrying 20 marks and Eight Short question/notes – 10 x 8 = 80 marks.
- Total theory marks: 500 (Theory papers in the final examination – 400 marks, and an average of 4 internal examination – 100 marks).
- Students have to secure 50% marks in internal marks (in both theory and practical) to be eligible to appear for the final examination.

	1 st Internal examination	2 nd Internal examination	3 rd Internal examination	4 th Internal examination	Total Internal marks (average of 4 examinations)	Final examination	Total marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

- Practical examination: Total marks 500 (Practical and viva in the final examination – 400 marks and an average of 4 internals – 100 marks).
- The format of the practical examination (400 marks) for final examination

Part	Components	Marks allotted
Part A* 200 marks	Long case (1)	100
	Short cases (2)	50
	OSCE/OSPE	50
Part B 200 marks	Operative procedure/ Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

* students should pass (secure 50% marks) in Part A separately.

- The format of the theory examination (400 marks) for final examination

Paper 1	: Basic science as applied to pediatrics	100
Paper 2	: Neonatology and community pediatrics	100
Paper 3	: General pediatrics including advances in Pediatrics relating to cluster I specialties*	100
Paper 4	: General pediatrics including advances in Pediatrics relating to Cluster II specialties**	100
Total		400

*Cluster I- Nutrition, growth and development, immunization, infections disease, genetics, immunology, rheumatology, psychiatry and behavioral science, skin, eye, ENT, adolescent health, critical care; accidents and poisoning.

** Cluster II- Neurology and disabilities, nephrology, hematology, oncology, endocrinology, gastroenterology, hematology, respiratory and cardiovascular disorders.

Log book

A log book is a comprehensive record of all academic events during the 3 years course. Work done by student in the department should be entered in the log book regularly. The log book shall be checked by the faculties at regular intervals. The logbook is reviewed 6 monthly by the departmental faculty to supplement deficits if any in the succeeding 6 months. The log book shall be reviewed at the time of viva-voce at the time of final examination. The log book details are as follows;

- Academic session (s) (Seminar /Symposium, Journal review etc) attended and presented by the candidate
- Procedure / skills – minor and major
- Assessment in chronological order

RECOMMENDED BOOKS

1. Allen HD, Driscoll DJ, Shaddy RE, Feltes TF. Moss & Adams' Heart Disease in Infants, Children, and Adolescents: Including the Fetus and Young Adult: Wolters Kluwer Health; 2013.
2. Bagga A. Protocols in Pediatric Nephrology: CBS Publishers & Distributors Pvt. Limited; 2015.
3. Cassidy JT, Petty RE, Laxer RM, Lindsley CB. Textbook of Pediatric Rheumatology: Elsevier Health Sciences; 2010.
4. Elizabeth KE. Nutrition and Child Development: Paras Medical Publisher; 2004.
5. Farrar J, Hotez PJ, Junghanss T, Kang G, Lalloo D, White NJ. Manson's Tropical Diseases: Elsevier Health Sciences; 2013.
6. Goldsmith JP, Karotkin E. Assisted Ventilation of the Neonate: Elsevier Health Sciences; 2016.
7. Guandalini S. Textbook of Pediatric Gastroenterology and Nutrition: CRC Press; 2004.
8. Gupta P, Menon P, Ramji S, Lodha R. PG Textbook of Pediatrics: Three Volume Set: Jaypee Brothers, Medical Publishers Pvt. Limited; 2018.
9. Hansen AR, Eichenwald EC, Stark AR, Martin C. Cloherty and Stark's Manual of Neonatal Care: Wolters Kluwer; 2017.
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11. Jain V, Menon R. Case Based Reviews in Pediatric Endocrinology: Jaypee Brothers, Medical Publishers Pvt. Limited; 2014.
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13. Kabra SK, Jat KR, Lodha R, Sankar J. Case Based Reviews in Pediatric Pulmonology: Jaypee Brothers, Medical Publishers Pvt. Limited; 2017.
14. Kelly DA. Diseases of the Liver and Biliary System in Children: Wiley; 2009.
15. Kher K, Schnaper HW, Greenbaum LA. Clinical Pediatric Nephrology, Third Edition: CRC Press; 2016.
16. Kliegman RM, Stanton BMD, Geme JS, Schor NF. Nelson Textbook of Pediatrics, 2-Volume Set: Elsevier Health Sciences; 2015.
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18. Ghai Essential Pediatrics, 9 Ed: CBS Pub & Dist Pvt Limited India; 2019.
19. MKC Nair PR. Illingworth's The Development of the Infant and Young Child Normal and Abnormal, 10th ed: Elsevier; 2013.
20. Organization WH. Management of Severe Malnutrition: A Manual for Physicians and Other Senior Health Workers: World Health Organization; 1999.
21. Orkin SH, Nathan DG. Nathan and Oski's Hematology of Infancy and Childhood: Saunders/Elsevier; 2009.
22. Park MK. The Pediatric Cardiology Handbook: Mobile Medicine Series: Elsevier Health Sciences; 2014.
23. Piña-Garza JE. Fenichel's Clinical Pediatric Neurology: A Signs and Symptoms Approach: Elsevier; 2013.
24. Rudolph CD, Rudolph AM, Lister GE, First Gershon AA. Rudolph's Pediatrics, 22nd Edition: McGraw-Hill Education; 2011.
25. Seth V, Kabra SK. Essentials of Tuberculosis in Children: Jaypee Bros. Medical Publishers; 2011.
26. Shaffner DH, Nichols DG. Rogers' Textbook of Pediatric Intensive Care: Wolters Kluwer; 2015.
27. Shaw KN, Bachur RG. Fleisher & Ludwig's Textbook of Pediatric Emergency Medicine: Wolters Kluwer; 2015.

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28. Singh M. Pediatric Clinical Methods: Sagar Publications; 2006.
29. Singh M. CARE OF THE NEW BORN REVISED 8ED (2017): CBS Publishers & Distributors; 2015.
30. Singh M, Deorari AK. Drug Dosages in Children: CBS PUB & DIST PVT Limited INDIA; 2019.
31. Sperling MA. Pediatric Endocrinology E-Book: Elsevier Health Sciences; 2014.
32. Srivastava R, Bagga A. Pediatric Nephrology: Jaypee Brothers, Medical Publishers Pvt. Limited; 2016.
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39. Veena Kalra. Practical Paediatric Neurology. New Delhi. Arya Publications. 2017
40. World Health Organization. The treatment of diarrhoea. A manual for physicians and other senior health workers. 2005

MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASIC MEDICAL SCIENCES

Max. Marks: 100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Discuss the mechanisms of regulation of intracranial pressure. Describe the causes and management of non-traumatic coma in children. (20 marks)
2. Write short notes on the following. (8 x 10 = 80 marks)
 - a. Discuss in detail the study design to evaluate a bronchodilator for treating bronchial asthma in children.
 - b. Discuss factor affecting calcium and phosphorous metabolism and enumerate the causes of hypocalcaemia across various ages in children.
 - c. Briefly describe the development of the reproductive system. Discuss the abnormalities of development of the reproductive system and external genitalia.
 - d. Discuss the pathogenesis of hemolytic uremic syndrome.
 - e. Enumerate different modalities of prenatal diagnosis of fetal disease.
 - f. Discuss the pathogenesis of septic shock.
 - g. Discuss the biochemical mechanism of bacterial resistance.
 - h. Describe the role of immunonutrition in critically ill children.

PAPER 2

NEONATOLOGY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Discuss approach to evaluation and management of new born with apneic episodes (20 marks)
2. Write short notes on the following. (8 x 10 = 80 marks)
 - a. Discuss in brief about Human breast milk banking.
 - b. Discuss the clinical feature and complications in a neonate born to a mother with diabetic mellitus.
 - c. Discuss in brief about Integrated Management of Neonatal and Childhood Illness (IMNCI).
 - d. Describe causes and management of anemia in newborn.
 - e. Write a note on Infant and Young Child Feeding (IYCF).
 - f. Write a note on India Newborn Action Plan (INAP).
 - g. Discuss the newborn and child health services under the National Health Mission (NHM)
 - h. Write a note on Mission Kishore Uday (MKU).

PAPER 3

CORE PEDIATRICS

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Discuss the diagnostic investigations for pulmonary tuberculosis. Outline the case definition, categorization and treatment of cases as per Revised National Tuberculosis Control Programme (RNTCP). (20 marks)
2. Write short notes on the following. (8 x 10 = 80 marks)
 - a. Diagnostic approach to pyrexia of unknown origin (PUO) in an 8-year-old child
 - b. Pathogenesis, diagnosis, and treatment of 1-year old child with cow milk allergy
 - c. Discuss the management of Scorpion bite
 - d. Discuss survival sepsis campaign guideline with reference to children
 - e. Write a note on Mission Indradhanush.
 - f. Discuss different methods to prevent suicide in adolescents.
 - g. What is nutritional recovery syndrome? Discuss about its management.
 - h. How to approach to a child with short stature?

PAPER 4

SUB-SPECIALTY PEDIATRICS

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Enumerate the causes, evaluation and management of systemic hypertension in children (20 marks)
2. Write short notes on the following. (8 x 10 = 80 marks)
 - a. How to approach to refractory seizure in a 5-year-old child?
 - b. Discuss about dietary management of persistent diarrhea.
 - c. Discuss about clinical presentation and management of Idiopathic thrombocytopenic purpura.
 - d. Outline the recent advances in management of Kawasaki disease.
 - e. Outline the diagnostic approach to refractory rickets.
 - f. Discuss about pathophysiology and clinical manifestations of Primary ciliary dyskinesia.
 - g. Write a brief note on autistic spectrum disorder.
 - h. Outline the dietary management of a child with Type I Diabetes mellitus.

ENTRUSTABLE PROFESSIONAL ACTIVITIES(EPA)

S. No.	EPA	Competency Domains						Level of Competency				MSF (Multi Source Feedback)
		MK	PC	PBLI	SBP	P	ICS	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year	
01	History taking	+	+	+	+	+	+	II	III	IV	V	S, P, PG, I
02	General physical & Systemic examination	+	+	+	+	+	+	II	III	IV	V	S, P, PG, I
03	Formulating diagnosis and differential diagnoses based on history and examination	+	-	+	-	-	+	I	II	III	IV	S, PG, I
04	Clinical case presentation	+	-	+	+	-	+	II	III	IV	IV/V	S, PG, H
05	Document patient details in the case record	-	+	-	+	+	-	I	II	III	IV	S, PG, I
06	Advising common diagnostic tests	+	+	+	+	+	-	II	III	IV	V	S, I
07	Interpreting common diagnostic tests	+	+	+	+	+	-	II	III	IV	V	S, I
08	Making entry, analyzing and discussing the advises/ prescriptions	+	+	+	+	+	+	I	II	III	IV	S, P, PG, I
09	Providing proper instructions to the patients based on the test results	+	+	+	+	+	+	I	II	III	IV	S, P, PG, I
10	Applying current best information/ evidence based medicine to improve patient care	+	-	+	-	-	-	I	II	III	IV	S, I
11	Either receive or give a patient handover to transition care responsibility	+	+	-	+	+	+	I	II	III	IV	S, PG, H, I
12	Efficient participation as a member of an inter-professional team	+	-	-	-	+	+	I	II	III	IV	S, PG, H, I
13	Identifying emergency conditions and providing primary care	+	+	+	+	+	+	I	II	III	IV	S, PG, H, P, I
14	Obtain informed consent for tests and/or procedures	+	+	-	+	+	+	II	III	IV	V	S, P, PG
15	Performing general medical procedures	+	+	+	+	+	+	I	II	III	IV	S, PG, I
16	Performing minor surgical procedures	+	+	+	+	+	+	I	II	III	IV	S, PG, I
17	Identifying organ dysfunction and taking remedial measures	+	+	+	+	+	+	I	II	III	IV	S, PG, I

S. No.	EPA	Competency Domains						Level of Competency				MSF (Multi Source Feedback)	
		MK	PC	PBLI	SBP	P	ICS	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year		
18	Assessing the Growth and nutritional status of children	+	-	+	+	+	-	II	III	IV	IV	IV	S, PG
19	Assessing the Development status of children	+	-	+	+	+	-	II	III	IV	IV	IV	S, PG
20	Advising parents regarding growth and development of a child	+	-	+	+	+	-	II	III	IV	IV	IV	S, PG
21	Attending delivery of a newborn, and breast feeding counseling	+	+	+	+	+	-	I	II	III	IV	IV	S, PG
22	Resuscitation of a sick newborn	+	+	+	+	+	-	I	II	III	IV	IV	S, PG
23	Assessment and management plan of common neonatal problems	+	+	+	+	+	-	I	III	IV	IV	IV	S, PG
24	Counseling the mother of a neonate getting discharged	-	-	-	+	+	+	I	III	IV	IV	IV	S, C, H
25	Counseling the parents of a sick child	+	-	-	+	+	+	I	II	III	IV	IV	S
26	Breaking the bad news	+	-	-	+	+	+	I	II	III	IV	IV	S
27	Clinical demonstration classes for undergraduates	+	-	+	+	+	+	I	III	III	IV	IV	S, UG
28	Assessing the need for oxygen and choosing the suitable mode of delivery	+	+	+	+	-	-	I	II	III	III	III	PG
29	Knowledge about mechanical ventilation (setting, choosing appropriate mode, and weaning)	+	+	+	+	-	-	I	II	III	III	III	S, PG
30	Performing CPR in a child	+	+	+	+	-	-	I	II	III	III	III	S, PG
31	Practice of universal precautions	+	+	+	+	-	-	I	II	III	III	III	S, PG
32	Prevention of Hospital acquired infections (Hand hygiene, etc)	+	+	+	+	-	-	I	II	III	III	III	S, PG

Competency Domains:	Levels of competence:	Multisource feedback (MSF):
MK: Medical Knowledge	Level 1: Knowledge only; can observe	Supervisor: S
PC: Patient Care		Patients/Relatives: P
PBL: Problem Based Learning and Improvement	Level 2: Can do under strict supervision	Undergraduate students: UG
SBP: Systems-Based Practice	Level 3: Can do under loose supervision	Peers: PG
P: Professionalism	Level 4: Can do independently	Community: C
ICS: Interpersonal and Communication Skills	Level 5: Has the expertise to teach others	Other health professionals: H
		Self: I

The background features a complex network of interconnected nodes and lines, resembling a molecular structure or a data network. The nodes are represented by circles of various sizes and colors, including yellow, green, teal, grey, and blue. The lines connecting them are thin and light grey. The overall composition is abstract and scientific, with the central text 'PHARMACOLOGY' prominently displayed in a black serif font.

PHARMACOLOGY

MD in Pharmacology

COURSE NAME

MD in Pharmacology

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

OBJECTIVES

Acquisition of knowledge: The resident should be able to understand the various concepts in pharmacology at the end of three years. This includes knowledge about the basic pharmacology of drugs and its therapeutic application. The resident is also required to understand the various experimental techniques pertaining to pharmacology, drug development process, regulatory affairs in drug development and usage, biostatistics, pharmacokinetics and the concepts in clinical trials.

Teaching and training: The residents should learn to teach various undergraduate courses like MBBS, BSc in Nursing and allied sciences using various techniques of medical education. This should enable them to teach various undergraduate and postgraduate students in the medical field to effectively train the doctors in pharmacology and therapeutics.

Research: The residents should be able to understand the basic research methodology along with basic biostatistics at the end of their residency. They should be able to construct the research protocol, construct the consent form and case record form, apply to the ethics committee, conduct the research (basic, clinical, in-vitro or computational), analyze the data, interpret the results and compile them as a thesis as a part of their curriculum.

COMPETENCIES TO BE DEVELOPED

Knowledge domain:

1. Describe and apply pharmacological principles to explain the mechanism/s of the effects of drugs used in diagnosis, prevention and treatment of diseases of all systems of the human body.
2. Explain the pharmacodynamics and pharmacokinetics of drugs.
3. Describe mechanisms of drug-drug interactions and their clinical importance.
4. Apply and integrate the knowledge of pathophysiology of diseases and its modulation by drugs.
5. Acquire knowledge on pharmacogenetics and pharmacogenomics
6. Acquire knowledge on principles of pharmacoconomics
7. Acquire knowledge on pharmacoepidemiology, including drug utilization studies.
8. Acquire knowledge and understanding of principles of Good clinical practice (GCP) and Good laboratory practice (GLP) guidelines
9. Acquire knowledge of essential medicines
10. Acquire knowledge on pharmacovigilance
11. Acquire knowledge and apply the principle of biostatistics in the evaluation and interpretation of drug safety and efficacy studies
12. Describe how to evaluate, analyze and monitor preclinical and clinical data in drug discovery
13. Able to integrate principles of immunology in biochemistry.
14. Demonstrate knowledge of basics of research methodology, develop a research protocol, conduct the study, record experimental observations, analyze data using currently available statistical software, interpret results and disseminate these results and to have the potential ability to pursue further specializations and eventually be competent to guide students.

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15. Describe the principles of teaching-learning technology towards application and take interactive classroom lectures, modules for problem-based learning (PBL), case discussions, small group discussions, seminars, journal club and research presentations
 16. Demonstrate knowledge about computer-assisted learning (CAL) software and ability to use them efficiently to promote learning of pharmacology.
 17. Demonstrate knowledge of principles of Instrumentation.
 18. Demonstrate knowledge about recent advances and trends in research in the field of pharmacology and clinical pharmacology.
 19. Acquire knowledge of generic drugs and generic prescription.
 20. Acquire knowledge on the rational use of drugs and prescription auditing
 21. Acquire knowledge about antimicrobial stewardship programs and strategies for containment of antibiotic resistance
 22. Acquire knowledge of animal toxicity studies
 23. Acquire knowledge of common poisoning
 24. Acquire knowledge of the legal and ethical issues involved in drug development and research.
 25. Acquire knowledge in Biostatistics including the use of statistical software:
 - The estimation of sample size for a clinical trial
 - Scales of measurement, data display, measures of central tendency (mean, median, mode)
 - Dispersion of data (variance, standard deviation)
 - Selection of tests (of significance) and their applicability
 - Correlation and regression analysis
 - Basics of systematic reviews and meta-analysis

Affective domain:

1. Effectively explain to patients, the effects and side effects of drugs, including the need for medication adherence.
2. Communicate effectively with pharmacological reasoning with students, peers, staff and faculty, and other members of the healthcare team on the rational use of drugs and improving spontaneous reporting of adverse events.
3. Demonstrate respect in interactions with peers and other healthcare professionals.
4. Demonstrate ethical behaviour and integrity in one's work.
5. Demonstrate the ability to generate awareness about the use of generic drugs in patients.
6. Acquire skills for self-directed learning to keep up with developments in the field and to continuously build to improve on skills, expertise and perpetual professional development.

Psychomotor domain:

1. Able to predict efficacy and adverse effects associated with the use of drugs, along with causality assessment.
2. Demonstrate skills for prescription writing.
3. Perform major in vivo and in vitro animal experiments.
4. Observe and understand basic principles of working of important advanced techniques, like High-Performance Liquid Chromatography (HPLC).
5. Demonstrate standard operating procedures of various methods and techniques used in clinical trials and research.
6. Determine levels of common poisons in blood
7. Demonstrate presentation skills at academic meetings, publications and writing research projects for funding agencies.
8. Be able to analyze and evaluate a research paper

PRACTICAL SKILLS

1. In vivo and ex vivo experiments, like organ bath, analgesiometer, convulsiometer, learning and memory, models for affective disorders.
2. Administration of drugs by various routes (subcutaneous, intravenous, intraperitoneal) in experimental animals
3. Preparation and administration of a drug solution in the appropriate strength and volume
4. Experiments to show dose-response curve of agonists (in the presence or absence of an antagonist) on various biological tissues, like
 - Isolated rabbit/rat/ guinea-pig intestine
 - Isolated stomach fundus of rats
5. Determination of EC50, ED50, pA2 values of drugs
6. Plan, conduct, analyze and report a clinical trial.
7. Use computational tools for learning and research in pharmacology
8. ADR reporting
9. Provide clinical pharmacology opinions to practising physicians like dose modification, ADR management and suggesting various drug regimens
10. Operate HPLC, ELISA and spectrophotometry.

Departmental Training schedule & posting of residents:

The topics which have been mentioned below will be covered over a period of 3 years. There will be clinical rotatory posting in various clinical departments over a period of 4 months to understand the pharmacotherapy of various clinical disorders. Similarly, there will be two months of industrial internship which will enable the residents to understand the practical aspects of clinical drug development.

THEORY :

General pharmacology and allied sciences:

1. Drug-receptor theory
 - Theories like a lock and key principle, two-state theory, three state theory, probabilistic theory
2. Drug targets
 - Proteins like transporters, G proteins, enzyme-linked proteins, enzymes, ion channels and others
 - Carbohydrate as receptors
 - Nucleotide as receptors
 - Other forms of targets
3. Drug delivery systems
 - Various forms of conventional and modern delivery systems like nano-formulation targeted delivery systems and regional drug delivery systems
4. Pharmacokinetics
 - Basic principles of compartmental kinetics
 - Population kinetics
 - Bioavailability and bioequivalence
5. Pharmacodynamics
 - Molecular mechanisms of drug actions
 - Physiological and pathological principles of drug actions
 - Biochemical principles of drug actions
 - Models of pharmacodynamics and their association with pharmacokinetics
 - Dose-response concepts
 - Agonism and antagonism with isobologram
6. Molecular biological tools relevant to pharmacology
 - High-performance liquid chromatography
 - Mass spectrometry
 - Enzyme-linked immunosorbent assay
 - Spectrophotometry
 - Polymerase chain reaction
 - Flow cytometry

7. Bioinformatics tools for pharmacology

- Drug database like ZINC
- Protein database like SWISSPROT
- BLAST
- Servers for ADME prediction
- Docking tools
- Structure-activity prediction
- CAL tools in pharmacology

8. Modelling in pharmacology

9. Basics of immunology and microbiology relevant to pharmacology

10. Teaching and communication skills

Systemic pharmacology, chemotherapy and therapeutics:

1. Drugs acting on the autonomic nervous system
2. Drugs acting on the central nervous system
3. Autacoids
4. Renal and cardiovascular system
5. Drugs affecting the gastrointestinal and respiratory system
6. Drugs affecting uterine motility
7. Chemotherapy of microbial (bacterial, fungal and viral) diseases
8. Chemotherapy of parasite infections
9. Antineoplastic agents
10. Immunomodulators
11. Drugs acting on blood and blood-forming organs
12. Hormones, vaccines and miscellaneous agents

Clinical pharmacology and recent advances:

1. Clinical pharmacokinetics
2. Pharmacokinetic - pharmacodynamic correlation and its application in therapeutics
3. Types of clinical Studies
4. Designs of clinical Trials
5. Phase 1 studies
6. Phase 2 studies

7. Phase 3 studies

8. Phase 4 studies

9. Randomization, Blinding and Bias

10. The methodology of Protocol Writing

11. Ethical Considerations in Clinical Studies and Structure of Informed Consent Form

12. PICO concepts and Assessment of a Clinical Trial Publication

13. Types of Literature with Literature Searching and Evidence Pyramid

14. Meta-Analysis

15. Concepts of non-inferiority and equivalence

16. GCP, ethics, GLP and GMP

17. Clinical trials of various organ systems

18. Clinical trials in special populations

19. Pharmacokinetics in special conditions and population

20. Therapeutic drug monitoring

21. Antimicrobial stewardship

22. Simulation of clinical studies

23. Omics in pharmacology

24. Vaccine clinical trials

25. Pharmacoeconomics

26. Pharmacoepidemiology

27. Pharmacovigilance – ADR monitoring and reporting

28. Schedule Y

29. Rational drug prescription

30. Drug formulary

31. Concepts of essential medicines

32. Recent advances in the pharmacotherapy

33. Recent advances in drug development

Experimental pharmacology:

1. Principles of biostatistics
 - Sample size calculation
 - Descriptive statistics
 - Parametric and non-parametric tests
 - Regression techniques

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- Handling missing data
 - ROC analysis
 - Survival analysis
 - Simulation of clinical studies
2. Principles of animal experimentation and their limitations in drug evaluations
 3. Animal handling and animal care
 4. Methods of anaesthetizing animals and methods of euthanasia.
 5. Restraining and blood collecting methods
 6. Principles of bioassay
 7. Drug screening methods in the evaluation of anti-ulcer, antidepressant, antianginal, antihypertensive, antiarrhythmic, antidiabetic, anti-cataract, antiplatelet, anticancer, anti-inflammatory, antidiarrhoeal, antiepileptic, analgesic, antithyroid, antipyretic, antiglaucoma, antihyperlipidemic, antiasthmatics and cough suppressants, antifungal, antihelminthic, antibacterial, antiviral agents, drugs for heart failure, drugs acting on endocrine system
 8. Principles of chromatography, PCR, spectrophotometry and mass spectroscopy
 9. Pharmacodynamic assessment of drugs in human beings
 10. Computational tools in experimental pharmacology and pre-clinical research
 5. Evaluation of pharmacodynamics of drugs acting on the central nervous system in humans using a battery of psychomotor tests
 6. Evaluation of pharmacodynamics of drugs acting on the cardiovascular system in humans using the treadmill
 7. Evaluation of pharmacodynamics of drugs acting on the respiratory system in humans using spirometry
 8. Construction of dose-response curve of acetylcholine using isolated tissue preparations
 9. Determination of unknown concentration of acetylcholine or histamine using parallel assay methods like four or three-point bioassay
 10. Determination of pA2 of compounds using
 11. Determination of pharmacodynamic character of various drugs acting on the central nervous system in animals using
 - Elevated plus-maze
 - Photoactometer
 - Rotarod apparatus
 12. Determination of pharmacodynamic character of analgesics in animals using analgesiometer
 13. Determination of pharmacodynamic character of anti-epileptics using convulsimeter
 14. ADR reporting
 15. Evaluation of scientific literature
 16. Biostatistics
 17. Meta-analysis

PRACTICAL:

1. Determination of various pharmacokinetic parameters using excel for single and multi-compartmental kinetics
2. Determination of binding energy of a drug to its target by molecular docking
3. In-silico prediction of ADME of a compound
4. Determination of concentration of a drug in a biological matrix using HPLC or ELISA or spectrophotometry

TEACHING AND LEARNING METHODS

The minimum teaching schedule for the MD students shall incorporate the participation in the following:

1. Seminars- At least one per week, a minimum of 48 seminars. The presentation should be discussed and finalized with the faculty assigned as the moderator, at least a week prior. The presenter will be assessed by all the faculty and marks recorded in the logbook.

2. Journal club – Which will include critical appraisal of original research or important review article published in peer-reviewed national/international journals. The article should be circulated to all at least a week prior.
3. Lectures – Lectures in statistics and research methodology and other clinical pharmacology related topics will be conducted periodically. Students will be given assignments that they have to complete and submit.
4. Practicals - Pharmacology experiments will be demonstrated and the students have to practice and familiarize themselves with these experiments. The pharmacology experiments and procedures performed by the students should be recorded in the logbook. A practical record should also be maintained.
5. Modular Teaching - Participation in Undergraduate Modular Teaching in the subjects of Pharmacology and Therapeutics.

In addition, the student will also participate in

- Interdepartmental meetings between various clinical departments (Medicine, Dermatology, Neurology) and the Department of Pharmacology.
- Bed-side Clinics/Rounds – Routinely conducted for postgraduates in the various clinical departments, in which the student is posted.

ASSESSMENT

Examination on Research Methodology & Biostatistics

- Timing: End of 2nd Semester
- Total marks: 100
- Will be considered as an internal examination
- Candidate should pass to appear in Final examination
- No marks will be added to final/summative examination
- Will be conducted by Examination Cell in the month of June & December

Internal Examinations

- Timeline: End of the 3rd, 4th and 5th semester, pre-final (2 months before final examination).
- Marks distribution: Theory 100 marks, and practical with viva and
- logbook will carry 100 marks (Practical – 70, viva – 20, logbook – 10).
- The marks of the 4 internal examinations will be averaged to 100 each for theory and practical.

Assessment of progress

The student's performance will be recorded by the faculty of the department/laboratory where he/she has worked. The student will also maintain a daily log of his/her activities and this will be reviewed by the concerned faculty. The progress will be discussed with the student and his/her chief guide every 3 months. The chief guide will periodically monitor the progress of the student and sign on the logbook every quarter. The logbook will be countersigned by the chief head of the department prior to the final MD examination.

Summative assessment

This is expected to be in the form of a formal final examination having the following pattern

Final M.D. Examination (Pharmacology)

Examiners: At the end of 3 years, the candidates will undergo the final MD Examination spanning 2 days. Two internal and two external examiners will examine the candidates. The Head of the Department will be the convener cum internal Examiner.

Total marks: 1000 (including internal marks)

A. Theory papers (400 marks)

There will four theory papers (100 marks each) entitled:

Paper I - General pharmacological principles and allied sciences

Paper-II - Systemic pharmacology, chemotherapy and therapeutics

Paper III - Experimental pharmacology, screening of drugs and statistics

Paper IV - Clinical pharmacology and recent advances in pharmacology

B. Practical examination and viva (400 marks)

The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A* 200 marks	Longcase (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

* Students should pass (secure 50% marks) separately in Part A

Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

RECOMMENDED BOOKS

1. Brunton L, Knollman B, Hilal-Dandan R. Goodman and Gilman's The Pharmacological Basis of Therapeutics, 13th Edition: McGraw-Hill Education; 2017.
2. Daniel WW, Cross CL. Biostatistics: A Foundation for Analysis in the Health Sciences: Wiley; 2018.
3. DiPiro JT, Talbert RL, Yee GC, Matzke GR, Wells BG, Posey LM. Pharmacotherapy: A Pathophysiologic Approach: McGraw-Hill Education; 2008.
4. Friedman LM, Furberg C, DeMets DL. Fundamentals of Clinical Trials: Springer; 1998.
5. Hofmann A, Clokie S. Wilson and Walker's Principles and Techniques of Biochemistry and Molecular Biology: Cambridge University Press; 2018.
6. Jadad AR, Enkin MW. Randomized Controlled Trials: Questions, Answers and Musings: Wiley; 2008.
7. Katzung BG. Basic and Clinical Pharmacology 14th Edition: McGraw-Hill Education; 2017.
8. Lee BM, Kacew S, Kim HS. Lu's Basic Toxicology: Fundamentals, Target Organs, and Risk Assessment, Seventh Edition: CRC Press; 2017.
9. Shargel L, Yu ABC. Applied Biopharmaceutics & Pharmacokinetics, Seventh Edition: McGraw-Hill Education; 2015.
10. Vogel HG, Maas J, Gebauer A. Drug Discovery and Evaluation: Methods in Clinical Pharmacology: Springer Berlin Heidelberg; 2010.
11. Vogel HG, Vogel WH. Drug Discovery and Evaluation: Pharmacological Assays: Springer Berlin Heidelberg; 2013.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

GENERAL PHARMACOLOGICAL PRINCIPLES AND ALLIED SCIENCES

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe in detail the structure and molecular mechanisms of various types of G protein receptor. Enumerate the various G protein-coupled receptors in the cardiovascular system and describe their pharmacological significance. (8+12)
2. Describe the character of the dose-response curve. Enumerate the various parameters determined from it and its significance. (5+5)
3. Describe the renin-angiotensin system and its pharmacological significance. (10)
4. What is metabolomics? Explain its role in drug development. (10)
5. What is isobologram? Describe its use in determining the drug interactions. (10)
6. Describe the various pharmacokinetic parameters relevant for a drug undergoing two compartmental elimination kinetics when given intravenously. (10)
7. Describe the various online drug databases useful for clinical practice. (10)
8. Role of pharmacoepidemiology in pharmacotherapy. (10)
9. Enumerate the dopamine pathways in the central nervous system and its pharmacological significance. (10)

PAPER 2

SYSTEMIC PHARMACOLOGY, CHEMOTHERAPY AND THERAPEUTICS

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the pharmacotherapeutic management of ST-elevated myocardial infarction. (20)
2. Describe the management of Alzheimer's disease. (10)
3. What is the role of benzodiazepines in clinical practice? (10)
4. Write about the management of hospital-acquired pneumonia. (10)
5. Explain the pharmacotherapeutic management of Helicobacter pylori infection. (10)
6. What are tyrosine kinase inhibitors and their role in the management of various cancers? (10)
7. What is gene therapy? Describe the gene therapy approved for the management of eye disorder. (10)
8. Describe the pharmacotherapeutic management of acne. (10)
9. Pharmacotherapeutic management of the chronic obstructive pulmonary disease. (10)

PAPER 3

EXPERIMENTAL PHARMACOLOGY, SCREENING OF DRUGS AND STATISTICS

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the various pharmacodynamic models and the parameters associated with them in explaining the drug action. (20)
2. High throughput screening in drug discovery. (10)
3. Describe the various animal models used in the screening of antihypertensive drugs. (10)
4. What is alpha and beta error and how does it influence the sample size estimation? What are the various parameters which determine the sample size estimation and describe their association with the sample size estimation? (5+5)
5. Describe fragment-based drug discovery. (10)
6. Describe the principles of mass spectrometry. How does it differ from liquid chromatography? What are the advantages and disadvantages associated with mass spectrometry? (4+3+3)
7. Describe the process of simulation of clinical studies and its significance. (10)
8. Explain principal component analysis. (10)
9. Describe toxicokinetic studies in preclinical settings. (10)

PAPER 4

CLINICAL PHARMACOLOGY AND RECENT ADVANCES IN PHARMACOLOGY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the objective, composition, functioning and outcomes of the antimicrobial stewardship program. (20)
2. Describe the causality assessment in adverse drug reaction reporting. (10)
3. Explain the principles of non-inferiority trials. (10)
4. What is the missing data in a clinical trial? What are its types and relevance? What are the ways to handle the missing data in a clinical trial? (3+3+4)
5. What is the role of the principal investigator in clinical trials? (10)
6. Describe the development of biosimilars. (10)
7. What are the recent advances in the treatment of neurodegenerative disorders? (10)
8. What are the recent advances in the drugs acting on coagulation pathway? (10)
9. Describe pharmacoeconomic studies. (10)

YEAR-WISE ENTRUSTABLE PROFESSIONAL ACTIVITIES FOR M.D. (PHARMACOLOGY) RESIDENTS

S. No.	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year	
1	History taking and general physical examination	*	*	*	*	*	*	2	3	4	4	S, P, PG, I
2	Interpretation of common diagnostic tests	*	*	*	*	*		2	3	3	4	S, I
3	Discussing orders and prescriptions and giving the necessary instructions to the patients	*	*	*	*	*	*	2	3	4	4	S, P, PG, I
4	Clinical presentation of a case to the Professor and discuss t the provisional diagnosis/ results of the investigations/ care plan dose adjustment	*					*	2	2	3	4	S, PG, H
5	Using evidence-based medicine to improve patient care	*	*	*				1	2	3	3	S, I
6	Participating efficiently as a member of an inter-professional team	*	*			*	*	1	2	3	3	S, PG, H, I
7	Learning to use electronic medical records		*		*			1	2	3	4	S, PG, H, I
8	Develop prescribing policies, formularies and guidelines using available evidence.	*	*		*			1	2	2	3	S, H, I
9	Capable of planning, review and reconciliation of pharmacotherapy and suspected failure of drug therapy in conjunction with clinical colleagues	*	*			*	*	1	2	3	3	S, PG, H, I

S. No.	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year	
10	Carry out the calculation of drug doses based on various types of nomograms/ Carry out Calculation of the strength of an infusion based on the required rate of drug administration.	*	*	*				1	2	3	4	S, PG,H,I
11	Manage common and serious ADR, including anaphylaxis, appropriately. Use printed and electronic resources to identify and analyze unusual or uncertain ADR, and report ADR to appropriate authorities	*		*		*		1	2	3	3	S, P, PG,H,I
12	Knowing the Research Methodology/ Collecting data for the research and compiling them/ Analysis of the collected research data and writing a research paper	*	*	*		*		1	2	3	3	S,I
13	Screen potential subjects for inclusion/ exclusion criteria, and obtain valid informed consent prior to their recruitment in clinical research.	*				*		1	2	3	3	S,PG,H,I
14	Maintain records to the standard required by GCP	*				*		2	3	4	4	S, I
15	Operate and maintain analytical instruments like HPLC, ELISA reader, Spectrophotometer, ECG machine.				*	*		2	3	4	4	S, I
16	Participation in UG/PG clinical class/ seminar/ symposium /journal club etc	*		*		*		1	2	3	4	S, PG, I
17	Use of computational tools in research	*		*				1	1	2	3	S,PG,I
18	Use of lab animals in research	*		*				1	2	3	4	S,PG,I

Abbreviations:

MK: Medical knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I

The background of the page is a complex network diagram. It consists of numerous circular nodes of varying sizes, connected by thin, light-colored lines. The nodes are color-coded: yellow and orange at the top, green and teal in the middle, and blue and grey at the bottom. The overall effect is a dense, interconnected web of points and lines, suggesting a network or a molecular structure.

PHYSICAL MEDICINE AND REHABILITATION

MD in Physical Medicine and Rehabilitation

COURSE NAME

MD in Physical Medicine and Rehabilitation

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

OBJECTIVES

The overall objective is to impart a thorough and comprehensive training to a medical graduate so that at the end of this training he/she becomes a knowledgeable, skilled, and competent Physical Medicine and Rehabilitation specialist, capable of discharging his/her duties as expected under different settings, in an ethical manner. The student should be able to suspect, investigate, diagnose, confirm, evaluate, certify, treat, and rehabilitate if and when a person is suffering from a temporary or permanent limitation in function, disability, or restriction in participation; the student should be able to plan, prescribe, supervise and lead the execution of rehabilitation plan through an integrated, multi-disciplinary team involving various medical, nursing, allied health professionals such as therapists (occupational therapists, physiotherapists, speech therapists etc.), counsellors, and technicians (orthotic-prosthetic engineers/ technicians). The student should be able to interpret reports and plan research, teach medical and paramedical personnel, educate (1) the person with disability, (2) family, (3) rehabilitation team members and (4) the community. The student should be well versed with recent advances in the field, and with administrative, financial, ethical and legal aspects related to the speciality.

COURSE CONTENT

THEORY

The course contents for MD (Physical Medicine and Rehabilitation) is divided into four broad sections, covering four theory papers. However, a certain degree of overlapping may occur among different sections. The content would include the following:

Paper I

1. Basic Anatomy and Physiology of the Musculoskeletal (including Biomechanics), Urogenital, Cardio-pulmonary and nervous systems, etc.
 2. Basics of biochemical aspects of Calcium and Vit. D metabolism, osteoporosis, diabetes mellitus etc.
 3. Basic Pathological processes causing diseases and disabilities, healing etc.
 4. Basic principles of Pharmacology as applied to the conditions encountered in Physical Medicine and Rehabilitation.
 5. Basic principles of diagnostic modalities as applied to Physical Medicine and Rehabilitation.
 6. Philosophy, history, scope and need of Physical Medicine and Rehabilitation.
 7. Basic concepts in Physical Medicine and Rehabilitation - definitions, rehabilitation team, team members, scope, role and responsibilities of different members etc.
 8. Principles of evaluation and rehabilitation management of social problems
 9. Principles of evaluation and rehabilitation management of vocational problems
 10. Organisation and Administration of Physical Medicine and Rehabilitation Services.
 11. Disability process. Impairment, disability, International Classifications
 12. Disability Prevention- levels and examples
 13. Epidemiology of disability, magnitude, causes, changing trends etc.
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14. Gait Analysis - Terminology, types, Clinical Applications
 15. Electrodiagnostic Medicine - basic principles, clinical methods, interpretation etc.
 16. Outcome Measures in Physical Medicine and Rehabilitation
 17. Impairment Rating and Disability Evaluation

Paper-II

1. Therapeutic exercises - principles, types, indications, contraindications
2. Physical agents/modalities - principles, types, indications, contra-indications, precautions.
3. Manipulation, traction, massage - principles, types, indications, contra- indications, precautions.
4. Electrical stimulation - principles, types, indications, contra-indications, precautions.
5. Principles and scope of Occupational Therapy
6. The rationale of A.D.L. (Activities of Daily Living) in various conditions
7. Integrative Medicine and Physical Medicine and Rehabilitation
8. Upper limb orthotic devices including splints- principles, types, materials and indications,
9. Lower limb orthotic devices including footwear modifications- principles, types, materials and indications
10. Spinal orthoses - principles, types, materials and indications
11. Upper limb prosthetics and amputee rehabilitation,
12. Lower limb prosthetics and amputee rehabilitation
13. Mobility aids, wheelchairs and seating systems,
14. Low back pain and Physical Medicine and Rehabilitation
15. Musculoskeletal trauma and Physical Medicine and Rehabilitation

16. Holistic Rehabilitation of persons suffering from:

- Arthritis, including Rheumatoid Arthritis, Osteoarthritis, Ankylosing Spondylitis etc.
- Spinal deformity
- Neck Pain, Shoulder Pain etc.
- Osteoporosis
- Sports Injury
- Burns Injury
- Spinal Cord Injury (traumatic and non-traumatic)

17. Rehabilitation of persons:

- with obesity, dyslipidemia etc.
- after Arthroplasty
- after POP cast, Fracture treatment, Surgical intervention

18. Principles of Sports Medicine, diagnosis, evaluation, prevention, and management of sports injuries

19. Basic principles of rehabilitative surgeries such as deformity correction in poliomyelitis, cerebral palsy, clubfoot, contractures, revision of amputation stump, closure of pressure sore, tendon transfers etc.

Paper-III

1. Holistic Rehabilitation of persons suffering from:

- Plexus or Nerve Injury
 - Traumatic Brain Injury
 - Stroke
 - Parkinsonism, Multiple sclerosis, Ataxia, neurodegenerative disorders etc.
 - Neuropathy, Bell's Palsy etc.
 - Hansen's Disease
 - Diseases of Muscles e.g. myopathy, motor neuron disease, myasthenia gravis etc.
 - Cerebral Palsy
 - Spasticity
 - Poliomyelitis and its sequelae
-

-
- Cardiovascular Disease e.g. CAD, MI, CABG Surgery, Angioplasty, Cardiac transplantation etc.
 - Pulmonary Disease e.g. COPD, Bronchiectasis, Cystic fibrosis etc.
 - Cancer
 - Swallowing disorder
 - Bladder dysfunction
 - Bowel dysfunction
 - Vertigo
 - HIV/AIDS
 - Chronic Pain
 - Neural tube defects like meningomyelocele and hydrocephalus etc.
2. Rehabilitation of persons:
 - after Organ Transplantation
 - in ICU setting
 3. Pediatric Rehabilitation including children with Autism Spectrum Disorders, learning disabilities, multiple disabilities etc.
 4. Geriatric Rehabilitation
 5. Principles of evaluation and rehabilitation management of persons with:
 - visual impairment
 - mental retardation
 - hearing /speech impairment
 - psychological problems or mental illness
 6. Medical/ surgical Emergencies in Physical Medicine and Rehabilitation
 7. Sexuality and Disability
4. Schemes and Benefits extended to persons with disabilities by the Govt.
 5. Barrier-free Environment and access related issues
 6. Computers in Physical Medicine and Rehabilitation
 7. Assistive Technology related to Physical Medicine and Rehabilitation
 8. Recent Advances related to Physical Medicine and Rehabilitation
 9. Ethical aspects in rehabilitation
 10. Research methodology

PRACTICAL

An indicative list of Competencies/ Basic and Advanced Skills:

First Year

1. External/ Non-invasive Interventions (First six month)
 - CPR, ABLIS
 - Nebulization, Inhaler administration
 - Manipulation, Ponsetti technique
 - Massage, Credit' manoeuvres
 - Postural drainage
 - Manual lymphatic drainage
 - Skin Traction
 - Dressing
 - Bandaging
 - Transfer activities
 - Self-help basic ADLs
 - Gait training
 - Crutch gait training
 - Wheelchair activities/ manoeuvres
 - POP casting
 - Therapeutic exercises

Paper-IV

1. Evidence-based Medicine and Physical Medicine and Rehabilitation
2. Legislation in relations to disability- National and International
3. Functional evaluation, Impairment rating, disability evaluation and certification including

- Neuro-Developmental Therapy, Proprioceptive Neuromuscular Facilitation
- Counselling
- Behaviour therapy
- Aquatic therapy
- Electrical stimulation, FES
- Strapping
- Splinting
- Orthoses
- Immediate Post Op Prosthesis
- Physical Agents and Electrotherapeutic Equipment like Cold, Heat, Diathermy, Ultrasound, LASER etc.

2. Invasive Interventions (2nd Six Month)

- Peri-articular injections
- Tendon-sheath injections
- Intra-articular injections including visco-supplementation
- Joint aspiration/ injections
- Bursa aspiration/ injections
- Ganglion decompression
- Trigger point injections
- Spinal injections e.g. Epidural injection
- Botulinum toxin injections
- Platelet rich plasma injections
- Prolotherapy
- Ultrasound/ image guided injections
- Penile injections
- Facet joint injections
- SI joint injections
- TM joint injections
- Nascent Nitrogen, Ozone or CO₂ intra-particular/ intra-discal instillation

Second-year

1. Blocks (Third Six months)

- Nerve Blocks e.g. Phenol, Lignocaine
- Motor point blocks

- Regional nerve blocks
- Stellate ganglion blocks
- Coeliac plexus nerve blocks
- Installations:
Intravesical instillation of anticholinergics

2. Diagnostic Interventions (Third Six months)

- EMG, NCV and other electrodiagnostic tests
- Musculoskeletal Ultrasound
- Urodynamic Evaluations
- Instrumental Gait Analysis
- Foot pressure analysis
- Dynamic posturography
- Trans cutaneous oxymetry
- Tests for autonomic dysfunction
- Cutaneous Thermography
- Spondylometry
- Body composition analysis
- Instrumental ADL assessment
- Dynamometry
- Goniometry
- Doppler test
- Exercise Testing
- Pulmonary Function Testing
- Isokinetic Exercise Testing
- Driving and work simulation
- Bodyweight supported treadmill testing/ training
- Robotics- testing/ training
- Audiometry
- Biofeedback
- Videofluoroscopic evaluation of swallowing
- Modified barium swallow
- Cine esophagogram
- Palato-pharyngeal analysis (image-guided swallow analysis)
- Fibreoptic endoscopy examination of swallow

- Instrumental Swallowing assessment
- Ultrasound Evaluation of Swallowing
- Intraluminal pharyngeal manometry
- Electromagnetic articulography
- Oesophageal manometry
- Hyperbaric oxygen therapy
- Vacuum-Assisted Closure (VAC)
- Robotic Interactive Therapy
- Virtual Reality
- Ambient Intelligence
- Transcranial Magnetic Stimulation
- Optokinetic Stimulation

3. Surgical Interventions: (Fourth six months)

- Debridement of pressure sores
- Release of compressive neuropathies, repositioning of nerves
- Tenotomy- subcutaneous, open
- Soft tissue release
- Tendon lengthening
- Tendon transfers
- Release of pulleys in hand
- Joint stabilization/ Arthrodesis
- Excision arthroplasty
- Insertion of wires, K wire, pins and rods
- External fixator – Ilizarov, JESS
- Osteotomies e.g. for Genu valgum / varum, hip-related problems etc.
- Amputation/ Revision amputation
- Anaesthetic foot surgeries e.g. TA lengthening, ulcer management
- CTEV -STR, bony correction
- Synovectomy, capsuloplasty, repositioning/ repair of tendons etc. in rheumatoid hand
- Excision of ganglion
- Skin grafting
- Skin flaps rotation

- Contracture release like at hip, knee, elbow, neck (sternomastoid tumour), hand
- Congenital anomalies correction
- Urethral Dilatation
- Urethral Repair
- Sphincterotomy
- Sphincter Stent Prosthesis
- Balloon Dilation
- Penoscrotal Fistula repair
- Sacral Anterior Root Stimulation
- Spinal Cord Stimulation

Third Year

1. Scopies (Fifth six month)

- Arthroscopy- diagnostic and therapeutic
- Cystoscopy in neurogenic bladder
- Proctoscopy

2. Advanced Interventions (Fifth six Months)

- Intra-thecal pump
- Neuro-prosthetic implants
- Osseointegration
- Stem cells therapy

3. Miscellaneous: (Last/Six six months)

- Endotracheal suction
- Endo-Tracheal Intubation
- Nasogastric tube insertion
- Flatus tube insertion
- Catheterization including Supra Pubic Catheterization
- Digital evacuation
- Stoma care
- Central venous line insertion and care
- Insertion of the intercostals drainage tube
- Venti mask/ nasal prong
- Arterial blood sample
- Monitoring of vital signs

- Venesection
- Incision and drainage of abscess
- Pulse oxymetry
- Vital stim for dysphagia management
- Tourniquet application
- Brain death identification

TEACHING AND LEARNING METHODS

Theoretical Methodology

1. Symposia/Seminars:

The postgraduate student would be required to present topics to the combined group of teachers and students. A free discussion would be encouraged in these activities. The topics of the symposia/seminars would be given to the residents with the dates for presentation. The topics for Seminars could include any of the following: Gait Analysis, Spasticity, Pressure Sores, Spinal Orthoses, Hand Splints, Assistive Technology, Psycho-Social-Vocational Aspects, Cardiac Rehabilitation, Pulmonary Rehabilitation, Neuro-developmental Techniques, Post-Polio Syndrome, Cognitive Rehabilitation, Prosthetic Feet, PTB Prosthetic, Prosthetic Terminal Devices, CAD-CAM, FES, Spinal Deformities, Rehabilitation after Arthroplasty, Epidemiology of Disability, Barrier-free Environment, Ethical Aspects, Legislation related to Disability and Rehabilitation, Community-Based Rehabilitation, Leprosy Rehabilitation, Sexuality and Disability, Rehabilitation related to HIV/AIDS, Stem Cell Therapy in Rehabilitation, Geriatric Rehabilitation, Sports Injuries Rehabilitation, Rehabilitation after Organ Transplantation, Pain Management, Analgesics, NSAIDs, DMARDs, Disability Evaluation, Interventions in Physical Medicine and Rehabilitation etc.

2. Journal Club:

This should be a regular/weekly activity. The postgraduate student would be assigned / allowed to chose an article from amongst the recent publications from the list of

recommended journals, present, summarise, and discuss the published article critically. The contributions made by the article in furtherance of the scientific knowledge as well as limitations (if any) should be highlighted.

3. Practical and Clinical Training:

The student would be attached to a Faculty member to be able to pick up methods of history taking and examination in rehabilitation practice. During this period, the student would also be oriented to the common problems that present in the OPD or Wards/ICUs or are encountered in the community. The student would be supervised by Senior Residents and Faculty members.

Bedside:

The student would work up cases; learn the management of cases by a discussion with the senior residents and faculty of the department. She/he would be trained in management of in-patients including performing certain procedures such as debridement, Plaster cast application, traction, catheterization, intubation etc.

Rehabilitative Interventions and Surgery:

The student would be provided with an opportunity, as far as possible, to observe, learn, assist and once proficient, perform rehabilitative surgical operations such as for correction of deformities in polio, cerebral palsy, amputation, clubfoot, pressure sore etc. including post-operative care with the assistance of the Senior Residents and/or under the direct supervision of a Faculty member. The student would also be oriented to the various sections/units in a comprehensive rehabilitation set up (such as occupational therapy, orthotics prosthetics, physiotherapy, social works, clinical psychology, vocational guidance/counseling, educational institution and Non-Governmental Organization in the disability sector etc.) and be well informed about and demonstrated the various equipments/materials/methods used there, and the scope, role and responsibilities of different members of a rehabilitation team.

4. Training in Research Methodology

The student would carry out the research project and write a thesis. Thesis topic would be finalized by the student in consultation with the Guide and Co-Guides, as per the norms duly approved by the Ethics Committee of the Institution. He would also be given exposure to partake in the research projects going on to learn their planning, methodology and execution to learn various aspects of research. The student would be given exposure to partake in the research projects going on to learn their planning, methodology and execution to learn various aspects of research.

5. Teaching Skills

The postgraduate students shall be required to participate in the teaching and training programme of undergraduate students and interns.

6. Continuing Medical Education Programmes (CME)

At least two CME programmes should be attended by each student in 3 years.

7. Conferences

The student should attend courses, conferences and seminars relevant to the speciality.

8. Case presentation, case workup, case handling/management (once a week)

9. Attending clinical grand rounds / clinic-pathological conference

The postgraduate students are encouraged to attend lectures and grand rounds of other clinical and basic science departments of the hospital.

10. Paper/poster presentation:

A post-graduate student would be required to present one poster presentation, to read one paper at a national/state conference and to present one research paper which should be published/accepted for publication/sent for publication during the period of

his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.

11. A logbook should be maintained recording the duration of posting, the period of absence if any, skills performed, and remarks if any by the teacher/faculty member. The logbook should also record journal clubs, seminars attended and partaken as well as undergraduate teaching activities the postgraduate student has participated and should be signed by the faculty in charge.

12. The department should encourage e-learning activities.

During the training programme, patient safety is of paramount importance, therefore skills are to be learnt initially on the models, later to be performed under supervision followed by performing independently; for this purpose, provision of surgical skills laboratories in medical colleges is mandatory.

DEPARTMENTAL TRAINING SCHEDULE & POSTING OF RESIDENTS :

The training program would focus on knowledge, skills and attitudes (behaviour), all essential components of education. It is being divided into theoretical, clinical and practical into all aspects of the delivery of the rehabilitative care, including methodology of research and teaching.

1. **Theoretical:** The theoretical knowledge would be imparted to the candidates through discussions, journal clubs, symposia and seminars. The students are exposed to recent advances through discussions in journal clubs. These are considered necessary in view of inadequate exposure to rehabilitation medicine in the undergraduate curriculum. Knowledge in applied basic and para-clinical and clinical subjects would be imparted during clinical case discussion in the OPD, speciality clinics and bedside.

-
2. **Symposia:** Trainees would be required to present a minimum of 20 topics based on the curriculum in a period of three years to the combined class of teachers and students. A free discussion would be encouraged in these symposia. The topics of the symposia would be given to the trainees with the dates for presentation. A suggestive, not exhaustive, list of topics is given below:
- Analgesics and NSAIDs
 - Disease-Modifying Anti-Rheumatic Drugs
 - Medicines to reduce spasticity
 - Newer medicines including Biological agents used in Rheumatoid Arthritis and Ankylosing Spondylitis
 - Human walking- normal and deviations
 - Biomechanics of hip, knee, shoulder, hand, foot and spine
 - Calcium and Vitamin D Metabolism in relation to rickets/ osteomalacia, Osteoporosis
 - Neuro-muscular junction and conduction
 - Rheumatoid Arthritis and other types of arthritis
 - Spinal Orthoses
 - Hand Splints and Wrist-Hand Orthoses
 - P.T.B. Prosthesis
 - Above-Knee Prosthesis
 - Pressure Sores
 - Spasticity
 - Bell's Palsy/ Peripheral Nerve Injuries
 - Back Pain including pain due to Disc Prolapse
 - Muscular Dystrophy
 - Neurodevelopmental Techniques
 - Cardiac Rehabilitation
 - Pulmonary Rehabilitation
 - Stroke Rehabilitation
 - Post head injury Rehabilitation
 - Poliomyelitis and Post-polio syndrome
 - Rehabilitation in Parkinsonism and other movement disorders
 - Scoliosis and other spinal deformities
 - Osteoarthritis- e.g. of Knee joints
 - Rehabilitation after arthroplasty
 - Extent and causes of Disability problem in India (Epidemiology)
 - Rehabilitation of persons affected with Leprosy (Hansen's Disease)
 - Rehabilitation of a patient with HIV infection/ AIDS
 - Sports Injury Rehabilitation
 - Diabetic/ Anaesthetic Foot
 - Disability Concepts
 - Community-Based Rehabilitation (CBR)
 - Legislation in the Disability Sector
 - Autism Spectrum Disorders
 - Cancer Rehabilitation
 - Cerebral Palsy
 - Rehabilitation after burns injury
 - Speech and language pathology
 - Cochlear implants
 - Hearing Aids
 - Neurogenic Bladder-Bowel
 - Geriatric Rehabilitation
 - Sexuality and Disability
 - Spinal cord injury rehabilitation
 - Amputee rehabilitation
 - ICF (International Classification of Functioning, Disability and Health)
 - Research in Rehabilitation
 - Ethics in Rehabilitation
 - Chronic Pain
 - Rehab management of patients with lymphoedema
 - Rehabilitation in Trauma care etc.
3. **Clinical:** The trainee would be attached to a faculty member to be able to pick up methods of history taking, examination, prescription writing and management in rehabilitation practice.
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4. **Bedside:** The trainee would work up cases, learn the management of cases by a discussion with the faculty of the department.

5. **Surgical and other procedures:** The trainee would be provided with an opportunity *to learn, assist and perform* operations commonly required for rehabilitation of persons with a disability, including post-operative care under the direct supervision of a PMR faculty member. Departments of PMR should be encouraged and supported to build capacity for this training in-house, if required, as far and as soon as possible.

An indicative list of common rehabilitative surgical procedures and other techniques/ interventions/ procedures is given here. Please also see sub-section 11 below.

- Plaster of Paris techniques
- Joint aspirations
- Intra-articular injections
- Nerve Blocks and Chemodenervation
- Botulinum toxin injection
- Peripheral and Neuraxial blocks including Epidural Injections etc.
- Rehabilitative surgery in Post Polio residual Paralysis and other paralytic disorders
- Club Foot correction
- Corrective surgeries in acquired and congenital common musculoskeletal disorders seen in PMR practice with deformities/ contractures
- Surgical Procedures in Spinal Injuries and Spinal Cord Lesions
- Surgical procedures required in the rehabilitation of persons with Cerebral Palsy, Hemiplegia
- Cystoscopy, cystolitholapaxy etc. in Neurogenic bladders
- Amputations- revisions
- Skin grafting and Pressure sore surgery
- Neuro-prosthetic implants etc.

6. **Journal Clubs:** This would be a weekly academic exercise. A list of suggested Journals is given towards the end of this document.

The candidate would summarize and discuss the scientific article critically. A faculty member will suggest the article and moderate the discussion, with participation by other faculty members and resident doctors. The contributions made by the article in furtherance of the scientific knowledge and limitations, if any, will be highlighted.

7. **Impairment Rating, Disability evaluation and certification-** candidates will learn about the background, need existing laws, guidelines and methods of impairment rating, disability evaluation and certification etc. Candidates will be trained to practice this after having learnt during seminars/ postings.

8. Training shall also include preparation of study materials for medical and paramedical undergraduate students, for other rehabilitation team members, and for patients, caregivers or community groups.

9. **Research:** The student would carry out the research project and write a thesis/ dissertation in accordance with NBE guidelines. He/ she would also be given exposure to partake in the research projects going on in the departments to learn their planning, methodology and execution so as to learn various aspects of research.

10. **Rotation Posting:** During the tenure of 3 years training, the candidate should be posted on rotation in Orthopedics, Internal Medicine, Pediatrics, Neurology, Neurosurgery, Cardiology and Cardiothoracic Surgery, Pulmonary/ Respiratory Medicine, Burns and Plastic Surgery, Psychiatry, Urology, Accident & Emergency, Intensive Care Unit, HDU (High Dependency Unit), ENT, Ophthalmology departments in the same institution or other institutions, for a total period of 6 months, including one elective posting, for a period of 15 days, should be done in the field as per the choice of the candidate. The duration of posting in different departments will be 15 days to 1

month, as per the availability of different services and mutual agreement between heads of the departments/ institutions. During this rotation posting the trainee should be posted to the High Dependency Unit for at least 30 days in order to acquire skills necessary for managing patients in sub-acute stage.

ASSESSMENT

Examination on Research Methodology & Biostatistics

- Timing: End of 2nd Semester
- Total marks: 100
- Will be considered as an internal examination
- Candidate should pass to appear in Final examination
- No marks will be added to final/summative examination
- Will be conducted by Examination Cell in the month of June & December

Internal Examinations

Timeline: End of the 3rd, 4th and 5th semester, pre-final (2 months before final examination).

Marks distribution:

Theory 100 marks, and practical with viva and logbook (Practical -70, viva -20, logbook -10).

The marks of the 4 internal examinations will be averaged to 100 each for theory and practical.

Summative/Final Examinations

Theory 4 papers (100 marks each)

Question Paper Format One Long question -20 marks

Eight Short question/notes - 8 x 10 = 80 marks

Total marks in theory: 500 marks

Theory papers in the final examination -400 mark, Average of 4 internal examination -100 marks

Practical examination

Total marks: 500

Practical and viva in the final examination -400 marks Average of 4 internals (practical + viva + logbook) examinations -100 marks

The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A* 200 marks	Longcase (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/ Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

* Students should pass (secure 50% marks) separately in Part A

Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

Thesis Evaluation

The student should submit the completed thesis 6 months before the final examination.

Plagiarism check: If more than 20% plagiarism is detected, the student will be asked to re-write and re-submit. Plagiarism checking will be done before the thesis is bound.

The thesis will be sent to one external evaluator for approval.

RECOMMENDED BOOKS

1. Agarwal A. Essentials of Prosthetics and Orthotics: Jaypee Brothers Medical Publishers; 2013.
2. Andrews JR, Gary L. Harrelson EDATC, Kevin E. Wilk PTDPT. Physical Rehabilitation of the Injured Athlete: Expert Consult - Online and Print: Elsevier Health Sciences; 2012.
3. Apley AG, Solomon L. Apley's System of Orthopedics and Fractures: Butterworths; 1982.
4. Azar FM, Canale ST, Beaty JH. Campbell's Operative Orthopedics: Elsevier Health Sciences; 2016.
5. Basmajian JV. Therapeutic Exercise: Williams & Wilkins; 1984.
6. Bleck EE. Orthopaedic management in cerebral palsy: Mac Keith; 1987.
7. Brotzman SB, Wilk KE. Handbook of Orthopaedic Rehabilitation: Mosby, Elsevier; 2007.
8. Campagnolo DI, Kirshblum S, Nash MS, Heary RF, Gorman PH. Spinal Cord Medicine: Wolters Kluwer Health; 2011.
9. Cifu DX. Braddom's Physical Medicine and Rehabilitation: Elsevier Health Sciences; 2015.
10. Cristian A. Patient Safety in Rehabilitation Medicine, An Issue of Physical Medicine and Rehabilitation Clinics: Elsevier Health Sciences; 2012.
11. D JKM. Electrodiagnosis in Diseases of Nerve and Muscle: Principles and Practice: Oxford University Press; 2001.
12. Das S. A Manual on Clinical Surgery: Including Special Investigations and Differential Diagnosis: the Author; 2004.
13. DeLisa JA, Gans BM, Walsh NE. Physical Medicine and Rehabilitation: Principles and Practice: Lippincott Williams & Wilkins; 2005.
14. Demeter SL, Andersson G. Disability Evaluation: Mosby; 2003.
15. Dionyssiotis Y. Essentials of Spinal Cord Injury Medicine: IntechOpen; 2018.
16. Downey JA, Myers SJ, Gonzalez EG. The Physiological Basis of Rehabilitation Medicine: Elsevier Science; 2013.
17. Field-Fote E. Spinal Cord Injury Rehabilitation: F.A. Davis; 2009.
18. Frontera WR, Silver JK, Rizzo TD. Essentials Physical Medicine and Rehabilitation E-Book: Musculoskeletal Disorders, Pain, and Rehabilitation: Elsevier Health Sciences; 2018.
19. Glynn M. Hutchison's Clinical Methods : An Integrated Approach to Clinical Practice, 23/e: Elsevier Health Sciences; 2012.
20. Harvey RL, Stein J, Carolee J. Winstein PPT, Wittenberg G, Zorowitz RD. Stroke Recovery and Rehabilitation, 2nd Edition: Springer Publishing Company; 2014.
21. Helander E. Prejudice and Dignity: An Introduction to Community-based Rehabilitation: United Nations Development Programme, Division for Global and Interregional Programmes; 1993.
22. Helander E, Organization WH. Training in the Community for People with Disabilities: Training package for a family member of a person who has difficulty moving: World Health Organization; 1989.
23. Herdman S. Vestibular Rehabilitation: F.A. Davis; 2007.

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MODEL SAMPLE QUESTION PAPERS

PAPER 1

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the biomechanics of Hip joint and gait deviations due to pathology around hip. (20)
2. Discuss the role of obturator neurectomy in spasticity management and anatomy. (10)
3. Discuss the role of various diagnostic studies in evaluation of acute stroke. (10)
4. Describe the bursas around knee joint and its clinical significance. (10)
5. What is platelet rich plasma? Describe its preparation and application in musculoskeletal diseases. (10)
6. What is stem cell therapy? Discuss its role in Rehabilitation Medicine. (10)
7. Describe the muscle Quadratus Lumborum – origin, insertion, nerve supply, testing and strengthening protocol. (10)
8. Discuss about Calcitonin and its role in management of Osteoporosis. (10)
9. Discuss the role urodynamic studies for evaluation of bladder in spinal cord injury. (10)

PAPER 2

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Discuss management including differential diagnosis of a 45-year-old female patient with anterior knee pain and swelling of right knee of 12 days' duration. (20)
2. What is Osteoporosis? Discuss various markers and investigation procedures in Osteoporosis. (10)
3. Discuss the swallowing dysfunction and its evaluation technique in a patient having stroke of 2 weeks' duration (10)
4. Describe the various psychometric parameters used to evaluate tests and measures used in Rehabilitation Medicine (10)
5. Discuss hand function deficits & its assessment in patients with Leprosy. (10)
6. Discuss the role of Pedobarography in Rehabilitation Medicine. (10)
7. What are the core muscles? Discuss core muscle strengthening exercises for back pain. (10)
8. Discuss functional evaluation for measuring outcomes for brain injury rehabilitation. (10)
9. Discuss the role of electrical stimulation in muscle re-education and training in nerve injury rehabilitation and in stroke rehabilitation (10)

PAPER 3

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. A 22 year old female having cerebral palsy came on a wheelchair to your OPD. Describe the important issues/ problem areas you would anticipate and look for while taking history and examination (20)
2. Discuss the role of customized foot orthotics in management of foot problems. (10)
3. Discuss the management of shoulder subluxation in a patient with right hemiplegia. (10)
4. Discuss the role of biologicals in rheumatoid arthritis. (10)
5. Discuss the bowel management in spinal cord injury. (10)
6. Describe the pathophysiological basis of fibromyalgia syndrome. (10)
7. Describe the various neuromuscular issues causing disability in a patient with Human immunodeficiency virus. (10)
8. Enumerate different types of prosthetic feet and discuss their salient features. (10)
9. Discuss the role of counselling of parents of child with Duchene Muscular Dystrophy. (10)

PAPER 4

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Discuss the International Classification of Functioning, Disability and health (ICF) based assessment in Spinal Cord Injury. (20)
2. Discuss the role of transcranial magnetic stimulation in neuro-rehabilitation. (10)
3. Describe the robotic in upper extremity rehabilitation (10)
4. What is neural prosthesis ? Discuss its role in neuro-rehabilitation. (10)
5. Discuss the role of hyperbaric oxygen therapy in rehabilitation practice. (10)
6. Discuss the Rights of Persons with Disability Act 2016, India. (10)
7. Discuss the physiatrist interventions for treatment of pain arising from spinal facet joints. (10)
8. What are the recent additions in Disability Assessment guidelines 2018? (10)
9. What is neuroplasticity? Discuss its role in stroke recovery (10)

ENTRUSTABLE PROFESSIONAL ACTIVITIES

S. No.	EPA	Competency Domain								Level of Competency			MSF
		MK	PC	PBLI	SBP	P	ICS	Day of Residency	End of I year	End of II year	End of III year		
1	Should be able to perform CPR, ABLIS	+	+	+	+	+	+	+	L II	L IV	L V	S, PG, I	
2	Should be able to demonstrate Nebulization, Inhaler administration	+	+	+	+	+	+	+	L II	L IV	L V	S, PG, I	
3	Should be able to demonstrate Manipulation, Ponsetti technique	+	+	+	+	+	+	+	L II	L IV	L V	S, PG, I	
4	Should be able to demonstrate Massage, credes' maneuvers, Postural drainage, Manual lymphatic drainage	+	+	+	+	+	+	+	L II	L IV	L V	S, PG, I	
5	Should be able to perform skin traction, dressing & bandaging	+	+	+	+	+	+	+	L II	L III	L IV	I, PG, S	
6	Should be able to demonstrate transfer activities, self-help basic ADLs	+	+	+	+	+	+	+	L I, II	L III	L IV	S, PG, I, H	
7	Should be able to demonstrate Gait training, Crutch gait training, Wheelchair activities/ manoeuvres	+	+	+	+	+	+	+	L I, II	L III	L IV	S, PG, I, H	
8	Should be able to perform routine POP casting	+	+	+	+	+	+	+	L I	L II	L III	S, PG, I, H	
9	Should be able to demonstrate Therapeutic exercises, Neuro Developmental Therapy, Proprioceptive Neuromuscular Facilitation	+	+	+	+	+	+	+	L I	L II	L III	S, PG, I, H	
10	Should be able to conduct counselling & behaviour therapy	+	+	+	+	+	+	+	L I	L II	L III	S, PG, I	
11	Should be able to demonstrate Aquatic therapy	+	+	+	+	+	+	+	L I, II	L III,	L IV	S, PG, I, UG	
12	Should be able to demonstrate Electrical stimulation, FES and Strapping	+	+	+	+	+	+	+	L I	L I	L II	S, PG, I, UG	

S. No.	EPA	Competency Domain								Level of Competency			MSF
		MK	PC	PBLI	SBP	P	ICS	Day of Residency	End of I year	End of II year	End of III year		
13	Should be able to write prescription of splinting, orthoses and Immediate Post Op Prosthesis	+	+	+	+	+	+	+	+	L II	L III	L IV	S, PG, I
14	Should be able to use Physical Agents and Electrotherapeutic Equipments like Cold, Heat, Diathermy, Ultrasound, LASER etc.	+	+	+	+	+	+	+	+	L II	L III	L IV	S, PG, I, H
15	Should be able to perform Peri-articular injections	+	+	+	+	+	+	+	+	L II	L III	L IV	S, PG, I, H
16	Should be able to perform Tendon-sheath injections	+	+	+	+	+	+	+	+	L II	L III	L IV	S, PG, I, H
17	Should be able to perform Intra-articular injections including visco-supplementation	+	+	+	+	+	+	+	+	L II	L III	L IV	S, PG, I, H
18	Should be able to perform Joint aspiration/ injections, Bursa aspiration/ injections	+	+	+	+	+	+	+	+	L II	L III	L IV	S, PG, I, H
19	Should be able to perform Ganglion decompression	+	+	+	+	+	+	+	+	L II	L III	L IV	S, PG, I, H
20	Should be able to perform Trigger point injections Spinal injections e.g. Epidural injection	+	+	+	+	+	+	+	+	L II	L III	L IV	S, PG, I, H
21	Should be able to perform Botulinum toxin injections	+	+	+	+	+	+	+	+	L II	L III	L IV	S, PG, I, H
22	Should be able to perform Platelet rich plasma injections	+	+	+	+	+	+	+	+	L II	L III	L IV	S, PG, I, H
23	Should be able to perform Prolotherapy	+	+	+	+	+	+	+	+	L II	L III	L IV	S, PG, I, H
24	Should be able to perform Ultrasound/image guided injections	+	+	+	+	+	+	+	+	L II	L III	L IV	S, PG, I, H
25	Should be able to perform Penile injections	+	+	+	+	+	+	+	+	L II	L III	L IV	S, PG, I, H

S. No.	EPA	Competency Domain								Level of Competency			MSF
		MK	PC	PBLI	SBP	P	ICS	Day of Residency	End of I year	End of II year	End of III year		
26	Should be able to perform Facet joint injections	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
27	Should be able to perform SI joint injections	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
28	Should be able to perform TM joint injections	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
29	Should be able to perform Nascent Nitrogen, Ozone or CO2 intra-particular/ intra-discal instillation	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H
30	Should be able to perform Nerve Blocks e.g. Phenol, Lignocaine	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
31	Should be able to perform Motor point blocks	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
32	Should be able to perform Regional nerve blocks	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H
33	Should be able to perform Stellate ganglion blocks	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H
34	Should be able to perform Coeliac plexus nerve blocks	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H
35	Should be able to perform Intravesical instillation of anti-cholinergics	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H
36	Should be able to perform, Ponsetti technique	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H
37	Should be able to perform EMG, NCV and other electrodiagnostic tests	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
38	Should be able to use Musculoskeletal Ultrasound	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
39	Should be able to perform Urodynamic Evaluations	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H

S. No.	EPA	Competency Domain									Level of Competency			MSF
		MK	PC	PBLI	SBP	P	ICS	Day of Residency	End of I year	End of II year	End of III year			
40	Should be able to perform Instrumental Gait Analysis	+	+	+	+	+	+	+	+	+	LII	LIII	LIV	S, PG, I,H
41	Should be able to perform Foot pressure analysis	+	+	+	+	+	+	+	+	+	LII	LIII	LIV	S, PG, I,H
42	Should be able to perform Dynamic posturography	+	+	+	+	+	+	+	+	+	LII	LIII	LIV	S, PG, I,H
43	Should be able to perform Trans cutaneous oxymetry	+	+	+	+	+	+	+	+	+	LII	LIII	LIV	S, PG, I,H
44	Should be able to perform Tests for autonomic dysfunction	+	+	+	+	+	+	+	+	+	LII	LIII	LIV	S, PG, I,H
45	Should be able to perform Cutaneous Thermography	+	+	+	+	+	+	+	+	+	LII	LIII	LIV	S, PG, I,H
46	Should be able to perform Spondylometry	+	+	+	+	+	+	+	+	+	LII	LIII	LIV	S, PG, I,H
47	Should be able to perform Body composition analysis	+	+	+	+	+	+	+	+	+	LII	LIII	LIV	S, PG, I,H
48	Should be able to perform Instrumental ADL assessment	+	+	+	+	+	+	+	+	+	LII	LIII	LIV	S, PG, I,H
49	Should be able to perform Dynamometry	+	+	+	+	+	+	+	+	+	LII	LIII	LIV	S, PG, I,H
50	Should be able to perform Goniometry	+	+	+	+	+	+	+	+	+	LII	LIII	LIV	S, PG, I,H
51	Should be able to perform Doppler test	+	+	+	+	+	+	+	+	+	LII	LIII	LIV	S, PG, I,H
52	Should be able to perform Exercise Testing	+	+	+	+	+	+	+	+	+	LII	LIII	LIV	S, PG, I,H
53	Should be able to perform Pulmonary Function Testing	+	+	+	+	+	+	+	+	+	LII	LIII	LIV	S, PG, I,H
54	Should be able to perform Isokinetic Exercise Testing	+	+	+	+	+	+	+	+	+	LII	LIII	LIV	S, PG, I,H

S. No.	EPA	Competency Domain									Level of Competency			MSF
		MK	PC	PBLI	SBP	P	ICS	Day of Residency	End of I year	End of II year	End of III year			
55	Should be able to perform Driving and work simulation	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
56	Should be able to perform Body weight supported treadmill testing/ training	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
57	Should be able to perform Robotics-testing/ training	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
58	Should be able to perform Audiometry	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
59	Should be able to perform Biofeedback	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
60	Should be able to perform Video fluoroscopic evaluation of swallowing	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
61	Should be able to perform Modified barrium swallow	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
62	Should be able to perform Cine esophagogram	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
63	Should be able to perform Palato pharyngeal analysis (image guided swallow analysis)	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
64	Should be able to perform Fiber optic endoscopy examination of swallow	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
65	Should be able to perform instrumental Swallowing assessment	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
66	Should be able to perform Ultrasound Evaluation of Swallowing	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
67	Should be able to perform Intraluminal pharyngeal manometry	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	

S. No.	EPA	Competency Domain									Level of Competency			MSF
		MK	PC	PBLI	SBP	P	ICS	Day of Residency	End of I year	End of II year	End of III year			
68	Should be able to perform Electro magnetic articulography	+	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H
69	Should be able to perform Esophageal manometry	+	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H
70	Should be able to perform Hyperbaric oxygen therapy	+	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H
71	Should be able to perform Vaccum Assisted Closure (VAC)	+	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H
72	Should be able to perform Robotic Interactive Therapy	+	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H
73	Should be able to perform Virtual Reality	+	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H
74	Should be able to perform Ambient Intelligence	+	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H
75	Should be able to perform Transcranial Magnetic Stimulation	+	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H
76	Should be able to perform Optokinetic Stimulation	+	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H
77	Should be able to perform Debridement of pressure sores	+	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H
78	Should be able to perform Release of compressive neuropathies, repositioning of nerves	+	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H
79	Should be able to perform Tenotomy-subcutaneous, open	+	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
80	Should be able to perform Soft tissue release	+	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
81	Should be able to perform Tendon lengthening	+	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
82	Should be able to perform Tendon transfers	+	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
83	Should be able to perform Release of pulleys in hand	+	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H

S. No.	EPA	Competency Domain									Level of Competency			MSF
		MK	PC	PBLI	SBP	P	ICS	Day of Residency	End of I year	End of II year	End of III year			
84	Should be able to perform Joint stabilization/ Arthrodesis	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
85	Should be able to perform Excision arthroplasty	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
86	Should be able to perform Insertion of wires, K wire, pins and rods	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
87	Should be able to perform External fixator – Ilizarov, JESS	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
88	Should be able to perform Osteotomies e.g. for Genu valgum / varum, hip related problems etc.	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
89	Should be able to perform Amputation/ Revision amputation	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
90	Should be able to perform Anaesthetic foot surgeries e.g. TA lengthening, ulcer management	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
91	Should be able to perform CTEV -STR, bony correction	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
92	Should be able to perform Synovectomy, capsuloplasty, repositioning/ repair of tendons etc. in rheumatoid hand	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
93	Should be able to perform Excision of ganglion	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
94	Should be able to perform Skin grafting	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
95	Should be able to perform Skin flaps rotation	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
96	Should be able to perform Contracture release like at hip, knee, elbow, neck (sternomastoid tumor), hand	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	

S. No.	EPA	Competency Domain									Level of Competency			MSF
		MK	PC	PBLI	SBP	P	ICS	Day of Residency	End of I year	End of II year	End of III year			
97	Should be able to perform Congenital anomalies correction	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
98	Should be able to perform Urethral Dilatation	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
99	Should be able to perform Urethral Repair	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
100	Should be able to perform Sphincterotomy	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
101	Should be able to perform Sphincter Stent Prosthesis	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
102	Should be able to perform Baloon Dilatation	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
103	Should be able to perform Penoscrotal Fistula repair	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
104	Should be able to perform Sacral Anterior Root Stimulation	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
105	Should be able to perform Spinal Cord Stimulation	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
106	Should be able to perform Arthroscopy- diagnostic and therapeutic	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
107	Should be able to perform Cystoscopy in neurogenic bladder	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
108	Should be able to perform Proctoscopy	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
109	Should be able to perform Intra-thecal pump	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
110	Should be able to perform Neuro-prosthetic implants	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	
111	Should be able to perform Osseointegration	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H	

S. No.	EPA	Competency Domain								Level of Competency			MSF
		MK	PC	PBLI	SBP	P	ICS	Day of Residency	End of I year	End of II year	End of III year		
112	Should be able to perform Stem cells therapy	+	+	+	+	+	+	+	+	L I, II	L II	L II	S, PG, I,H
113	Should be able to perform Endotracheal suction	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
114	Should be able to perform Endo-Tracheal Intubation	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
115	Should be able to perform Nasogastric tube insertion	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
116	Should be able to perform Flatus tube insertion	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
117	Should be able to perform Catheterization including Supra Pubic Catheterization	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
118	Should be able to perform Digital evacuation	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
119	Should be able to perform Stoma care	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
120	Should be able to perform Central venous line insertion and care	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
121	Should be able to perform Insertion of intercostals drainage tube	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
122	Should be able to perform Venti mask/nasal prong	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
123	Should be able to perform Arterial blood sample	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
124	Should be able to perform Monitoring of vital signs	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
125	Should be able to perform Venesection	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H
126	Should be able to perform Incision and drainage of abscess	+	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H

S. No.	EPA	Competency Domain								Level of Competency			MSF
		MK	PC	PBLI	SBP	P	ICS	Day of Residency	End of I year	End of II year	End of III year		
127	Should be able to perform Pulse oxymetry	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
128	Should be able to perform Vital stim for dysphagia management	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
129	Should be able to perform Tourniquet application	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
130	Should be able to perform Brain death identification	+	+	+	+	+	+	+	LII	L III	L IV	S, PG, I,H	
131	Should be able to Interpret Radiology basic X-rays, USG, CT, Mand MRI.	+	+	+	+	+	+	+	L I, II	L III	L IV, V	I, PG, S,H	
132	Should present a paper in a seminar or conference.	+		+	+	+	+	+	L I, II	L III	L IV	I, PG, S	
133	Should be able to know the research methodology, data interpretation and calculation.	+		+	+	+	+	+	L I, II	L II	L II	S	
134	Should be familiar with the use of multimedia for teaching/learning in Anatomy.	+		+	+	+	+	+	L I, II	L II	L II	S	
135	Should be familiar with the basics principles of teaching-learning methodology like learning objectives, TL activity and assessment.	+		+	+	+	+	+	L I, II	L II	L II	S	

Competency Domains:

MK: Medical Knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Undergraduate students: UG

Peers: PG

Other health professionals: H

Self: I

The background of the page is a complex network diagram. It consists of numerous circular nodes of varying sizes, connected by thin, light-colored lines. The nodes are color-coded: yellow and orange at the top, green and teal in the middle, and blue and grey at the bottom. The overall structure is a dense, interconnected web of nodes and edges, suggesting a complex system or network.

PHYSIOLOGY

MD in Physiology

COURSE NAME

MD in Physiology

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

GOAL

The broad goal of the MD Physiology course aims at providing comprehensive training for teaching theoretical, practical and clinical aspects of Physiology as well as the research methodology.

OBJECTIVES

The candidate qualifying for the award of M.D. (Physiology) should be able to:

1. Demonstrate a comprehensive understanding of physiology as well as that of the applied disciplines;
2. Demonstrate adequate knowledge of the current developments in medical sciences as related to physiology;
3. Teach undergraduates and postgraduates in physiology;
4. Plan and conduct research;
5. Plan educational programs in physiology utilizing modern methods of teaching and evaluation;
6. Organize and equip physiology laboratories
7. Identify lacunae in the existing knowledge in a given area and be able to plan investigative procedures for research, analyze data critically and derive logical conclusions.

COURSE CONTENT**THEORY & PRACTICAL**

The theory and practical syllabus are completed in four semesters. The department conducts the semester wise programme in a cyclic fashion so that no matter at what point a student joins the programme, he/she completes the course in two years. Besides the postgraduate students are expected to attend MBBS Theory classes in 1st year. The semester-wise programme is as follows:

SEMESTER 1

- a. General & Cellular Physiology
- b. Hematology
- c. Renal Physiology & Fluid Balance

SEMESTER 2

- a. Cardiovascular Physiology
- b. Respiration
- c. Environmental Physiology

SEMESTER 3

- a. Nerve & Muscle Physiology
- b. General, Sensory & Motor Physiology
- c. Special Senses
- d. Limbic System and Higher Nervous System

SEMESTER 4

- a. Nutrition & Metabolism
- b. Gastrointestinal System
- c. Endocrines & Reproduction

SEMESTER 5

- a. Thesis preparation and submission

SEMESTER 6

- a. Clinical posting in different clinical departments

DISTRIBUTION OF THEORY: PAPER WISE

PAPER 1: General and Cellular Physiology including Genetic Basis and Historical perspectives

1. General & Cellular Physiology

- a. The cell as the living unit of the body
- b. The internal environment
- c. Homeostasis
- d. Control systems
- e. Organization of a cell
- f. The physical structure of a cell
- g. Transport across cell membranes
- h. Functional systems in the cells
- i. Genetic code, its expression, and regulation of gene expression
- j. Cell cycle and its regulation

2. History of Medicine and Physiology

PAPER 2. Systemic Physiology (systems concerned with transport, nutrition, metabolism and energy) including comparative Physiology.

1. Hematology

- Plasma and Formed elements
- Erythrocytes
 - erythropoiesis
 - structure & function of RBCs
 - formation of haemoglobin
 - destruction & fate of RBCs
 - anaemias
 - polycythemias
- Leucocytes
 - general characteristics
 - genesis & life span of WBCs
 - classification & functions of each type of WBC
 - leukopenia
 - leukaemias

- Blood groups
 - classification
 - antigenicity
 - agglutination
 - blood typing
 - principles of transfusion medicine
- Hemostasis
 - components of hemostasis
 - mechanisms of coagulation
 - coagulation tests
 - anticoagulants
- Immunity
 - Innate immunity
 - Acquired immunity
 - Allergy, hypersensitivity and immunodeficiency
 - Psychoneuroimmunology

2. Cardiovascular Physiology

- Properties of cardiac muscle
- Cardiac cycle
- Heart as a pump
- Cardiac output
- Nutrition & metabolism of the heart
- Specialized tissues of the heart
- Generation & conduction of the cardiac impulse
- Control of excitation & conduction
- Electrocardiogram
- Arrhythmias
- Principles of Hemodynamics
- Neurohumoral regulation of cardiovascular function
- Microcirculation & lymphatic system
- Regional circulations
- Cardiac failure
- Circulatory shock

3. Respiration

- Functional anatomy of the respiratory system
- Pulmonary ventilation
- Alveolar ventilation
- Mechanics of respiration
- Pulmonary circulation
- Pleural fluid
- Lung oedema
- Principles of gas exchange
- Oxygen & carbon-dioxide transport
- Regulation of respiration
- Hypoxia
- Oxygen therapy & toxicity
- Artificial respiration

4. Environmental Physiology

- Physiology of hot environment
- Physiology of cold environment
- High altitude
- Aviation physiology
- Space physiology
- Deep-sea diving & hyperbaric conditions

5. Nerve & Muscle Physiology

- Resting membrane potential
- Action potential
- Classification of nerve fibres
- Nerve conduction
- Degeneration and regeneration in nerves
- Functional anatomy of skeletal muscle
- Neuro-muscular transmission and blockers
- Excitation-contraction coupling
- Mechanisms of muscle contraction
- Smooth muscle

6. Gastrointestinal System

- General principles of G-I function
- Mastication & swallowing

- Oesophageal motility
- Salivary secretion
- Gastric mucosal barrier
- Pancreatic & biliary secretion
- Gastrointestinal motility
- Digestion & absorption
- Functions of Colon
- Pathophysiology of peptic ulcer and diarrheal disease
- Liver functions

7. Nutrition & Metabolism

- Carbohydrates
- Fats
- Proteins
- Minerals
- Vitamins
- Dietary fibre
- Recommended Dietary Allowances
- Balanced diet
- Diet for infants, children, pregnant & lactating mothers, and the elderly
- Energy metabolism
- Obesity & Starvation

PAPER 3: Systemic Physiology (systems concerned with regulation, neural control, excretion and procreation,)

1. Endocrines & Reproduction

- Classification of Hormones
- Mechanism of Hormone action
- Measurement of hormones in Blood
- Endocrine functions of the hypothalamus
- Pituitary
- Thyroid
- Adrenals
- The endocrine pancreas
- Pathophysiology of diabetes
- Parathyroid, calcitonin, Vit D & calcium metabolism

- Pineal gland
- Testosterone & male sex hormones
- Spermatogenesis
- Hyper & hypogonadism
- Menstrual cycle
- Female sex hormones
- Pregnancy & Lactation
- Functions of Placenta
- Parturition
- Lactation

2. Renal Physiology & Fluid Balance

- Body fluid compartments
- Water balance; regulation of fluid balance
- Urine formation
- Regulation of extracellular sodium & osmolarity
- Renal mechanisms for the control of blood volume, blood pressure & ionic composition
- Regulation of acid-base balance
- Micturition
- Diuretics
- Renal failure

3. General, Sensory & Motor Physiology

- The general design of the nervous system
- Interneuronal communication
- Classification of somatic senses
- Sensory receptors
- Sensory transduction
- Information processing
- Dorsal column & medial lemniscal system
- Thalamus
- Somatosensory cortex
- Somatosensory association areas
- Pain
- Organization of spinal cord for motor function
- Reflexes & reflex arc

- Brain stem & cortical control of motor function
- Cerebellum
- Basal ganglia
- Maintenance of posture and equilibrium
- Motor cortex

4. Special Senses

- Optics of vision
- Receptors & neural functions of the retina
- Colour vision
- Perimetry
- Visual pathways
- Cortical visual function
- Functions of the external and middle ear
- Cochlea
- Semicircular canals
- Auditory pathways
- Cortical auditory function
- Deafness & hearing aids
- Primary taste sensations
- Taste buds
- Transduction & transmission of taste signals
- Perception of taste
- Peripheral olfactory mechanisms
- Olfactory pathways
- Olfactory perception

5. Limbic System and Higher Nervous System

- Autonomic nervous system
- The limbic system and hypothalamus
- EEG
- Sleep
- Emotions & Behaviour
- Learning & Memory
- Yoga

PAPER 4. Applied Physiology, pathophysiology including recent advances

Clinical correlations of altered physiological functions in different deviations from normal. Applications of knowledge of recent advances in physiology. These will include:

1. Pathophysiology pertaining to systemic Physiology
2. Physiological basis of various clinical problems and investigation tests
3. Recent advances relevant to systemic Physiology
4. Social responsibilities of physiologists

DISTRIBUTION OF PRACTICAL (SEMESTER-WISE)

Practical exercises are conducted every semester exclusively for M.D. students on systems scheduled for the semester. The results obtained in these exercises are presented in teaching meetings. Besides specially designed P.G. practical, M.D. students will have to perform all undergraduate practicals, and also teach some of these practicals to the undergraduates.

SEMESTER 1**Experiments on:**

- a. General & Cellular Physiology
- b. Hematology
- c. Renal Physiology & Fluid Balance
- d. Medical Education and Ethics

These Includes:

1. Histology
2. Cell Culture
3. Protein quantification and separation
4. Immunochemical analysis
5. Bone marrow smear (Goat/Human)
6. Human peripheral blood and staining with different stains

7. All UG Haematological experiments along with
 - Eosinophil count
 - Reticulocyte count
 - Plasma prothrombin time
 - The haemoglobin content of the blood sample
 - Median corpuscular fragility
8. Water diuresis test
9. Microteaching
10. Hands-on activity: Preparing MCQs; Item analysis; Preparing SAQs
11. Hands-on activity: Preparing OSPEs
12. Visit different clinical laboratories

SEMESTER 2**Experiments on:**

- a. Cardiovascular Physiology
- b. Respiration
- c. Environmental Physiology

These Includes practicals on:

1. ECG and heart rate variability
2. Venous occlusion plethysmography
3. Phonocardiogram
4. Pulse-wave velocity and Ankle Brachial Index (ABI).
5. Lactate threshold during aerobic exercise.
6. Demonstration of :
 - Cath lab procedures
 - Echo evaluation of cardiac function
 - Nuclear imaging of cardiac function
 - Exercise stress testing
 - Techniques utilized in cardiac radiology
7. Recording of the arterial BP, respiration and ECG of the rat.
8. Measuring Physiological dead-space in a subject.
9. Spirometric Lungs Function tests.

-
10. Recording respiratory-flow volume loop
 11. Determination of diffusion capacity
 12. Determination of respiratory impedance
 13. Record of the in-vivo mechanical activity of the amphibian heart and demonstrating different physiological phenomena
 14. Recording the mechanical activity of the isolated amphibian heart.
 15. Clinical examination of CVS.
 16. Clinical examination of the respiratory system
 17. Cardiopulmonary resuscitation (CPR) and Artificial respiration
 18. Treadmill test for determination of VO₂ max

SEMESTER 3

Experiments on:

- a. Nerve & Muscle Physiology
 - b. General, Sensory & Motor Physiology
 - c. Special Senses
 - d. Limbic System and Higher Nervous System
1. Different experiments on frog sciatic nerve-gastrocnemius muscle preparation
 2. Tests to assess sensory and motor and higher function
 3. Tests to assess the autonomic function of a human subject
 4. Measuring the conduction velocity of sensory and motor nerve
 5. Recording of different event-related potentials and reflexes in human subject
 6. Neuroimaging studies
 7. Recording of electromyography
 8. Examination of cranial nerves
 9. Record and interpret the EEG of a human subject
 10. Recording of visual, auditory, motor and sensory evoked potentials

11. Evaluation of Reaction time (Visual, Auditory)
12. Audiometry tests
13. Clinical examination of the nervous system
14. Clinical examination of special senses

SEMESTER 4

Experiments on:

- a. Nutrition & Metabolism
 - b. Gastrointestinal physiology
 - c. Endocrines & Reproduction physiology
1. Recording of mechanical activities of isolated segments of the mammalian small intestine.
 2. Recording of electrical activities of gastric movements in the human subject (Electrogastrography).
 3. Calculation of resting energy expenditure (REE)
 4. Preparation of a diet chart for Pregnant & lactating lady; Paediatric age group; Geriatric age group and some disease condition
 5. Determination of the blood lipid profile
 6. Study of vaginal cytology in rat and human subject
 7. Determination of the Cortisol level in human subject
 8. Analysis of semen sample.
 9. Determination of the status of pregnancy from the urine samples of a subject

SEMESTER 5

Thesis preparation and submission

SEMESTER 6

Clinical posting in different clinical departments

TEACHING & LEARNING METHODS

During the course, students have formal teaching and are trained for teaching and research.

The above topics are covered through a mix of self-learning and structured program. The structured program consists of various teaching-learning methodologies:

Teaching Learning Methodologies

I. Theory by:

- Seminars
- Journal club
- Group discussion
- Symposium
- Problem-based Learning

II. Practicals by:

- Demonstration and Hands-on training
- Clinical posting (last 6 months)

DEPARTMENTAL TRAINING SCHEDULE & ACTIVITY OF RESIDENTS:

1. Seminars every Saturday

The seminars are on a topic belonging to a system scheduled for the semester. The topic is presented in-depth appropriate for postgraduates by one of the M.D. students and moderated by a faculty member. The seminars represent only a small and somewhat arbitrary selection of topics. They are not intended to cover an entire system. Their aims are to:

- Introduce the system
- Tune the students to the system
- Cover recent advances
- give students practice in the art of oral presentation

2. Journal Clubs/Symposium, every Tuesday

The journal clubs are on an article belonging

to a system scheduled for the semester. The article is presented by an M.D. student or senior demonstrator, and moderated by a faculty member. The aims of journal clubs are to:

- Highlight recent advances
- Discuss classical papers
- Inculcate the faculty of critical appreciation of a research article
- Give students and senior demonstrators practice in the art of oral presentation

3. Group Discussions, every Wednesday

The group discussions are on a topic belonging to a system scheduled for the semester. A group discussion aims at a structured exchange of knowledge, ideas, and perceptions among the participants on a given topic. The topics are chosen so as to bridge the gaps in coverage of entire system by seminars and journal clubs. Their aims are to:

- Cover historical perspectives along with recent advances
- Develop the understanding of the topic/system in a wholesome manner with applied aspects
- Develop their skills in interpersonal communication and in expressing their views in a clear and succinct manner
- Give students the practice of group discussion and learn the group dynamics

4. Practicals

- Practical exercises are conducted every semester exclusively for M.D. students on systems scheduled for the semester. The results obtained in these exercises are presented in teaching meetings (see below).
- Besides specially designed P.G. practicals, M.D. students should perform all undergraduate practicals, and also teach some of these practicals to the undergraduates.
- The logbook should be maintained and monitored periodically

5. Clinical postings.

During their last semester, M.D. students are posted for two weeks each in the

Departments of Medicine, Cardiology, Gastroenterology, Neurology, Endocrinology, Ophthalmology and Nephrology. In these postings, the students attend ward rounds and also observe the work going on in clinical physiology laboratories associated with these departments. The aim of these postings is to:

- Provide the students with concrete living examples of the application of physiology in the diagnosis and management of disease
- Illustrate through some living examples of how knowledge of physiology may grow through observations made on patients.

III. EVALUATION OF TRAINING

Written/practical assessment every semester.
Feedback on teaching/training programmes.

IV. RESEARCH WORK

Writing Thesis protocol, Collection of data, Statistical analysis, Result submission

Progress monitoring of research work every semester,

Result presentation and submission at the end of 2 & ½ yrs

Presenting paper/poster at conferences

Preparing manuscripts for documentation/publication

Design a project for research

ASSESSMENT

Examination on Research Methodology & Biostatistics

- Timing: End of 2nd Semester
- Total marks: 100
- Will be considered as an internal examination
- Candidate should pass to appear in Final examination
- No marks will be added to final/summative examination
- Will be conducted by Examination Cell in the month of June & December

Internal Examination

Examination on Research Methodology & Biostatistics at the end of the 2nd semester.

Internal examination: At the end of the 3rd, 4th and 5th semester, pre-final (2 months before final examination).

Marks distribution:

Theory 100 marks,

Practical (As per semester schedule) with viva and logbook

(Practical – 70, viva – 20, logbook – 10).

The marks of the 4 internal examinations will be averaged to 100 each for theory and practical.

Summative/ Final Examinations

Final examination at the end of the course has theory, practical and viva-voce which will cover as follows.

Theory (MD Physiology)

4 papers (100 marks each)

Question Paper Format

One Long question – 20 marks

Eight Short question/notes – 8 x 10 = 80 marks

Total marks in theory: 500 marks

Theory papers in the final examination – 400 marks

Average of 4 internal examination – 100 marks

DISTRIBUTION OF TOPICS FOR THEORY

Paper-I: General and Cellular Physiology including Genetic Basis and Historical perspectives

Paper-II: Systemic Physiology (system providing transport, nutrition and energy) including comparative Physiology.

Paper-III: Systemic Physiology (system concerned with procreation, regulation and neural control and excretion)

Paper-IV: Applied Physiology, pathophysiology including recent advances

PRACTICAL AND VIVA

Practical examination

Total marks: 500

Practical and viva in the final examination – 400 marks

Average of 4 internals (practical + viva + logbook) exams – 100 marks

- The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A* 200 marks	Longcase (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

* Students should pass (secure 50% marks) separately in Part A

Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

RECOMMENDED BOOKS

1. Alberts B. Molecular Biology of the Cell: CRC Press; 2017.
2. Barrett KE, Barman SM, Boitano S, Brooks HL. Ganong's Review of Medical Physiology (Enhanced EB): McGraw-Hill Education; 2009.
3. Boron WF, Boulpaep EL. Medical Physiology E-Book: Elsevier Health Sciences; 2016.
4. Caligiuri M, Levi MM, Kaushansky K, Lichtman MA, Prchal J, Burns LJ, et al. Williams Hematology, 9E: McGraw-Hill Education; 2015.
5. Cotes JE, Chinn DJ, Miller MR. Lung Function: Physiology, Measurement and Application in Medicine: Wiley; 2009.
6. Kasper DL, Fauci AS, Hauser SL, Longo DL, Jameson JL, Loscalzo J. Harrison's Principles of Internal Medicine 19/E (Vol.1 & Vol.2) (ebook): McGraw-Hill Education; 2015.
7. Koeppen BM, Stanton BA. Berne & Levy Physiology: Elsevier; 2017.
8. Mack S, Kandel ER, Jessell TM, Schwartz JH, Siegelbaum SA, Hudspeth AJ. Principles of Neural Science, Fifth Edition: McGraw-Hill Education; 2013.
9. McArdle WD, Katch FI, Katch VL. Exercise Physiology: Nutrition, Energy, and Human Performance: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2015.
10. Owen J, Punt J, Stranford S, Jones P. Kuby Immunology: Macmillan Learning; 2018.
11. Podolsky DK, Camilleri M, Fitz JG, Kalloo AN, Shanahan F, Wang TC. Yamada's Textbook of Gastroenterology, 2 Volume Set: Wiley; 2015.
12. Shlomo Melmed MM, Polonsky KS, P. Reed Larsen MDF, Kronenberg HM. Williams Textbook of Endocrinology: Elsevier Health Sciences; 2015.
13. Vaz MD, Raj TD, Anura KD. Guyton & Hall Textbook of Medical Physiology - E-Book: A South Asian Edition: Elsevier Health Sciences; 2014.
14. Yu ASL, Chertow GM, Luyckx V, Marsden PA, Skorecki K, Taal MW. Brenner and Rector's The Kidney E-Book: Elsevier Health Sciences; 2019.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the impact of the human genome project and its application to any two disorders (10+5+5=20)
2. Describe the historical perspectives of phagocyte respiratory burst (10)
3. Explain the sequence of events that lead to the discovery of cardiac catheterization (10)
4. Illustrate the work was done that lead to the discovery of chemoreceptors (10)
5. Explain the negative and positive feedback mechanism with examples and relate its significance in homeostasis (10)
6. Describe the mechanism of aquaporin in the permeability of water (10)
7. Illustrate the mechanism of recycling of synaptic vesicles (10)
8. Explain the mechanism of insulin receptor signalling (10)
9. Describe the mechanism of apoptosis (10)

PAPER 2

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the waves of an Electrocardiographic recording and the relationship of the ECG to the electrical axis of the heart. List the early and late ECG manifestations of myocardial infarction. Explain the early ionic changes that produce them. (6+6+8 = 20 marks)
2. Describe the mechanism of the hematopoietic inductive microenvironment (10)
3. Compare the electrical and mechanical events in smooth and cardiac muscle with those of skeletal muscle. (10)
4. Describe the special features of the coronary circulation. (10)
5. Describe and explain the ventilatory responses to increased carbon dioxide concentrations in inspired air. (10)
6. Describe the pressure-volume characteristics of the lung and the chest wall. Describe the changes in compliance of the lung and the chest wall in different physiologic and pathologic conditions. (10)
7. What are the tissue macrophages? What is their origin and how do they contribute to body defences? (10)
8. The bacteria in the colon exist in a symbiotic relationship with the host. How does the host benefit from this relationship? What are the harmful or potentially harmful effects of this relationship? (10)
9. The cholinergic division of the autonomic nervous system has been called the anabolic nervous system. Discuss the actions of the cholinergic division that justify this. (10)

PAPER 3

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe how skilled movements are planned and carried out. (10 +10= 20 marks)
2. Describe and explain the symptoms of Parkinson's disease. (10)
3. Describe how the countercurrent mechanism in the kidney operates to produce hypertonic or hypotonic urine. (10)
4. Describe the renal mechanisms of regulation of acid-base balance. (10)
5. Describe the role of chromosomes, hormones and related factors in sex determination and development. (10)
6. Trace the path of auditory impulses in the neural pathways from the cochlear hair cells to the auditory cortex. Explain how pitch, loudness and timbre are coded in the auditory pathways. (10)
7. List the hormones that affect plasma glucose concentration. Describe the action of each. (10)
8. Explain how the intensity, location and quality of stimuli are coded. (10)
9. Outline the steps involved in the biosynthesis of thyroid hormones. Describe the regulation of secretion and the mechanism of action of the same. State the actions of thyroid hormone. (10)

PAPER 2

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the path that led to the discovery of plate and grid cells (20)
2. Explain the pathophysiology of Down's Syndrome (10)
3. Describe the physiological basis of Nephrotic syndrome (10)
4. Explain the Physiological Basis of Cushing's syndrome (10)
5. Explain "Transcranial Direct Current Stimulation (tDCS) " and its role in treating Alzheimer's disease (10)
6. Explain the physiological basis of treatment of cardiac failure. (10)
7. Explain the physiological basis of Gastro-oesophageal reflux disease (10)
8. Explain the mechanism of high altitude pulmonary Oedema (10)
9. Describe the energy system used in the 100-meter swim and a 200-meter dash (5+5)

ENTRUSTABLE PROFESSIONAL ACTIVITIES

S. No.	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year	
1	Should be able to teach Physiology to and allied health sciences.	*		*	*	*	*	-	III	IV	V	S,UG,PG,I
2	Should be able to teach Physiology to undergraduates (MBBS)	*		*	*	*	*	-	III	IV	V	S,UG,PG,I
3	Should be able to demonstrate hematology experiments in Physiology such as RBC count, WBC count, Haemoglobin estimation, DLC, AEC, PCV, ESR, BT, CT, Blood indices, blood grouping to undergraduate students.	*	*	*	*		*	I	III	IV	V	S,UG,PG,I
4	Should be able to perform hematology experiments in Physiology such as Osmotic fragility, Platelet count, reticulocyte count.	*	*	*	*			-	II	III	IV	S,UG,PG,I
5	Should be able to demonstrate clinical experiments in Physiology such as recording of BP, the examination of CVS, RS, CNS, spirometry, pulse wave recording, ECG.	*	*	*	*		*	I	III	IV	V	S,UG,PG,I
6	Should be able to perform clinical experiments in Physiology such as autonomic function testing, stethography, ECG, EEG, EMG studies, NCV, Evoked potentials, Mosso's ergography, perimetry, HRV.	*	*	*	*			-	II	III	IV	S,UG,PG,I
7	Should be able to perform mammalian experiments on uterine contraction, intestinal contraction, skeletal muscle contraction, mammalian heart.	*		*	*			-	II	III	IV	S,UG,PG,I

S. No.	EPA	Competency Domains						Level of competency					MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year		
8	Should be able to interpret the charts on amphibian experiments on nerve, muscle, and heart.	*		*	*			-	II	III	IV	S,UG,PG,I	
9	Should be able to interpret the charts on dog experiments on nerve, muscle, heart and blood vessels.	*		*	*			-	II	III	IV	S,UG,PG,I	
10	Should be able to maintain the record of all the experiments performed.	*		*	*			-	III	IV	IV	S,UG,PG,I	
11	Should attend peripheral postings in the clinical departments.	*	*	*	*	*		-	III	III	III	S,UG,PG,I	
12	Should update recent concepts in physiology.	*		*	*			-	II	III	IV	S,UG,PG,I	
13	Should be able to handle small group teaching for under graduate students.	*	*	*	*	*		-	III	IV	V	S,UG,PG,I	
14	Should involve in periodic assessment of students	*		*	*			-	II	III	IV	S,UG,PG,I	
15	Should undergo a research methodology course.	*		*	*			-	II	III	IV	S,UG,PG,I	
16	Should be able to present seminars and symposia in the department.	*		*	*			-	II	III	IV	S,UG,PG,I	
17	Perform a critical appraisal of an article published in a journal.	*		*	*			-	II	III	IV	S,UG,PG,I	
18	Should design and implement a dissertation research work, with periodic reports submitted to the head of the department.	*		*	*			-	II	III	IV	S,UG,PG,I	
19	Design and implement an original research project and publish an article with the outcome.	*		*	*			-	II	III	IV	S,UG,PG,I	

S. No.	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ISC	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year	
20	Should be able to present oral and poster presentations in conferences, CME's conducted by physiological societies.	*		*	*		*	-	II	III	IV	S,UG,PG,I
21	Should maintain the daily log of activities.	*		*	*			-	III	IV	IV	S,UG,PG,I
22	Should design and implement a dissertation research work and publish	*		*	*		*	-	II	III	IV	S,UG,PG,I

Abbreviations:

MK: Medical knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I



PSYCHIATRY

MD in Psychiatry

COURSE NAME

MD in Psychiatry

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

OBJECTIVES

At the end of three years course in (MD) Psychiatry the candidate should be able to achieve the followings:

- 1. Basic Sciences:** The candidate should have a sound knowledge of basic and applied neuroanatomy, neurophysiology, neurochemistry, developmental and social psychology.
 - 2. General and Clinical Psychology:** The candidates are expected to know the general psychological principles in areas such as personality, learning, intelligence, memory, emotions, perceptions etc. They are expected to learn the theory and practical aspects of clinical psychology like psychometric assessment, psychological and behavioural methods of treatment.
 - 3. Statistics and Research Methodology:** The candidates should have basic skills in statistics and research methodology so as to successfully interpret/conduct/guide self and others in research.
 - 4. Clinical Psychiatry:** The candidates should attain a high degree of clinical proficiency in history taking, conducting and reporting mental status examination, diagnosis and the treatment of various psychiatric disorders.
 - 5. Psychiatric Sub-specialties:** The candidates should acquire a sound knowledge of principles and practice of Addiction Psychiatry, Child & Adolescent Psychiatry, Geriatric Psychiatry, Neuropsychiatry and consultation & liaison psychiatry.
 - 6. Psycho-pharmacology:** The candidates should be thorough with the basic principles and application of psycho-pharmacology in clinical practice.
 - 7. Psycho-dynamics & Psychotherapies:** The candidates should have a proper understanding of the various schools of psycho-dynamics and their applications to psychiatry. They should also become familiar with theoretical framework and practice of the various psychotherapies.
 - 8. Psychosomatic Disorders & Liaison Psychiatry:** The candidates should develop skills in understanding and managing psychosomatic disorders and liaison psychiatry. They should also be aware of the psychosocial aspects of various medical and surgical disorders.
 - 9. Emergency Psychiatry:** The candidate should be expert in understanding and managing the various psychiatric emergencies.
 - 10. Forensic Psychiatry:** Trainee should be aware of the legal and ethical issues involved in the practice of psychiatry. They should have a thorough knowledge about The Mental Health Care Act 2017 and its application in daily practice.
 - 11. Marital Adjustment:** The candidates should know the basic principles of the treatment of marital problems.
 - 12. Psycho-sexual Problems:** The candidates should know the basic principles of the treatment of psychosexual problems
 - 13. Community Psychiatry & Epidemiology:** The trainees should know the principles and practices of community psychiatry and epidemiology so that they can effectively participate, plan, execute and supervise community mental health and another outreach programme.
 - 14. Teaching:** The candidates should learn the basic concepts and techniques of teaching. The trainee should participate in different teaching programmes like case conferences, seminars, journal club, tutorials, and clinical teaching.
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COURSE CONTENT

THEORY (The following will be covered over a period of 3 years)

SEMESTER 1

Basic Sciences: Neuroanatomy, Neurochemistry, Neurophysiology

1. Neuroanatomy: Lobes of the brain, neural tracks, thalamus, hypothalamus, reticular activating system, limbic system, basal ganglia.
2. Neurochemistry: Neurotransmitters, Neuropeptides, Second Messenger Systems
3. Sleep physiology
4. Basic and applied Electrophysiology
5. Neuroimaging and Implications for Psychiatry

Clinical Psychology and Sociology

1. History of Psychiatry
2. Theories of Mind: Ego psychology
3. Theories and applications of personality, Emotions, Motivation, Attitude, Intelligence, Learning, Aggression
4. Developmental psychology
5. Social & Transcultural Psychiatry
6. Basic Statistics & Research Methodology
7. Psychiatric History taking, Mental Status examinations, Psychopathology and Phenomenology
8. Communications and interviewing skills

SEMESTER 2

Clinical Psychiatry

1. Classification and diagnosis of Psychiatric disorders as per nosology (ICD-10, DSM-V)
2. Rating scales: principles and Administration
3. Concept, Typology, etiology, genetics, clinical features, treatment, course/ outcome & prognosis:

- Schizophrenia & other psychotic diseases
- Mood disorders - bipolar disorder and depression
- Anxiety disorders -generalized anxiety disorder, OCD, phobia, panic disorder

4. Psychological Assessment - Intelligence, Memory, Personality

SEMESTER 3

Clinical Psychiatry:

1. Concepts, Typology, aetiology, clinical features, course, outcome and prognosis of:
 - Stress-induced disorders -Acute stress disorder, adjustment disorder, PTSD etc.
 - Somatoform disorders, Hypochondriasis
 - Dissociative disorders, conversion disorder
 - Factitious disorder, Malingering
 - Personality disorders
 - Sleep disorders
 - Eating disorders
 - Psycho-sexual disorders
2. Psycho-diagnostics and Neuropsychological assessment: principles and tools including various projective tests

SEMESTER 4

Therapies

1. Psychiatry emergencies: assessment and interventions
2. Psychopharmacology: General principles, classifications, indications, adverse effects
3. Psychotherapies: General principles, classifications, indications and applications
4. Behaviour therapies: General principles, classifications, indications and applications
5. Principles and applications of Electroconvulsive therapy (ECT)
6. Other brain stimulation techniques-rTMS, tDCS etc.

SEMESTER 5

Psychiatry sub-specialities

1. Forensic Psychiatry- Ethics, Mental Health Acts, NDPSA, POCSO, Persons with Disability Act, Mental Health programmes and policy, assessment of disability and quality of life
2. Child and adolescent psychiatry
3. Geriatric psychiatry
4. Addiction psychiatry
5. Community psychiatry
6. Perinatal psychiatry
7. Consultation-Liaison Psychiatry and Psychosomatic Medicine

SEMESTER 6

Neuropsychiatry and Medicine as related to psychiatry

1. Delirium
2. Dementia
3. Epilepsy and its neuropsychiatric aspects
4. Headache: classification, clinical features and management
5. Neuropsychiatric aspects of neurological, cardiovascular, gastrointestinal and endocrinological conditions.
6. Psycho-oncology
7. Psycho-dermatology
8. Psycho-immunology
9. Obesity

TEACHING AND LEARNING METHODS

1. **Seminars:** There should be a weekly seminar in which the MD candidates should present material on assigned topics in rotation. It should be followed by discussion in which all trainees are supposed to participate.
2. **Case Conference:** A case conference should be held every week where a trainee prepares and presents a case of academic interest by rotation and it is attended by all the members of the Department.
3. **Journal Club:** There should be at least one Journal Club in a week, in which the critical evaluation of a research paper from an indexed journal is required.
4. **Interdepartmental clinical combined rounds (psychosomatic rounds) and clinical case conference or seminar:** Here a case or a topic is to be presented which should have an interface between psychiatry and any other medical stream like neurology, pediatrics, medicine, pulmonary medicine, PMR etc. It should be held monthly in collaboration with various departments and attended by all the members from the concerned department.
5. **Case presentation:** Selected in-patient and out-patient cases should be evaluated in detail case work-up format and discussed with one of the Consultants. All the new OPD cases should be initially worked up by the resident in the assessment proforma.
6. **Research Forum/ Chart review:** There should be a fortnightly meeting in which the MD candidates should present their plan of research as well as the report of the completed work of their projects. In chart review, the discharge summary of the cases has to be reviewed in presence of consultant.
7. **Psychotherapy tutorials:** These should be held in small groups supervised by a consultant once in a week in which a case is presented by a trainee and psychotherapeutic management discussed.

<p>8. Attendance at special clinics/unit as applicable e.g. Child and Adolescent Psychiatry Clinic, Drug-de-addiction clinics, Neuropsychiatry Clinic, Sleep clinic etc.</p> <p>9. Training in ECT administration and other brain stimulation techniques.</p> <p>10. Thesis writing: it is compulsory for an MD resident.</p> <p>11. Research Methodology: The student should know the basic concepts of research methodology and biostatistics and plan a research project, Periodic assessment of research methodology will be done.</p> <p>12. Teaching skills: The postgraduate students shall be required to participate in the teaching and training programme for undergraduate students and interns.</p> <p>13. Continuing Medical Education Programme (CME): Each student should attend at least two CME programme, in 3 years.</p> <p>14. Extra-departmental activities: The candidates should be encouraged to attend academic/clinical activities in allied subjects like Psychology, Neurology etc.</p> <p>15. Logbook: Each student must be asked to present a specified number of cases for clinical discussion, perform procedures/present seminars/review articles from various journals in inter-unit/interdepartmental teaching sessions. They should be entered in a Log Book and signed by the authorized teacher and Head of Department.</p>	<table border="0"> <tr> <td>Child & Adolescent Psychiatry</td> <td>03 months</td> </tr> <tr> <td>Neurology</td> <td>01 month</td> </tr> <tr> <td>Clinical Psychology</td> <td>01 month</td> </tr> <tr> <td>Electrophysiology Lab</td> <td>01 month</td> </tr> <tr> <td>Community Psychiatry</td> <td>01 month</td> </tr> <tr> <td>Mental Hospital Posting: (including NIMHANS, Bangalore; CIP Ranchi)</td> <td>01 month</td> </tr> </table> <p>(Exposure to community-based services should be integral to various postings including posting in other higher centres)</p>	Child & Adolescent Psychiatry	03 months	Neurology	01 month	Clinical Psychology	01 month	Electrophysiology Lab	01 month	Community Psychiatry	01 month	Mental Hospital Posting: (including NIMHANS, Bangalore; CIP Ranchi)	01 month
Child & Adolescent Psychiatry	03 months												
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Clinical Psychology	01 month												
Electrophysiology Lab	01 month												
Community Psychiatry	01 month												
Mental Hospital Posting: (including NIMHANS, Bangalore; CIP Ranchi)	01 month												

ASSESSMENT

Examination on Research Methodology & Biostatistics

- Timing: End of 2nd Semester
- Total marks: 100
- Will be considered as an internal examination
- Candidate should pass to appear in Final examination
- No marks will be added to final/summative examination
- Will be conducted by Examination Cell in the month of June & December

Internal examinations

Internal assessment Timeline: End of 3rd, 4th and 5th semester and pre-final (2 months before final examination).

Marks distribution: Theory 100 marks, and practical with viva and logbook (Practical – 70, viva – 20, logbook – 10).

The marks of the four internal examinations will be averaged to 100 each for theory and practical.

Departmental educational training Schedule and Residents posting

Each trainee should be given clinical responsibility of various areas in rotation. The general schedule of clinical posting are as follows:

Ward/OPD/Emergency/ECT On daily basis/ daily posting (as per roster).

Consultation-Liaison On a daily basis under the supervision of SR/ Consultant.

Drug De-addiction	03 months
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Summative assessment

Theory:

PAPER I	Neuroanatomy, Neurochemistry, Neurophysiology and their applications related to psychiatry, Clinical Psychology and sociology and their application
PAPER-II	General Adult Psychiatry
PAPER III	Psychiatric sub-specialities (child psychiatry, addiction psychiatry, forensic psychiatry, organic and neuropsychiatry, geriatric psychiatry, psychosomatic medicine)
PAPER IV	Neuropsychiatry and Medicine as related to psychiatry, recent advances

Mark allotment

Theory

Question Paper Format

One Long question – 20 marks

Eight Short question/notes – 8 x 10 = 80 marks

Total marks in theory: 500 marks

Theory papers in the final examination – 400 marks

Average of 4 internal examination – 100 marks

Practical examination

Total marks: 500

Practical and viva in the final examination – 400 marks

Average of 4 internals (practical + viva + logbook) examinations – 100 marks

Due importance should be given to Log Book Records and day-to-day observation during training.

The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A* 200 marks	Longcase (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/ Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

* Students should pass (secure 50% marks) separately in Part A

Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

RECOMMENDED BOOKS

1. Arciniegas DB, Yudofsky SC, Robert E. Hales MD MBA. The American Psychiatric Association Publishing Textbook of Neuropsychiatry and Clinical Neurosciences, Sixth Edition: American Psychiatric Association Publishing; 2018.
2. Association AP. Diagnostic and Statistical Manual of Mental Disorders (DSM-5®): American Psychiatric Publishing; 2013.
3. Association AP. The American Psychiatric Association Practice Guidelines for the Psychiatric Evaluation of Adults, Third Edition: American Psychiatric Association; 2015.
4. Barrera A, Chaplin R. Oxford Textbook of Inpatient Psychiatry: Oxford University Press; 2019.
5. Casey P, Kelly B. Fish's Clinical Psychopathology: Signs and Symptoms in Psychiatry: Cambridge University Press; 2019.
6. Denning T, Thomas A. Oxford Textbook of Old Age Psychiatry: OUP Oxford; 2013.
7. Gelder MG. Oxford Textbook of Psychiatry: Oxford University Press; 1996.
8. Lishman WA. Organic Psychiatry: The Psychological Consequences of Cerebral Disorder: Blackwell Science; 1998.
9. Oyebode F. Sims' Symptoms in the Mind E-Book: Textbook of Descriptive Psychopathology: Elsevier Health Sciences; 2014.
10. Robert E. Hales MD MBA, Yudofsky SC, Laura Weiss Roberts MD MA. The American Psychiatric Publishing Textbook of Psychiatry, Sixth Edition: American Psychiatric Publishing; 2014.
11. Sadock BJ, Sadock VA, Ruiz P, Kaplan & Sadock's Concise Textbook of Clinical Psychiatry: Wolters Kluwer; 2017.
12. Asman A, Kay J, Lieberman JA, First MB, Riba M. Psychiatry: Wiley; 2015.
13. Thornicroft G, Mueser KT. Oxford Textbook of Community Mental Health: OUP Oxford; 2011.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

APPLIED BASIC SCIENCES AS RELATED TO PSYCHIATRY PRINCIPLES, BASIC PRINCIPLES OF BIOLOGICAL AND BEHAVIOURAL SCIENCES AS RELATED TO PSYCHIATRY, APPLIED CLINICAL PSYCHOLOGY AND SOCIOLOGY.

Maximum marks: 100

Time: 3hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the anatomy of the limbic system. Discuss the role of limbic system in aetiology and treatment of mood disorders. (10+10)
2. Define memory and discuss the different types of memory. Briefly enumerate the clinical tests for immediate memory. (4+6)
3. Discuss about parametric and non-parametric tests with examples. (10)
4. Enumerate the anatomy of Pre-frontal cortex and its role in the pathogenesis of schizophrenia. (7+3)
5. What do you mean by mirror neurons? Discuss their application in autistic spectrum disorder. (6+4)
6. What is apperception? Classify projective tests and describe any one such test. (1+3+6).
7. Discuss the serotonergic projections in the brain and the role of serotonin in depression. (5+5)
8. Enumerate the dopaminergic tracts in the brain. Write the role of these tracts in the manifestation of the symptoms of schizophrenia? (3+7)
9. Name the post-freudians and the neo-freudians? Write about the contribution of any one post-freudian. (5+5)

PAPER 2

GENERAL ADULT PSYCHIATRY

Maximum marks: 100

Time: 3hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Write the neuroanatomical correlates of schizophrenia. Discuss the management strategies for treatment resistant schizophrenia? (10+10)
2. What are the various types of obsession and compulsion? Discuss the non-pharmacological management of Obsessive-compulsive disorder. (3+7)
3. What is atypical depression? Enumerate the predictors of bipolarity in a patient with depressive symptoms. (4+6)
4. Discuss the clinical presentation and management of Anorexia Nervosa. (5+5)

-
5. What is spectrum concept in psychiatry? Describe the different disorders included under Bipolar spectrum disorder. (4+6)
 6. Write about the nosology of schizoaffective disorder. What is the role of mood stabilizer in Schizoaffective disorder-manic type? (6+4)
 7. An 18 yrs old girl presented to the casualty with a history of recent sexual abuse. As a psychiatrist, how will you approach such a case? (10)
 8. Describe the concept and theories of suicide. Enumerate the current legal stand in India about suicide. (10)
 9. What are the symptoms of panic attack? Discuss the differential diagnosis and management of panic disorder. (5+5)

PAPER 3

PSYCHIATRIC SUB-SPECIALITIES

(CHILD PSYCHIATRY, ADDICTION PSYCHIATRY, FORENSIC PSYCHIATRY, ORGANIC AND NEUROPSYCHIATRY, GERIATRIC PSYCHIATRY, PSYCHOSOMATIC MEDICINE)

Maximum marks: 100

Time: 3hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Write the neuroanatomical correlates of schizophrenia. Discuss the management strategies for treatment resistant schizophrenia? (10+10)
2. What are the various types of obsession and compulsion? Discuss the non-pharmacological management of Obsessive-compulsive disorder. (3+7)
3. What is atypical depression? Enumerate the predictors of bipolarity in a patient with depressive symptoms. (4+6)
4. Discuss the clinical presentation and management of Anorexia Nervosa. (5+5)
5. What is spectrum concept in psychiatry? Describe the different disorders included under Bipolar spectrum disorder. (4+6)
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7. An 18 yrs old girl presented to the casualty with a history of recent sexual abuse. As a psychiatrist, how will you approach such a case? (10)
8. Describe the concept and theories of suicide. Enumerate the current legal stand in India about suicide. (10)
9. What are the symptoms of panic attack? Discuss the differential diagnosis and management of panic disorder. (5+5)

PAPER 4

NEUROLOGY AND GENERAL MEDICINE AS RELATED TO PSYCHIATRY, RECENT ADVANCES

Maximum marks: 100

Time: 3hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Differentiate between cortical and subcortical dementia. Describe the non-pharmacological management of Dementia. (10+10)
2. Discuss the neuropsychiatric aspects of Systemic Lupus Erythematosus (SLE). How does the medical treatment of SLE can affect psychiatric manifestation? (7+3)
3. Discuss the various neuropsychiatric sequelae of head trauma. (10)
4. Classify headache. Describe the prophylactic management in a case of migraine. (5+5).
5. Discuss the neuropathological findings of parkinson's disease. What are the different neuropsychiatric manifestations of parkinson's disease? (4+6).
6. What do you mean by end-of-life decisions? Describe the role of psychiatrist in palliative care. (5+5)
7. Write the various investigation and non-pharmacological management of a 45 yrs old male with erectile dysfunction. (5+5)
8. Classify epilepsy. Enumerate the different inter-ictal psychiatric manifestations. (4+6).
9. Classify the different prion diseases. What are the psychiatric manifestations of creutzfeldt Jakob Disease? (5+5)

ENTRUSTABLE PROFESSIONAL ACTIVITIES

Sl. No.	EPAs – MD Psychiatry.	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year	
1	Assess a patient presenting with mental/behavioural symptoms using appropriate methods/tools (History, mental status examination, rating scales, physical examination, etc.) & arrive at a psychiatric differential diagnosis based on standard criteria (ICD-10/DSM-5)	+	+	+	+	+	+	-	II	III	IV	S, P, PG, H, I
2	Recommend and interpret common psychodiagnostic tools and rating scales for a patient presenting with mental/behavioural symptoms.	+	+	+	+	+	+	-	II	III	IV	S, PG, I
3	Assessment and management of intentional self-harm and harm to others	+	+	+	+	+	+	-	II	III	IV	S, P, PG, H, I
4	Evaluation for general medical/surgical co-morbidities and organize appropriate referrals to concerned speciality departments.	+	+	+	+	+	+	I	II	III	IV	S, PG, I
5	Formulate & implement an appropriate, safe, comprehensive & evidence-based psychopharmacological treatment plan	+	+	+	+	+	+	-	II	III	IV	S, P, PG, I
6	Formulate & implement an appropriate, safe, comprehensive & evidence-based psychosocial treatment plan	+	+	+	+	+	+	-	I	II	III	S, P, H, I
7	Documentation of detail psychiatric examination in the patient records in OP & IP settings (history, examination, formulation, diagnoses, laboratory reports, treatment, progress, discharge plan etc.).	+	+	+	+	+	+	I	II	III	IV	S, PG, I

Sl. No.	EPAs – MD Psychiatry.	Competency Domains							Level of competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day 1 of residency	End of 1 st year	End of 2 nd year	End of 3 rd year		
8	Prepare a precise discharge summary with the post-discharge plan under supervision of a faculty	+	+	+		+	+	I	II	III	IV	S, PG, I	
9	Carry out non-pharmacological treatment strategies (supportive psychotherapy, cognitive behaviour therapy, behavioural therapy etc.)	+	+	+		+	+	I	II	III	IV	S, PG, I	
10	Provide psychoeducation, compliance therapy, group therapy, relapse prevention to the patient and family members	+	+			+	+	I	II	III	IV	S, P, PG, I	
11	Evaluation, management and reporting of treatment-emergent adverse side effects to the concerned authority	+	+	+		+	+	I	II	III	IV	S, PG, I	
12	Give or receive a patient handover to transition care responsibility	+	+	+	+	+	+	I	II	III	IV	S, PG, H, I	
13	Obtain informed consent for tests and/or procedures (ECT, rTMS, Narcoanalysis) and carry out under supervision of faculty	+	+	+	+	+	+	I	II	III	IV	S, P, PG, I	
14	Perform general procedures of a physician [Basic cardiopulmonary resuscitation (CPR); bag and mask ventilation; inserting an IV line]	+	+	+		+	+	II	III	IV	IV	S, PG, H, I	
15	Assess & manage mental/behavioural symptoms in a patient with physical illness/ physical trauma, in collaboration with other medical/surgical specialists.	+	+	+	+	+	+	I	II	III	IV	S, P, PG, H, I	
16	Assess & manage a patient with delirium, in collaboration with other medical/surgical specialists.	+	+	+	+	+	+	-	II	III	IV	S, P, PG, H, I	

Abbreviations:

MK: Medical knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I

The background of the page features a complex network diagram. It consists of numerous circular nodes of varying sizes, connected by thin, light-colored lines. The nodes are color-coded: yellow and orange nodes are located in the upper left quadrant; green and teal nodes are in the middle left; grey and light blue nodes are in the lower left; and dark blue nodes are in the lower right. The overall layout is asymmetrical, with the network elements framing the central text.

RADIODIAGNOSIS

MD in Radiodiagnosis

COURSE NAME

MD in Radiodiagnosis

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

OBJECTIVES

A resident on completing his/her MD (Radiodiagnosis) should have acquired good basic knowledge in the various sub-specialties of radiology such as Neuro-radiology, GI-radiology, GenitoUrinary-radiology, Vascular- Radiology, Musculoskeletal, Interventional radiology, Emergency radiology, Pediatric radiology, pulmonary radiology, Head and neck imaging and Mammography, and be able to independently conduct and interpret all routine and special radiological and imaging investigations.

1. Provide radiological services in acute emergency and trauma including its medico-legal aspects.
2. Elicit indications, diagnostic features and limitation of the application of USG, CT and MRI and should be able to describe the proper cost-effective algorithm of various imaging techniques in a given problem setting.
3. Perform (under supervision) basic image-guided interventional procedures for diagnosis and therapeutic management.
4. Formulate basic research protocols and carry out research in the field of radiology related clinical problems.
5. Undertake further specialization in any of the above-mentioned branches in Radio-diagnosis such as Gastrointestinal radiology, Uroradiology, Neuroradiology, Vascular Radiology, Musculoskeletal Radiology, Interventional radiology etc.

6. To interact with other specialists and super-specialists so that maximum benefit to the patient accrues.
7. Work as a consultant in Radiodiagnosis and conduct the teaching programme for undergraduates, postgraduates as well as paramedical and technical personnel.
8. Organize CME in the speciality utilizing modern methods of teaching and evaluation.

The three-year course in Radiodiagnosis is aimed at imparting training in both conventional radiology and modern imaging techniques so that the candidate is fully competent to practice, teach and do research in the broad discipline of radiology including ultrasonography, Computed Tomography, Magnetic Resonance Imaging and radiological intervention.

Candidate should be well versed with medical ethics and consumer protection act and the Preconception-Prenatal Diagnostic Technique (PC-PNDT) Act.

SYLLABUS

THEORY

1st semester:

- Basic sciences related to the speciality of Radiodiagnosis.
- Structure of X-ray tube and Production of X rays, X-ray generators, Basic interactions between X Rays and matter, attenuation, filters, beam restrictors, Grids, luminescent screens, Physical characteristics of X-Ray Film and Film processing, Photographic characteristics of X-Ray film.
- AERB act and radiation safety
- X-Ray equipment.
- Conventional X-Ray Units
- Digital X-Ray Units
- Computed Radiography system Fluoroscopy units (conventional, digital); Fluoroscopic

screen, tilting tables, over and under couch tubes, safety features, image intensifier tubes.

- Types of daylight film handling system, types of optical coupling and methods of viewing, recording of the intensified image, CCTV, cine fluorography.
- Introduction to advanced imaging equipment. US, CT, MRI, Angiography, cine fluoroscopy and cine angiography
- Film procession darkroom equipment and procedures-manual, automatic,
- Daylight processing
- Quality assurance
- Radiation hazards and radiation protection
- Mammography and Breast Intervention: Screen film mammography (conventional) and digital mammography in screening of breast cancer, benign and malignant lesions of the breast.
- Mammography: Equipment and physics related to mammography. Details of BIRADS.
- Conventional Radiology: Reading Conventional radiographs including radiographs on chest abdomen, pelvis, skull (including PNS + Orbit), spine, musculoskeletal and soft tissues, and special investigations.
- Contrast media. Types, chemical composition, mechanism of action, dose schedule, route of administration, adverse reaction and their management.
- Contrast safety
- Basic life support training
- Conventional imaging of radiological anatomy and various pathologies related to
 - Respiratory System: Disease of the chest wall, diaphragm, pleura and airway; Pulmonary: normal vasculature, pulmonary infections, pulmonary neoplasm, diffuse lung disease, Mediastinal disease, Chest trauma; post-operative and intensive care imaging
 - Musculoskeletal system: Imaging (Conventional, Ultrasound) and

interpretation of disease of muscles, soft tissue, bones and joints including congenital, inflammatory, infective, traumatic, metabolic and endocrine, neoplastic and miscellaneous conditions.

- Ultrasound: Performance and interpretation of all ultrasound studies. These include the abdomen, pelvis, small parts, neonatal head, breast, colour-duplex imaging (arterial and venous studies), obstetrics/gynaecology and intervention procedures using ultrasound guidance.

2nd semester:

- General Topics:
 - Research methodology
 - Principle of education
 - Biostatistics
 - Computer, information and technology
 - Ethics in Radiology
 - Internet search
- Physics of Diagnostic Ultrasound and Doppler

The nature and propagation of sound wave, speed of sound in a material medium, intensity of sound, the decibel, ultrasound wave, ultrasound wave properties propagation in tissue, absorption, scattering, reflection and refraction, acoustic impedance, Doppler's effect, Ultrasonic wave production of ultrasonic wave (piezo-electric effect) in ultrasonography, transducers.

Ultrasonography, A, B and M scanning modes, Use of the principle of Doppler's effect in Diagnostic radiology (e.g. Echo, blood flow measurement), Ultrasound image formation and storage/documentation devices.

Types of Transducers, Recording Devices and Orientation of Images, Focus of the beam, sensitivity and gain. Quality Control / Artifacts.

- Elastography
- Conventional imaging of radiological anatomy and various pathologies related to

- Cardiovascular Radiology: Congenital and acquired diseases of the cardiovascular system, The role of imaging by conventional radiology, ultrasound, Color-Doppler, CT, MRI, angiography and radionuclide studies.

3rd semester:

Physics of Computerized Tomography (CT)

CT Applications: Advantages and Limitations, Basic Data acquisition concepts, CT Detectors Technology, Image Reconstruction, display and recording systems. CT control console. Dosimetry and Image quality in CT. Future Developments.

Pressure injectors: Types, Injection protocols and usages.

- CT
 - Select CT protocol according to the clinical diagnosis
 - Demonstrate knowledge of the CT finding of the common pathology
 - Know the limitations of CT in the diagnosis of certain diseases
 - Perform CT guided interventions (under supervision)
- Conventional imaging of radiological anatomy and various pathologies related to Respiratory system
- Gastrointestinal (GIT) and Hepato-Biliary-Pancreatic System:
 - Diseases of mouth, pharynx, salivary glands, oesophagus, stomach & intestine, Diseases of omentum, peritoneum and mesentery,
 - Acute abdomen, abdominal trauma.
 - Diseases and disorders of hepato-biliary-pancreatic system.
- Conventional and other imaging methods like US, CT, MRI, DSA and isotope studies pertaining to these systems.
- Neuroimaging:

Includes imaging (using conventional and newer methods) and interpretation of various diseases

and disorders of the head, and spine covering congenital, infective, vascular, traumatic and neoplastic conditions

- Genito-Urinary System:
 - Congenital, inflammatory, traumatic, neoplastic, calculus disease and miscellaneous conditions.
 - Interpretation of conventional and other diagnostic imaging procedures used to evaluate urinary tract pathology i.e. X-ray, IVU, ultrasound, CT, MRI, angiography, urography.
 - Vascular/non-vascular interventions of genito-urinary system.
- Radiology Emergency Medicine
 - Emergency radiographic examinations
 - The protocol of imaging in emergency situations of different organ systems

4th semester:

- Magnetic Resonance Imaging Physics
 - History, the advantage over other imaging modalities, equipment terminology,
 - Physics of MRI, NMR Signals, pulse sequences
 - Magnetic Shielding and RF Shielding.
 - CT and MRI imaging of normal anatomy and various pathologies related to various systems - Central nervous system, musculoskeletal system, mammography and hepatobiliary
- MRI
 - Select MRI protocol according to the clinical diagnosis
 - Knowledge of conventional and modified MRI examinations, including MRA, MRV, MRCP, MRS
 - Demonstrate knowledge of the MRI of the common pathological conditions.
 - MRI safety (RF deposition, Cryogen related and MRI contrast agent related safety)

- Radiological anatomy and various pathologies related to Neuro-Radiology: Includes imaging (using conventional and newer methods) and interpretation of various diseases and disorders of the head, and spine covering congenital, infective, vascular, traumatic and neoplastic conditions
- Radiological anatomy and various pathologies related to head and neck and orbit
- The student should be able to perform (under supervision) simple interventional procedures of all the organ systems.

5th semester:

- Angiography: The student should be able to interpret and preferably perform (under supervision) Routine angiographic procedures and vascular interventions. Interventional Radiology
- Musculoskeletal system: Imaging (MRI) and interpretation of disease of muscles, soft

tissue, bones and joints including congenital, inflammatory, infective, traumatic, metabolic and endocrine, neoplastic and miscellaneous conditions.

- Thesis writing
- Angiography systems (DSA): Equipment (Present and past), Serial Imaging Devices, Subtraction process. Radiation Protection in DSA

6th semester:

- Nuclear Medicine. Diagnostic use of important isotopes in different organ systems.
- Instruments/equipment in Nuclear Medicine and their recent advances.
- Radiotherapy- Instruments/equipment in Radiotherapy and their recent advances.
- Picture archiving and communication system (PACS) and Radiology information system (RIS) to make a filmless department.

TEACHING & LEARNING METHODS

Teaching Schedule

The suggested departmental teaching schedule is as follows:

1. Seminar Once a week
 2. Film Reading Once a week
 3. Case presentation Once a week
 4. Inter department meet Once/ twice a week
 5. Journal club Once a week
- All sessions will be coordinated by the faculty members.
 - All the teaching sessions to be assessed by the consultants at the end of the session and graded.
 - Attendance of the Residents at various sessions should be at least 75%

Departmental Training schedule & posting of residents

The postgraduate student should be posted in all sections (Conventional radiology, U/S, CT, MRI etc.) so that there is adequate exposure to all modalities.

SCHEDULE FOR ROTATION OF RESIDENTS

1st Year (PG 1/6)	Conventional radiography (2 months)	Mammography (1 month)	USG (2 months)	Special radiographic procedures (1 month)
1st Year (PG 2/6)	USG (1 month)	Special radiographic procedures (2 months)	NCCT scan (2 months)	Emergency medicine (1 month)
2 nd Year (PG 3/6)	Doppler USG (2 months)	CT scan (NCCT & CECT) (2 months)	Mammography (1 month)	US / CT Intervention (1 month)
2 nd Year (PG 4/6)	Conventional radiography (1 month)	DSA (1 month)	USG (2 months)	CT scan (NCCT & CECT) (2 months)
3rd Year (PG 5/6)	MRI (2 months)	Doppler USG (1 month)	US / CT Intervention (1 month)	DSA (2 months)
3rd Year (PG 6/6)	MRI (2 months)	Nuclear medicine (15 days)	USG and Doppler (2 months)	US / CT Intervention (1.5 months)

ASSESSMENT

All the PG resident are assessed daily for their academic activities and also periodically.

General Principles

- The assessment is valid, objective and reliable
- Formative, continuing and summative (final) assessment is conducted in theory as well as practical. In addition, the thesis is assessed separately.

Examination on Research Methodology & Biostatistics

- Timing: End of 2nd Semester
- Total marks: 100
- Will be considered as an internal examination
- Candidate should pass to appear in Final examination
- No marks will be added to final/summative examination

- Will be conducted by Examination Cell in the month of June & December

Internal Assessment

- The formative assessment will be continuous as well as semester examinations. The former would be based on the feedback from the senior residents and the faculty concerned.
- Continuous assessment will be done on an ongoing basis using a logbook covering day to day performance of the candidate. It will be compiled and converted into marks by the faculty every 6 months.
- Tools and methods will be developed by the departments to assess research, teaching and managerial skills.

Timeline: End of the 3rd, 4th and 5th semester; pre-final (2 months before final examination).

Marks distribution: Theory 100 marks, and practical with viva and

logbook will carry 100 marks

(Practical – 70, viva – 20, logbook – 10).

The marks of the 4 internal examinations will be averaged to 100 each for theory and practical.

The performance of the Postgraduate student during the training period should be monitored throughout the course and duly recorded in the logbooks as evidence of the ability and daily work of the student.

Semester	Topics
3 rd semester (18 th month)	X-ray physics, USG and Doppler physics, Contrast media, Respiratory system, Cardiovascular system, Musculoskeletal system.
4 th semester (24 th month)	CT physics, Genitourinary system, Gastrointestinal system, mammography.
5 th semester (30 th month)	MRI physics, Nervous system, Head & Neck Imaging, Paediatric Radiology.
Prefinal	Complete syllabus
Final (at the end of 3 rd year)	Complete syllabus

Summative assessment

Final assessment will be carried out by two external examiners and two internal examiners. The summary of the examinations as follows:

A maximum of 1000 marks will be awarded. The candidate must obtain at least 50% (i.e. 500) marks to pass the examination. Of the 1000 marks, 200 marks will be from the Internal Assessment (both theory and practical). A total of 800 marks will be assigned to the Final Examination (Theory 400, Practical 400). It will be essential to pass the theory and practical both separately in the Final Examination by securing at least 50% marks in each (Candidate must pass in theory and practical independently by obtaining at least 200 marks in theory and 200 in practical respectively).

A. Theory Examination (Total=400)

Paper I Basic sciences related to radiology- 100

Paper-II Principles and practice of Radio-diagnosis - 100

Paper III Radiodiagnosis as related to pathology -100

Paper IV Recent advances & radiology as applied to other specialities- 100

B. Practical Examination and Viva-voce (Total=400) The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A* 200 marks	Longcase (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/ Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

* Students should pass (secure 50% marks) separately in Part A

Marking scheme

	1 st internal examination (18 th month)	2 nd internal examination (24 th month)	3 rd internal examination (30 th month)	4 th internal examination	Total internal marks (average of 4 exams)	Final exam	Total marks
Time Frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	Prefinal		36 months	
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

RECOMMENDED BOOKS

1. Atlas SW. Magnetic Resonance Imaging of the Brain and Spine: Wolters Kluwer Health; 2016.
2. Curry TS, Dowdey JE, Murry RC. Christensen's Physics of Diagnostic Radiology: Lea & Febiger; 1990.
3. Dahnert WF. Radiology Review Manual: Wolters Kluwer; 2017.
4. Davidson AJ. Davidson's Radiology of the Kidney and Genitourinary Tract: Saunders; 1999.
5. Geschwind JFH, Geschwind J, Dake MD. Abrams' Angiography: Interventional Radiology: Wolters Kluwer Health; 2013.
6. Gore RM, Levine MS. Textbook of Gastrointestinal Radiology: Elsevier - Health Sciences Division; 2014.
7. Grant LA, Griffin N. Grainger & Allison's Diagnostic Radiology Essentials E-Book: Elsevier Health Sciences; 2018.
8. Haaga JR, Boll D. Computed Tomography & Magnetic Resonance Imaging Of The Whole Body E-Book: Elsevier Health Sciences; 2016.
9. Heywang-Koebrunner SH, Schreer I, Barter S. Diagnostic Breast Imaging: Mammography, Sonography, Magnetic Resonance Imaging and Interventional Procedures: Thieme; 2019.
10. Lawrence R. Goodman MDF. Felson's Principles of Chest Roentgenology, A Programmed Text: Elsevier Health Sciences; 2014.
11. Lee EY, Hunsaker A, Siewert B. Computed Body Tomography with MRI Correlation: Lippincott Williams & Wilkins; 2019.
12. Lichtenstein DA, Pinsky MR, Jardin F. General ultrasound in the critically ill: Springer Berlin Heidelberg; 2008.
13. Margulis AR, Burhenne HJ, Freeny PC, Stevenson GW. Margulis and Burhenne's Alimentary Tract Radiology: Mosby; 1994.
14. Norton ME. Callen's Ultrasonography in Obstetrics and Gynecology E-Book: Elsevier Health Sciences; 2016.

MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASIC SCIENCE RELATED TO RADIODIAGNOSIS

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the general composition of a transducer. What are the commonly available frequencies of transducer? What is piezoelectric effect? Discuss the characteristics of Piezoelectric crystals. (6+4+4+6)
2. Define Roentgen. Mention various recommendations of maximum permissible dose for patients and staff members of the Radiodiagnosis department. (2+4+4)
3. Discuss the various types of magnets & gradient coils used in MRI. (5+5)
4. a. Rare earth screen.
b. Green Sensitive Film.
c. Dual energy substractions. (3+3+4)
5. Discuss contrast media used in MRI, their indications & side effects. (4+3+3)
6. Enumerate the factors affecting radiographic quality. Discuss the methods by which you improve the radiographic quality? Enumerate the factors that can contribute to reduction of radiation dose to the patients & the operator? (3+3+4)
7. What is MRCP? Describe the advantages of MRCP over ERCP. (4+6)
8. Describe briefly the types of detectors used in Multidetector CT & its advantages. (5+5)
9. Enumerate various interactions of X-ray photons with matter. Discuss any two in detail with their significance in Radiodiagnosis department. (3+3+4)

PAPER 2

RADIO ANATOMY & IMAGING

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the radiological anatomy of sella. How would you approach a case of sellar-parasellar mass? Describe the radiological findings of Pituitary masses with particular reference to MRI. (5+5+10)

-
2. Describe vascular anatomy of pancreas. Discuss CT, MRI protocol & technique in for both detection & staging of pancreatic adenocarcinoma. (4+3+3)
 3. Enumerate the various Neurocutaneous syndromes & describe the radiological features of any two of them. (2+4+4)
 4. Describe the MRI techniques and findings in the knee joint trauma. (3+7)
 5. What are the common cerebello-pontine angle tumors? Describe the imaging features of common Cerebellopontine angle tumors. (3+7)
 6. Discuss the differential diagnosis of metaphyseal lytic lesion in a 12 yr old child? Describe the radiological features. (4+6)
 7. Enumerate the cause of Portal hypertension. Describe the ultrasonography and Doppler findings in portal hypertension. (3+4+3)
 8. Draw diagram of axial CT anatomy of broncho-pulmonary segments & imaging in pulmonary sequestration. (5+5)
 9. Describe the congenital abnormalities of female genital tract & role of imaging. (3+7)

PAPER 3

CLINICAL RADIODIAGNOSIS & IMAGING

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Innumerate the causes of Renal masses. Role of USG, CT and MRI in characterisation of Renal masses. (5+15)
 2. Classify the types of tracheo-oesophageal fistula with their radiological features. (3+7)
 3. Enumerate the common causes of obstructive jaundice. Discuss the role of various imaging modalities in its diagnosis. (2+8)
 4. Describe MRI protocol, techniques & findings in the detection of prostatic carcinoma. (2+2+6)
 5. Define sarcoidosis. What are the various stages of thoracic sarcoidosis? Discuss the radiological manifestations of thoracic sarcoidosis. (2+2+6)
 6. Enumerate the causes of Hydrops foetalis? Describe the imaging findings. (4+6)
 7. What are the skeletal findings in primary hyperparathyroidism? What are the imaging findings in parathyroid adenoma. (5+5)
 8. Discuss the etiology and characteristic imaging findings in 'ring enhancing lesions' of the brain. (3+7)
 9. What is TIRADS. Describe its scoring & classification. (2+8)
-

PAPER 4

RECENT ADVANCES IN RADIODIAGNOSIS

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Radio frequency ablation of hepatic tumor – its indications, technique & advantages and describe post treatment changes. (5+10+5)
2. What is the role of diffusion & perfusion weighted imaging in acute stroke? (5+5)
3. Discuss the Indications & advantages of coronary CT angiography over DSA. (5+5)
4. Discuss the following: (3+4+3)
 - a. Bold Imaging.
 - b. Fusion Imaging.
 - c. MR Artefacts.
5. What are its types of invasive placentation? Which imaging modalities would be useful in its diagnosis? Briefly describe the imaging features of each imaging findings? (2+2+6)
6. Briefly discuss with diagram the anatomy of Circle of Willis. What are the causes of subarachnoid haemorrhage? Discuss the role of imaging in a case of subarachnoid hemorrhage. (3+3+4)
7. What is MR spectroscopy? How it helps in diagnosis of intracranial lesions? (5+5)
8. What is the aetiology of acute rejection & discuss the role of U/S Doppler in the diagnosis of acute rejection after renal transplant. (3+7)
9. What is elastography? Describe the role of elastography in evaluation of breast lesion. (4+6)

ENTRUSTABLE PROFESSIONAL ACTIVITIES FOR MD-RADIODIAGNOSIS RESIDENTS

S. No.	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ISC	DAY 1 OF RESIDENCY	End of 1 st year	End of 2 nd year	End of 3 rd year	
1	History taking and relevant physical examination.	*	*	*	*	*	*	1	2	3	4	S,P,PG,I
2	Formulation a differential diagnosis based on history	*	*	*	*	*	*	1	2	3	4	S,PG,I
3	Clinical presentation of the case	*	*	*	*	*	*	1	2	3	4	S,PG,I
4	Obtain informed consent for tests and/or procedures/ research	*	*	*	*	*	*	1	3	3	4	S,PG,I
6	Recognize a patient requiring emergency care and initiate evaluation	*	*	*	*	*	*	1	2	3	4	S,PG,I
7	Management of adverse effects of contrast media	*	*	*	*	*	*	1	2	3	4	S,PG,I
8	FAST scan	*	*	*	*	*	*	1	2	3	4	S,PG,I
9	Perform general procedure of physician	*	*	*	*	*	*	1	2	3	4	S,PG,I
10	Using evidence-based medicine to improve patient care.	*	*	*	*	*	*	1	2	3	4	S,PG,I
11	Interpretation of commonly performed X-rays	*	*	*	*	*	*	1	2	3	4	S,PG,I
12	Fluoroscopic guided barium procedures	*	*	*	*	*	*	1	2	3	4	S,PG,I,H
13	Perform IVP, RGU, MCU,HSG etc	*	*	*	*	*	*	1	2	3	4	S,PG,I,H
14	USG KUB for obstructive uropathy(calculus disease, MRD)	*	*	*	*	*	*	1	2	3	4	S,PG,I
15	USG for Hepatobiliary , appendix and pancreatic pathologies	*	*	*	*	*	*	1	2	3	4	S,PG,I

S. No.	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ISC	DAY 1 OF RESIDENCY	End of 1 st year	End of 2 nd year	End of 3 rd year	
16	Interpretation of normal CT anatomy of head, thorax, PNS	*				*		1	3	3	4	S,PG,I
17	CT interpretation in head trauma and stroke	*	*	*				1	2	3	4	S,PG,I
18	Interpretation of normal MR anatomy of brain spine and joints	*				*		1	2	3	4	S,PG,I
19	Interpretation of X-ray mammography	*	*			*		1	2	3	3	S,PG,I
20	Interpretation of pediatric intensive care and trauma X-rays	*	*		*	*		1	2	3	3	S,PG,I
21	ANC growth scans	*	*	*	*	*		1	2	3	4	S,PG,I
22	USG evaluation of hepatobiliary, Genitourinary diseases	*	*	*	*	*		1	2	3	4	S,PG,I
24	USG guided FNAC, diagnostic and therapeutic tapping	*	*	*	*	*		1	2	3	4	S,PG,I,H
26	Perform newborn and infants USG examination	*	*	*	*	*		1	2	3	4	S,PG,I,H
27	Interpretation of HRCT of thorax , temporal bone and PNS	*	*	*	*	*		1	2	3	4	S,PG,I,H
28	Interpretation of plain and contrast CT of KUB, thorax for lung and mediastinal masses.	*	*	*	*	*		1	2	3	4	S,PG,I,H
29	CT interpretation of liver ,adrenal and renal masses	*	*	*	*	*		1	2	3	4	S,PG,I,H
30	CT Interpretation of acute abdomen	*	*	*	*	*		1	2	3	4	S,PG,I,H
31	MR Interpretation of degenerative diseases of spine	*	*	*	*	*		1	2	3	4	S,PG,I,H

S. No.	EPA	Competency Domains						Level of competency				MSF
		MK	PC	PBLI	SBP	P	ISC	DAY 1 OF RESIDENCY	End of 1 st year	End of 2 nd year	End of 3 rd year	
32	MR evaluation of stroke imaging and seizure disorders	*	*	*	*	*	*	1	2	3	4	S,PG,I,H
33	Interpretation of MRCP and pelvic MRI	*	*	*	*	*	*	1	2	3	4	S,PG,I,H
34	Interpretation of knee, hip and shoulder joint	*	*	*	*	*	*	1	2	3	3	S,PG,I,H
35	Anomaly scan and fetal Doppler	*	*	*	*	*	*	1	2	3	3	S,PG,I
36	Perform doppler studies (carotid, renal, extremities, hepatic and portal vein)	*	*	*	*	*	*	1	2	3	4	S,PG,I,H
37	USG guided interventional procedures(biopsies and pigtail)	*	*	*	*	*	*	1	2	3	3	S,PG,I,H
38	Interpretation of coronary , peripheral angiograms and Cardiac CT	*	*	*	*	*	*	1	2	3	3	S,PG,I,H
39	CT guided interventional procedures	*	*	*	*	*	*	1	2	3	3	S,PG,I,H
40	Interpretation of brain tumours with MRS	*	*	*	*	*	*	1	2	3	3	S,PG,I,H

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others

Multisource feedback (MSF):

Supervisor: S

Patients/Relatives: P

Undergraduate students: UG

Peers: PG

Community: C

Other health professionals: H

Self: I

The background of the page is a complex network diagram. It consists of numerous circular nodes of varying sizes, connected by thin, light-colored lines. The nodes are color-coded: yellow and orange nodes are concentrated in the upper left quadrant; green and teal nodes are scattered in the middle left and center; grey nodes are distributed in the lower left and center; and blue nodes are primarily located in the lower left and bottom right. The overall effect is a dense, interconnected web of points and lines, suggesting a network or a molecular structure.

RADIOTHERAPY

MD in Radiotherapy

COURSE NAME

MD in Radiotherapy

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

OBJECTIVES

The purpose of PG education in Radiotherapy is to create specialists who would provide high-quality health care to the cancer patient and advance the cause of science through research & training.

Postgraduate undergoing training in MD Radiotherapy should be trained to identify and recognize various types of cancer, their staging, Contemplate possible differential diagnoses, treatment planning, execution of treatment, understanding toxicities, management of adverse events. He/She should be able to provide competent professional services to cancer patients at healthcare centres of every hierarchy.

SUBJECT SPECIFIC LEARNING OBJECTIVES

This will be dealt with under the following headings:

- Theoretical knowledge (Cognitive domain)
- Practical and clinical skills (psychomotor domain)
- Attitudes including communication skills (Affective Domain)
- Writing thesis / Reviewing Research activities (Scholarly activity)
- Training in Research Methodology (Practice-based learning, Evidence-based practice)
- Professionalism
- Teaching skills

COURSE CONTENT

THEORY AND PRACTICAL

STRUCTURE

1. Basic Sciences (a) Anatomy (b) Pathology - General Pathology, Systemic Pathology (c) Radiotherapeutic physics (d) Clinical Radiobiology & Cancer Cell Biology (e) Statistical basis for planning & interpretation of clinical trials.
2. Clinical Radiotherapy
3. Clinical Chemotherapy and other Systemic Therapies
4. Other disciplines allied to Radiotherapy and Oncology
5. Palliative care
6. Recent Advances in Radiation Oncology
7. Research, Training & Administration

BASIC SCIENCES

1.1. Anatomy 1.1.1. Knowledge of surface anatomy pertaining to Oncology 1.1.2. Detailed knowledge of the anatomy of all organs. 1.1.3. Detailed knowledge of the lymphatic system of all regions 1.1.4. Practical familiarity with the radiographic appearance of important regions 1.1.5. Cross-sectional anatomy 1.2. Pathology 1.2.1 General Pathology 1.2.1.1. Definitions of & distinction between different types of growth disorders (i.e. the distinction between hyperplasia, hypertrophy, regeneration, malformation & neoplasia) 1.2.1.2. Malignant transformation Initiation & promotion stages of carcinogenesis Mode of origin - monoclonal, polyclonal, unifocal, multifocal Structural & functional changes in the cellular components. Aetiology, mechanisms of carcinogenesis, known types of carcinogens & their effects upon the cell. The relative importance of different factors in the causation of human cancer. 1.2.1.3. Rate of growth, methods of measurement Factors affecting growth rate Mechanisms of spread Local effects of tumours Local & systemic reactions to tumours Effects of therapy on tumours & dual-mode tissues. 1.2.1.4. Criteria for tumour diagnosis - macroscopic, histological & cytological uses & value of biopsy material 1.2.1.5. Classification of

tumours - histogenic, histological, behavioural & immunological 1.2.1.6. Nomenclature - solid tumours, lymphomas, leukaemias 1.2.1.7. Structure & organization of tumours - vascular supply, stroma etc 1.2.1.8. Systems of grading 1.2.1.9. Endocrine aspects of malignancy:- production of hormones by tumours, effect of hormones on tumours, paracrine effects of tumours 1.2.1.10. Paraneoplastic syndromes 1.2.1.11. Aetiology of cancer Genetic predisposition, congenital syndromes Chromosomal abnormalities, hereditary tumours Protooncogenes, oncogenes, tumour suppressor genes, viruses & malignancy Multifactorial causation Nutritional aspects in cancer causation and prevention. Environmental causes of cancer Biological - protozoal, bacterial, viral Chemical - Classes of carcinogenic chemicals, smoking Physical - trauma, irradiation (UV rays, other electromagnetic radiation including X rays and Gamma rays and particulate radiations) Common occupational cancers. Experimental tumours in animals - relationship to human mutagenicity. 1.2.1.12. Tumour immunology Organisation & development of the immune system & the role of immune response in disease Cellular basis of immunity & measurement of immune function. Graft versus host reaction Tumor immunity, tolerance, enhancement Immune surveillance hypothesis Immunological markers in diagnosis & monitoring Experimental & clinical immunotherapy The HLA systems. 1.3. Radiation Oncology Physics The aim of this subject is to provide the future Clinical Oncologist with the knowledge of physics required in clinical practice.

An understanding of the principles of planning & carrying out treatment is a necessary prerequisite & will be enhanced by the study of this subject. Familiarity with the physics of electricity, atomic structure & electromagnetic radiation will also be required in order to understand parts of the syllabus. As they are studied they should be analyzed critically with respect to their implications for accurate dose delivery in clinical radiation therapy. Applicability limitations, advantages, & disadvantages of the various devices & techniques should receive particular attention. Candidates should be encouraged to observe & gain practical experience with the equipment & techniques used in radiotherapy in clinical oncology departments.

1.3.1 Structure of Matter: Constituents of atoms, Atomic and mass numbers, Atomic and mass-energy units, Electron shells, Atomic energy levels, Nuclear forces, Nuclear energy levels Electromagnetic radiation, Electromagnetic spectrum, Energy quantisation, Relationship between Wavelength, Frequency, Energy 1.3.2 Nuclear Transformations: Natural and artificial radioactivity, Decay constant, Activity, Physical, Biological and Effective half-lives, Mean life, Decay processes, Radioactive series, Radioactive equilibrium 1.3.3 Production of X-rays: The X-ray tube, Physics of X-ray production, Continuous spectrum, Characteristic spectrum, Efficiency of X-ray production, Distribution of X-rays in space, Specifications of beam quality, Measurement of beam quality, Filters and filtration 1.3.4 Interaction of radiation with matter: Attenuation, Scattering, Absorption, Transmission, Attenuation coefficient, Half Value Layer (HVL), Energy transfer, Absorption and their coefficients. Photoelectric effect, Compton Effect, Pair-production, Relative importance of different attenuation processes at various photon energies Electron interactions with matter: Energy loss mechanisms- Collisional losses, Radiative losses, Ionization, Excitation, Heat production, Delta rays, Polarization effects, Scattering, Stopping power, Absorbed dose, secondary electrons Interactions of charged particles: Ionization vs. Energy, Stopping power, Linear Energy Transfer (LET), Bragg curve, Definition of particle range 1.3.5 Measurement of radiation: Radiation Detectors: Gas, Solid-state, Scintillation, Thermoluminescence, Visual Imaging (Film, Fluorescent screens), and their examples Exposure, Dose, Kerma: Definitions, Units (Old, New), Inter-relationships between units, Variation with energy and material. Measurement of exposure (Free air chamber, Thimble chamber), Calibration of therapy beams: Concepts, Phantoms, Protocols (TG 21, IAEA TRS-277, TG 51) Dose determination in practice (brief outline only, details not required) 1.3.6 Radiotherapy Equipment: Grenz ray, Contact, Superficial, Orthovoltage or Deep therapy, Supervoltage, Megavoltage therapy. Therapy and diagnostic X-ray units - comparison. Filters, factors affecting output, principles of cooling. Betatrons. Co-60 units: Comprehensive description of the unit, Safety mechanisms, Source capsule.

Linear accelerators: History, Development, Detailed description of a modern, dual-mode linear accelerator, Linac head and its constituents, Safety mechanisms, Computer-controlled linacs, Record and Verify systems Relative merits and demerits of Co-60 and linac units Simulators: Need for them, Detailed description of a typical unit, Simulator CT 1.3.7 Basic ratios, Factors, Dose distributions, Beam modifications and Shaping in Teletherapy beams Characteristics of photon beams: Quality of beams, Difference between MV and MeV, Primary and scattered radiation Percentage depth dose, Tissue-Air Ratio, Scatter Air Ratio, Tissue-Phantom Ratio, Tissue Maximum Ratio, Scatter Maximum Ratio, Back Scatter Factor, Peak Scatter Factor, Off-Axis Ratio, Variation of these parameters with depth, field size, source skin distance, beam quality or energy, beam flattening filter, target material. Central axis depth dose profiles for various energies. Equivalent square concept, Surface dose (entrance and exit), Skin sparing effect, Output factors Practical applications: Co-60 calculations (SSD, and SAD technique), Accelerator calculations (SSD, and SAD technique) Beam profiles, Isodose curves, Charts, Flatness, Symmetry, Penumbra (Geometric, Transmission, and Physical), Field size definition Body inhomogeneities: Effects of patient contour, Bone, Lung cavities, Prosthesis on dose distribution. Dose within bone / lung cavities, Interface effects, Electronic disequilibrium Wedge filters and their use, Wedge angle, Wedge Factors, Wedge systems (External, In-built Universal, Dynamic / Virtual), Wedge isodose curves Other beam modifying and shaping devices: Methods of compensation for patient contour variation and / or tissue inhomogeneity - Bolus, Buildup material, Compensators, Merits and Demerits. Shielding of dose-limiting tissue: Non-divergent and Divergent beam blocks, Independent jaws, Multileaf collimators, Merits and Demerits 1.3.8 Principles of Treatment Planning - I Treatment planning for photon beams: ICRU 50 and Nordic Association of Clinical Physics terminologies. Determination of body contour and localization: Plain film, Fluoroscopy, CT, MRI, Ultrasonography, Simulator based Methods of correction for beam's oblique incidence, and body inhomogeneities SSD technique and isocentric (SAD) technique: Descriptions and advantages of SAD technique Combination of fields: Methods of field addition,

Parallel opposed fields, Patient thickness vs. Dose uniformity for different energies in a parallel opposed setup, Multiple fields (3 fields, 4 field box and other techniques). Examples of above arrangements of fields in SSD and SAD techniques, Integral Dose Wedge field technique, Rotation Therapy (Arc, and Skip), Tangential fields. Beam balancing by weighting. Total and Hemi-body irradiation, Field junctions.

1.3.9 Principles of treatment planning - II Limitations of manual planning. Description of a treatment planning system (TPS): 2D and 3D TPS. Beam data input, Patient data input (simple contour, CT, MR data, Advantages of transfer through media), Input devices (Digitizer, floppies, DAT devices, Magneto-optical disks, direct link with CT, MR). Beam selection and placement, Beam's Eye View (BEV), Dose calculation and display (Point dose, Isodose curves, Isodose surfaces, Color wash). Plan optimization, Plan evaluation tools: Dose-Volume Histograms (Cumulative and Differential), Hard copy output, Storage and retrieval of plans. Alignment and Immobilization: External and internal reference marks, Importance of immobilization in radiotherapy, Immobilization methods (Plaster of Paris casts, Perspex casts, bite block, shells, headrests, neck rolls, Alpha-Cradles, Thermoplastic materials, polyurethane foams), Methods of beam alignment (isocentric marks, laser marks, and front/back pointers). Treatment execution: Light field, Cross hair, ODIs, Scales in treatment machines Treatment verification: Port films, Electronic portal imaging devices, In-vivo patient dosimetry (TLD, diode detectors, MOSFET, Film, etc) Changes in patient position, target volume, and critical volume during course of treatment 1.3.10 Electron Beam Therapy Production of electron beams: Production using accelerators, Characteristics of electrons. Surface dose, percentage depth dose, beam profiles, Isodose curves and charts, Flatness and Symmetry. Beam collimation, variation of percentage depth dose and output with field size, and SSD, photon contamination. Energy spectrum, Energy specification, variation of mean energy with depth. Suitability of measuring instruments for electron beam dosimetry Treatment planning: Energy and field size choice, air gaps, and obliquity, Tissue inhomogeneity - lung, bone, air-filled cavities.

Field junctions (with either electron or photon beam). External and internal shielding. Arc therapy, Use of bolus in electron beam Total Skin Electron Irradiation, Intraoperative Radiation Therapy

1.3.11 Physical Principles of Brachytherapy: Properties of an ideal brachytherapy source, Sources used in brachytherapy: Ra-226, Cs-137, Ir-192, Au-198, Co-60, I-125, Sr90, Yt-90, Ru-106, Ta-182 and other new radionuclides, Their complete physical properties, Radium hazards. Source construction including filtration, comparative advantages of these radionuclides Historical background. Radiation and Dose units: Activity used, Exposure, Absorbed Dose, mg-hr, curie, milli-Curie destroyed, milligram Radium equivalent, Roentgen, Rad, Gray. Source strength specification, Brachytherapy Dose calibrator Techniques: Pre-loaded, Afterloading (manual and remote), Merits and Demerits. Surface, Interstitial, Intracavitary, Intraluminal, Intravascular brachytherapy. Low, Medium, High and Pulsed dose rates. Remote afterloading machines, Detailed description of anyone unit Dosage systems: Manchester System (outline only), Paris System (working knowledge)

Treatment Planning: Patient selection, Volume specification, Geometry of implant, Number, Strength and Distribution of radioactive sources, Source localization, Dose calculation, Dose rate specification, Recordkeeping. ICRU 38 Radiation Safety: Planning of brachytherapy facility, Rooms and equipment, Storage and Movement control, Source inventory, Disposal, Regulatory requirements Beta-ray brachytherapy including methods of use, inspection, storage and transport of sources, dose distribution Unsealed radionuclides: Concepts of uptake, distribution and elimination, Activities used in clinical practice, Estimation of dose to target tissues, and critical organs, Procedures for administering radionuclides to patients

1.3.12 Quality Assurance in radiotherapy (QART) Overview of ESTRO QART: Need for a quality system in Radiotherapy, Quality System: Definition and practical advantages, Construction, Development and Implementation of a Quality System Quality Assurance of Simulator, TPS, Co-60, linear accelerator Acceptance testing of Simulator, TPS, Co-60, linear accelerator

1.3.13 Radiation Protection and Regulatory Aspects: Statutory Framework – Principles underlying

International Commission on Radiation Protection (ICRP) recommendations. ICRP and National radiation protection i.e. Atomic Energy Regulatory Board (AERB) standards. Effective dose limits (ICRP and AERB). Protection mechanisms: Time, Distance and Shielding. Concept of “As Low As Reasonably Achievable” (ALARA) Personnel and Area Monitoring: Need for personnel monitoring, Principles of film badge, TLD badge used for personnel monitoring. Pocket dosimeter. Need for area monitoring, Gamma Zone monitors, Survey meters Regulatory aspects: Procedural steps for installation and commissioning of a new radiotherapy facility (Teletherapy and Brachytherapy). Approval of the Standing Committee on Radiotherapy Development Programme. Type approval of unit. Site plan, Layout of installation / Associated facility: Primary, Secondary barriers, leakage and scattered radiation. The regulatory requirement in procurement of teletherapy/brachytherapy source(s). Construction of building, Qualified staff, Procurement of instruments, and accessories, Installation of unit and performance tests, Calibration of unit, RP&AD approval for clinical commissioning of the unit. Other regulatory requirements: Regulatory consent, NOCs, Periodical reports to AERB and Radiological Physics and Advisory Division (RP&AD), Bhaba Atomic Research Centre (BARC).

1.3.14 Advancements in Radiation Oncology: Virtual Simulation: Principle, CT-Simulation, TPS based virtual simulation, Differences, Merits and Demerits, Practical considerations Conformal radiotherapy (CRT): Principles, Advantages over conventional methods, Essential requirements for conformal radiotherapy.

Various methods of CRT:

1. With customized field-shaping using conventional coplanar beams
2. Multiple non-coplanar MLC beams conforming to target shape
3. Stereotactic radiotherapy
4. Principle of Inverse planning and Intensity Modulated Radiation Therapy (IMRT) – Using 3D compensators – Static IMRT (Step and shoot technique) – Dynamic IMRT (sliding window technique) – Dynamic arc IMRT – Micro-MLC – Tomotherapy methods
5. Time gated (4D) radiotherapy

Merits and demerits of IMRT Stereotactic irradiation methods: Physics principles, Techniques, Description of Units (Gamma Knife

and Linac based), Merits and demerits, Stereotactic Radiosurgery (SRS) and Stereotactic Radiotherapy (SRT), Whole body stereotactic frame Networking in radiotherapy: Networking of planning and treatment units in a radiotherapy department including Picture Archival Communication System (PACS), Advantages, Patient Data Management

1.4. Radiobiology

1.4.1. Introduction to Radiation Biology

1.4.1.1. Radiation interaction with matter
Types of radiation, excitation and ionization. Radiation chemistry: direct and indirect effects, free radicals, oxygen effect and free radical scavengers, LET and RBE theory, dual-action theory, intracellular repair, general knowledge of repair models.

1.4.1.2. Introduction to factors influencing radiation response
Physical factors: dose, dose quality, dose rate, temperature
Chemical factors: Oxygen, radiosensitizers, radioprotectors
Biological factors: type of organism, cell type and stage, cell density and configuration, age, sex. Host factors: partial or whole-body exposure.

1.4.1.3. The relevance of radiation biology to radiotherapy

1.4.1.4. Interaction of ionizing radiation on mammalian cells. The cell: structure and function; relative radiosensitivity of nucleus and cytoplasm, mitosis, cell cycle, principles of DNA, RNA and protein synthesis, radiation effects on DNA, strand breakage and repair, common molecular biology techniques. Cell injury by radiation: damage to cell organelle like chromatids, chromosomes; interphase death, apoptosis, mitotic death, micronucleus induction, SLD, PLD. Oxygen effect: mechanism, hypoxia, OER, reoxygenation in tumours, significance in radiotherapy. Dose rate. Brachytherapy sources including ^{252}Cf . Radiobiology of low, high dose rate & pulsed brachytherapy, hypofractionation, significance in radiotherapy. Effects of low LET and high LET radiation on cell. Cell survival curves. Effect of sensitizing and protective agents. Dose modifying factors and their determination. Variation of response with growth and the progression of cell through the phases of cell cycle. Physical factors influencing cell survival; relative biological effectiveness (RBE); its definition and determination, dependence upon linear energy transfer, dose, dose rate and fractionation. Hyperthermic and photodynamic injury. Biological hazards of irradiation; dose protection and LET, effects on the embryo and the fetus, life-shortening, leukaemogenesis and carcinogenesis, genetic

and somatic hazards for exposed individuals and population. The biological basis of radiological protection.

1.4.1.5. Organ radiosensitivity and radio responsiveness, concept of therapeutic index.

1.4.1.6. Acute effects on Radiation Concept of mean lethal dose Radiation Syndromes: BM, GI, CNS, cutaneous
Suppression of immune System: mechanism, consequences
Total Body irradiation
Biological dosimetry: Blood counts, BM mitotic index. Chromosome aberrations in peripheral blood lymphocytes
Radiation accidents: typical examples

1.4.2. Radiation Effects on Major Organs/tissues
Acute & late effects on all normal organs & tissues including connective tissue, bone marrow, bones, gonads, eye, skin, lung, heart, central nervous system tissues, peripheral nerves, esophagus, intestine, kidney, liver & thyroid with special reference to treatment-induced sequelae after doses employed in radiotherapy
Normal tissue tolerances

1.4.2.1. Late effects of radiation (somatic) Sterility, cataracts and cancer
Carcinogenesis: mechanisms in vitro and in vivo, oncogenes and anti oncogenes
Radiation-induced cancer of occupational, medical or military origin
Recent controversial results for low-level exposure, risk estimates

1.4.2.2. Late Effects of Radiation (Genetic) Mutations: definition, types, potential hazards. Low-level radiation: sources, potential hazards, stochastic and deterministic (nonstochastic) effects, high background areas and cancer.

1.4.2.3. Effects of Radiation on Human Embryo & Fetus Lethality, congenital abnormalities and late effects (Leukemia and childhood cancer), severe mental retardation. Doses involved.

1.4.2.4. Biology and Radiation Response of Tumors
Tumor growth; kinetics of tumour response. Growth fraction, cell loss factor. Volume doubling times, potential volume doubling times, repopulation, and accelerated repopulation. Radiocurability: definition, factors involved, tumour control probability curves. Factors determining tumour regression rates. Causes of failure to control tumours by radiation: tumour-related, host-related technical/mechanical errors. Relationship between clonogen numbers and tumour control probability. Local tumour control and impact on survival.

1.4.3. Applied Radiobiology
Fractionation: rationale, factors involved (4 R's). Time, dose, and fractionation relationship: isoeffect curves, isoeffect relationships, e.g. NSD, CRE formalisms and their limitations, partial

tolerance, means of summing partial tolerance, steepness of dose-response curves. Multi-target, two-component and linear quadratic model. α/β ratios for acute and late effects and means of deriving these values. Isoeffective formulae. Clinical applications of the L-Q model, hyperfractionation, accelerated fractionation, hypofractionation, CHART, split dose treatments. Brachytherapy - low dose rate, high dose rate and pulsed treatments. Introduction to new techniques to optimize radio-curability; combination therapy (adjuvant surgery or chemotherapy), hyperthermia, hypoxic cell radio-sensitizes, high LET radiation. Photodynamic therapy. The volume effect, general principles and current hypotheses. Shrinking Field technique. Combination Radiation -Surgery Pre-, post- and intra-operative radiation. Rationale, radiobiological factors, current clinical results. Irradiation of sub-clinical disease, debulking surgery, importance of clonogen numbers. Combination Radiation -Chemotherapy Definitions of radiosensitiser, synergism, potentiation, antagonism. Radiosensitisers: types, mechanism. Hyperthermia Sources, rationale (historical examples), advantages and disadvantages, thermotolerance. Cellular damage: comparison and contrast with radiation, thermal and non-thermal effects of ultrasound, microwaves, radiofrequency, etc. General host responses (immunology, metastases). Use along with radiotherapy and chemotherapy: optimum sequencing of combined modalities. Current limitations to the clinical use of hyperthermia.

1.4.4. High LET Radiation Comparison and contrast with low LET radiation. Neutrons: source (including ^{252}Cf) and boron neutron capture (outline only). Advantages and disadvantages of neutrons, RBE values, hazards of low dose and low energy neutron, use in radiotherapy, combination with low LET, current clinical results. Other high LET particles: protons, mesons, high-energy heavy nuclei, application to radiotherapy, current clinical results. 1.4.5 radiation Protection 1.4.6 Brachytherapy 1.4.7 Emergency Oncological Procedures 1.5. Clinical trials - Statistical basis for planning & interpretation Clinical Trials. - Advantages & disadvantages - Retrospective & prospective studies - Controlled & uncontrolled trials - Single-blind & double-blind studies - Phase I, II & III trials - Ethics (Helinski declaration).

Planning a trial - Establishing objectives- short term and long term - Determining the appropriate criteria. - Establishing grounds for inclusion and exclusion of patients - Determining how many treatment schedules are to be completed - Determining the treatment schedules and any appropriate modifications - Determining the method of allocation of treatments ; the allocation ratio and the method and timing of randomization - Determining what measures are to be taken, how they will be taken, who will take them, at what time(s) and where they will be recorded - Designing the appropriate forms of documentation - Determining the proposed duration of the trial, either in terms of a fixed closing date, or the entry of a pre-determined number of patients. - Establishing conditions under which the trial may be terminated earlier than planned & procedures for detecting these conditions. - Re-assessing the proposed trial in terms of ethics, appropriateness to the short & long term objectives, feasibility & the availability of resources. - Writing the protocol - Running a pilot study

CLINICAL RADIOTHERAPY

2.1. Cancer Epidemiology & Etiology 2.1.1. Cancer Statistics - worldwide & India 2.1.2. Cancer Registries & National Cancer Control Programme. 2.1.3. Analysis of data in cancer registries. 2.1.4. Regional Cancer Centers 2.1.5. Cancer Screening & Prevention. 2.2. Patient Care 2.2.1. Assessment & referral systems for radiotherapy 2.2.2. Diagnosis & workup. 2.2.3. Staging 2.2.4. Care & evaluation during & after treatment 2.2.5. Emergencies in Oncology 2.2.6. Management of different malignancies 2.3. Treatment Response & Result 2.3.1. Guidelines for treatment response assessment - Complete Response, Partial Response, No Response, Stable disease. 2.3.2. Endpoints of treatment results: Local-regional control, recurrence, metastasis, survival, quality of life. 2.3.3. Treatment-related morbidity assessment (i) Radiation morbidity (early & late) (ii) Morbidities of combined treatment (iii) Grading Systems.

CLINICAL CHEMOTHERAPY

3.1. Basic principles of chemotherapy
3.1.1. Chemotherapy drugs. 3.1.2. Newer chemotherapeutic agents. 3.1.3. The basis for designing different chemotherapy schedules. Standard chemotherapy schedules. 3.1.4. Chemotherapy practice in various malignancies 3.1.5. Chemotherapy practice & results/ toxicities in sequential & concomitant chemoradiotherapy. 3.1.6. Supportive care for chemotherapy. 3.1.7. The basic principles underlying the use of chemotherapeutic agents. (i) Classification and mode of action of cytotoxic drugs. The principles of cell kill by chemotherapeutic agents, drug resistance, phase-specific and cycle-specific action. (ii) Drug administration. The general principles of pharmacokinetics; factors affecting drug concentration 'in vivo' including route and timing of administration, drug activation, plasma concentration, metabolism and clearance. (iii) Principles of combinations of therapy, dose-response curves, adjuvant and neoadjuvant chemotherapy, sanctuary sites, high dose chemotherapy, and regional chemotherapy. (iv) Toxicity of drugs. Early, intermediate and late genetic and somatic effects of common classes of anticancer drugs. Precautions in the safe handling of cytotoxic drugs. (v) Endocrine manipulation and biological response modifiers. An understanding of the mode of action and side effects of common hormonal preparations used in cancer therapy (including corticosteroids). Use of the major biological response modifiers such as interferons, interleukins and growth factors and knowledge of their side effects. (vi) Assessment of New Agents. Principles of phase I, II, and III studies. (vii) Gene Therapy

3.2. Other Disciplines Allied to Radiotherapy and Oncology 3.2.1. Surgical Oncology. 3.2.1.1. Basic principles of surgical oncology, biopsy, conservation surgery, radical surgery, palliative surgery. 3.2.1.2. Basics of surgical techniques - head & neck, breast, thorax, abdomen, gynaecological, genitourinary, musculoskeletal, CNS. 3.2.1.3. Combined treatments: with radiotherapy, chemotherapy, and hormone therapy. 3.2.2. Preventive oncology

OTHER DISCIPLINES ALLIED TO RADIOTHERAPY AND ONCOLOGY

4.1 Multidisciplinary Tumor Board, 4.2: Radio conference 4.3: Radiology and its application in Radiation Oncology 4.4: Oncopathology

PALLIATIVE CARE 4.1. Guidelines for palliative care 4.2. Symptoms of advanced cancer 4.3. Management of terminally ill patients. 4.4. Different pharmacologic & non-pharmacologic methods 4.5. Pain control, WHO guidelines for adults & children. 4.6. Palliative radiotherapy 4.7. Palliative chemotherapy 4.8. Home care 4.9. Hospice care 4.10. Physical, social, spiritual & other aspects.

RESEARCH, TRAINING & ADMINISTRATION

5.1. Research in Oncology 5.1.1. How to conduct a research 5.1.2. Guidelines for biomedical research: Animal studies, drug studies, human trial. 5.1.3. Cancer clinical trials. Phase I/II, III 5.1.4. Ethics of clinical research 5.1.5. Evidence-based medicine. 5.2. Training in Oncology 5.2.1 Residency in Radiotherapy and Oncology 5.2.2. Theory, clinical & practical modes of training 5.2.3. Structured training: lectures, seminar, Journal club, Ward-round, Physics demonstration, Practical, Case Presentations (e.g. Long Case; Short Case) 5.2.4. Participation in various procedures, techniques (e.g. Brachytherapy, Radiotherapy Planning, Mould Room Procedures etc.) 5.2.5. CME-conference, symposium, workshop, seminar 5.2.6 Visiting other cancer centres & radiotherapy departments 5.3. Administration in Radiotherapy and Oncology. 5.3.1 Clinical Oncologists' role as an administrator. 5.3.2. How to set up a Radiotherapy and Oncology department, planning of infrastructure, & equipment 5.3.3. Role in cancer control programme. 5.3.4. Responsibilities towards safety & quality assurance. Administration aspects of training, academic, patient care & research.

TEACHING & LEARNING METHODS

- Emphasis should be given to various small group teachings rather than didactic lectures.
- **Case Presentation:** He/she will do Case presentation in the ward posting time, in the outpatient department and special clinics.
- **Seminars / Symposia** – Twice a month; Theme based student-centred

All the PG students are expected to attend and actively participate in the discussion and enter in the logbook relevant details. Further, every candidate must present on selected topics at least four times a year and a total of 12 seminar presentations in three years.

- **Journal club/ Review:** Twice a month. It is recommended to be held once a fortnight. All the PG students are expected to attend and actively participate in the discussion and enter in the logbook relevant details. Further, every candidate must make a presentation from the allotted journal(s), selected articles at least four times a year and a total of 12 articles presentations in three years.
- **Academic grand ward rounds:** Twice a month presentation of cases by residents and clinically applicable discussions.
- **Service Rounds:** Postgraduate and interns should do every day for the care of the patients. Newly admitted patients should be worked up by the PGs and presented to the seniors the following day.
- **Radio-conference:** Twice a month discussions amongst RT & Radiology Residents under the facilitation of faculty on various imaging modalities used and its interpretation
- **ONCO-PATHOLOGICAL MEET:** Special emphasis on the surgical pathology radiological aspect of the case in the pathology department. The clinician (Radiotherapy resident) presenting the clinical details of the case, radiology PG student describes the Radiological findings and its interpretation and Pathology student describes the morbid anatomy and histopathology of the same case.

RADIOTHERAPY SKILLS LAB SESSIONS:

- Brachytherapy procedure, Atlas Based Contouring session – External Beam Radiotherapy, Brachytherapy target delineation, Plan evaluation
- **Clinical teaching** in the OPD, Simulation room, Mould room, TPS room, Brachytherapy Operation Theatre, Day Care.
- **Mortality & Morbidity meetings with audit:** Once a month • Maintenance of logbook: to be signed by the faculty in charge
- **Teaching skills:** Postgraduate students must teach undergraduate students (eg. medical, nursing) by taking demonstrations, bedside clinics, tutorials, lectures etc.
- **Publications and Conference Presentations:** A post-graduate student would be required to present one poster presentation, to read one paper at a national/state conference and to present one research paper which should be published/accepted for publication/sent for publication during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.
- Should have attended two conferences/CMEs/ Workshops during his tenure as a postgraduate
- Department should encourage e-learning activities.

DEPARTMENTAL TRAINING SCHEDULE & POSTING OF RESIDENTS

Each PG student shall be posted at various dedicated workstations in the department such as OPD, IPD, Simulation room, Mould room, Linear Accelerator, Brachytherapy, Day Care etc, as well as at different departments pertaining to allied branches of Oncology Such as Surgical Oncology, Medical Oncology, Radio-diagnosis, Pathology, ENT etc. At every posting the PG student has to Maintain logbook in prescribed format to ensure the learning as prescribed. He/She also has to perform an investigative project under the supervision of a faculty member and submit his/her thesis or dissertation according to the rules.

ASSESSMENT

Examination on Research Methodology & Biostatistics

Timing: End of 2nd Semester

Total marks: 100

Will be considered as an internal examination

Candidate should pass to appear in Final examination

No marks will be added to final/summative examination

Will be conducted by Examination Cell in the month of June & December

Internal Examinations

Timeline: End of the 3rd, 4th and 5th semester, pre-final (2 months before final examination).

Marks distribution: Theory 100 marks, and practical with viva and

logbook will carry 100 marks

(Practical – 70, viva – 20, logbook – 10).

The marks of the 4 internal examinations will be averaged to 100 each for theory and practical.

Summative/Final Examinations:

- Theory: 4 papers (100 marks each)
- Theory question paper format:
 - One Long question – 20 marks
 - Eight Short question/notes – $10 \times 8 = 80$ marks
- Total marks in theory: 500 marks
 - 4 papers in the final examination – 400 marks
 - Average of 4 internal examination – 100 marks

PAPER-WISE DISTRIBUTION OF SYLLABUS FOR PURPOSE OF MD (RADIOTHERAPY AND ONCOLOGY) EXAMINATION

Paper I- Basic Principles in practice of Radiotherapy (Physics, Biology, Pathology, Equipment & Techniques of Radiotherapy)

Paper-II- Clinical Radiation Oncology

Paper III- Allied Oncology Practices (Surgical oncology, medical oncology & Palliative Care)

Paper IV- Recent Developments in Radiation Oncology, Cancer Control Programmes, Research methodologies in oncology

d. Practical examination

The format of the practical examination (400 marks)

Part	Components	Marks allotted
Part A* 200 marks	Longcase (1 no.)	100
	Short cases (2 nos.)	50
	OSCE/OSPE (5-10 stations)	50
Part B 200 marks	Operative procedure/Pedagogy/ Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

* Students should pass (secure 50% marks) separately in Part A

Practical Examination should consist of the following:

- Long and short cases
- Pathology specimens, Imaging techniques as relevant to clinical oncology, combined radiotherapy, surgery, chemotherapy, radiotherapy techniques, brachytherapy applications, radiation protection, equipment, instruments and other armamentarium/ accessories relevant to various Chemotherapy/ Radiotherapy procedures, chemo-ports,
- Computer application in Radiotherapy, Simulation, Mould room technology, Radiotherapy Planning etc.

Total marking scheme:

	1 st Internal Examination	2 nd Internal Examination	3 rd Internal Examination	4 th Internal Examination	Total Internal Marks (Average of 4 exams)	Final Examination	Total Marks
Time frame	End of 3 rd semester	End of 4 th semester	End of 5 th semester	2 month before final			
Theory	100	100	100	100	100	400	500
Practical	100	100	100	100	100	400	500

Practical Viva Voce Examination Format marks distribution

Note 1: During the training programme, each postgraduate student should be required to engage himself/herself in an investigative project under the supervision of a faculty member and submit his/her thesis or dissertation according to the rules of the University concerned. The subject for the research should be related to clinical practice of oncology (radiotherapy/combined treatments/Lab Research related to clinical practice).

RECOMMENDED BOOKS

1. Barrett A, Dobbs J, Roques T. Practical Radiotherapy Planning Fourth Edition: Taylor & Francis; 2009.
2. Barrett KE, Barman SM, Yuan J, Brooks HL. Ganong's Review of Medical Physiology, 26th Edition: McGraw-Hill Education; 2019.
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MODEL SAMPLE QUESTION PAPERS

PAPER 1

BASIC PRINCIPLES IN PRACTICE OF RADIOTHERAPY (PHYSICS, BIOLOGY, PATHOLOGY, EQUIPMENT & TECHNIQUES OF RADIOTHERAPY)

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Define “Passenger mutation” and “Driver mutation” in context of carcinogenesis. Name four different Driver mutations with regard to Non-Small Cell Lung Cancer. Explain Next Generation sequencing. [20]
2. Explain the following mechanisms contributing to Tumorigenesis with suitable examples. [2+2+2+2+2]
 - a) Point mutation
 - b) Translocation
 - c) Amplification/Deletion
 - d) Epigenetics
 - e) Microsatellite instability
3. Explain the following concepts in relation to Carcinogenesis. [5+5]
 - a) Angiogenesis
 - b) Metastasis
4. Explain the four “R” s of Radiobiology. What’s the Fifth “R” of Radiobiology. [8+2]
5. Explain the following concepts with suitable diagram. [3+3+4]
 - a) Linear Energy Transfer
 - b) Relative Biological Effectiveness
 - c) Therapeutic Window in Radiotherapy

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6. Narrate the following concepts with suitable example / diagram. [6+4+4]
 - a) L-Q model cell survival curve
 - b) Hyperfractionation
 - c) Hypofractionation
 7. Write a short note on "Re-irradiation". Write the QUANTEC radiation dose tolerance of any five normal tissue with proper endpoint and technique. [5+5]
 8. Describe biological basis of Chemo-Radiation. Write examples of Randomised Controlled Trials where Chemo-Radiation has proved to improve Overall Survival in malignancy. [5+5]
 9. Write short notes about the followings. [3+3+4]
 - a) Monitor Unit
 - b) Multileaf collimator
 - c) Radiotherapy field junction

PAPER 2

CLINICAL RADIATION ONCOLOGY

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Write TNM staging of Squamous Cell Carcinoma of skin. Write high risk features of Skin malignancy. What are the indication and doses of radiotherapy for various types of malignancy. [20]
2. What recent changes were proposed in WHO classification of Central Nervous Tumours. Write target delineation and external beam radiotherapy doses for Glioblastoma, NOS post gross total excision setting. [6+4]
3. Write the management of T3N2Mx Squamous Cell Carcinoma Nasopharynx with notes on target delineation and radiotherapy dose and technique. [10]
4. Write the staging work up and management of stage IIIB Non Small Cell Lung Cancer. [3+7]
5. Enumerate evidences of benefit of adjuvant radiotherapy in post mastectomy setting. Write indications, target, techniques for adjuvant external beam radiotherapy in post mastectomy setting. [4+6]
6. Write note on Accelerated Partial Breast Irradiation [10]
7. Describe TNM Staging of Rectal cancer. Evidences for Neoadjuvant Concurrent Chemo-radiation. Write Brief note about the chemotherapy, target delineation, Dose employed in Neoadjuvant setting. [3+3+4]
8. Diagnostic work up, Risk stratification, Molecular classification of Medulloblastoma. Radiotherapy treatment planning for a 6 year old child with high risk Medulloblastoma.
9. Write the Diagnostic work up, staging, prognostic factors, indications and doses of Radiotherapy in Neuroblastoma of a 8 year old child. [2+2+2+2+2]

PAPER 3

ALLIED ONCOLOGY PRACTICES
(SURGICAL ONCOLOGY, MEDICAL ONCOLOGY & PALLIATIVE CARE)

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Write stage wise indications for radiotherapy and target volume delineation for Cancer Cervix stage IIB [20]
2. Write management of stage I Dysgerminoma Ovary. How will you follow up stage I Seminoma patient after orchidectomy [5+5]
3. Describe management of muscle invasive bladder cancer [10]
4. Write note on Anaplastic Thyroid cancer [10]
5. Describe revised Lugano staging system for Primary Nodal Hodgkin's lymphoma. Write brief note on International Prognostic Index for advanced Hodgkin's lymphoma. [5+5]
6. Note on Techniques of Lymphoma Radiotherapy. [10]
7. Write short notes about the followings. [3+4+3]
 - a) Extranodal Lymphoma
 - b) Target delineation and Dose in Craniopharyngioma
 - c) Radiotherapy dose fractionation schedule for refractory Grave's Ophthalmopathy
8. Describe evidence based Neo-adjuvant Radiotherapy in Soft Tissue Sarcoma. [10]
9. Write the accepted guidelines for management of locally advanced Carcinoma Cervix with High Dose Rate Brachytherapy. Compare Low Dose rate Vs High Dose Rate Brachytherapy in the same scenario [5+5]

PAPER 4

**RECENT DEVELOPMENTS IN RADIATION ONCOLOGY, CANCER CONTROL PROGRAMMES,
RESEARCH METHODOLOGIES IN ONCOLOGY**

Max. Marks:100

Time: 3 hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Define the followings. a) Stereotactic radiosurgery b) Stereotactic Radiotherapy c) Stereotactic Body radiotherapy. Explain the role and dose of Stereotactic radiosurgery in brain metastasis with evidences. What are the radiation tolerance dose for various organs at risk inside brain. [20]
2. What is the rationale for Image Guided radiotherapy. What are the "In Room Image guidance techniques" in practice. [4+6]
3. What are the Radio-biological rationality for Stereotactic Body Radiotherapy. Describe Stereotactic Body Radiotherapy for Early stage Non-small Cell Lung Cancer with evidences. [4+6]
4. Write short notes about the followings. [5+5]
 - a) Cisplatin
 - b) Capecitabine
5. Write short notes about the followings. [5+5]
 - a) Rituximab
 - b) Trastuzumab
6. Describe Role of PET-CT in radiotherapy planning [10]
7. Explain Motion management in Radiotherapy. [10]
8. Write Short Notes. [5+5]
 - a) SBRT Liver
 - b) SBRT Spine
9. Explain Electronic Brachytherapy. How is Cyberknife different from conventional LINAC based radiosurgery platform? [5+5]

YEAR-WISE ENTRUSTABLE PROFESSIONAL ACTIVITIES

S. No.	EPA CONTENTS	Competency Domains						Level Of Competency				MSF
		MK	PC	PBLI	SBP	P	ICS	Day1 Of Residency	End of 1 st Year	End of 2 nd Year	End of 3 rd Year	
1	Oncology Patient Workup: History taking, Clinical examination, Investigation, Diagnosis	+	+	+			+	II	III, IV			S, P, I, PG
2	Conventional Radiotherapy Planning: Marking the Radiation Fields on Patient taking into account Anatomical landmarks	+	+	+				I	II, III, IV	IV		S, I
3	CT Simulation: Simulating Patient using Planning CT simulator, with or without the use of contrast, Use of appropriate Immobilisation, fixation device	+	+	+	+	+	+	I, II	II	III/ IV	IV	S, I
4	EBRT Contouring / Prescription: Proper Delineation of Target Volumes	+	+	+	+	+	+	I, II	I, II	III	IV	S, I, P
5	Brachytherapy Application / Prescription: Different Types of Implant placement	+	+	+	+			I, II	II, III	IV	IV	S, I, PG
6	EBRT Plan Evaluation: Identifying inadequacies in plan and rectification advices	+	+	+	+	+	+	II	II, III	IV	IV	S, I
7	Tumour Board Presentation and Discussion of Oncology cases in Tumour Board	+	+	+	+	+	+	I	II	III	IV	S, I, PG

Competency Domains:

- MK: Medical Knowledge
- PC: Patient Care
- PBLI: Problem Based Learning and Improvement
- SBP: Systems-Based Practice
- P: Professionalism
- ICS: Interpersonal and Communication Skills

Levels of competence:

- Level 1: Knowledge only; can observe
- Level 2: Can do under strict supervision
- Level 3: Can do under loose supervision
- Level 4: Can do independently
- Level 5: Has the expertise to teach others

Multisource feedback (MSF):

- Supervisor: S
- Patients/Relatives: P
- Undergraduate students: UG
- Peers: PG
- Community: C
- Other health professionals: H
- Self: I

The background of the page is a complex network diagram. It consists of numerous circular nodes of varying sizes, connected by thin, light-colored lines. The nodes are color-coded: yellow and orange at the top, green and teal in the middle, and blue and grey at the bottom. The overall effect is a sense of interconnectedness and data flow.

TRANSFUSION MEDICINE

MD in Transfusion Medicine

COURSE NAME

MD in Transfusion Medicine

DURATION OF COURSE

3 years

ELIGIBILITY

MBBS

OBJECTIVES

On completion of the MD programme, the postgraduate student would have achieved the following objectives and be able to:

1. Organize blood bank activities including blood donations, component separation and storage, appropriate use of blood and blood components.
2. Understand the importance of blood and blood components and be competent in the judicious use of this resource.
3. Understand the need for transfusion safety and its importance in all aspects of medical care including a sound knowledge in the area of transfusion-transmitted Diseases (TTDs) and their testing methods.
4. Act as the medical expert in providing advice and clinical decision making with regard to the need for blood transfusion and work with clinical colleagues in formulating evidence-based guidelines especially with the support of blood and its products in resuscitation and hemostasis.
5. Acquire adequate and updated knowledge of immunohematology and its application to ensure safe transfusion practices and laboratory hematology, automation and quality control related to blood transfusion services.
6. Acquire adequate knowledge and be able to offer expert advice in histocompatibility and immunogenetics for stem cell and organ

transplantation and to provide laboratory support to the transplant team.

7. Able to apply knowledge of molecular biology along with latest advancement and technology like stem cell biology and cellular therapy in Transfusion Medicine
8. Able to incorporate among the students, a rational scientific approach in designing as well as performing medical research. The students must have the ability to reason and critically analyse a set of scientific data.
9. Able to provide training in various methods/ modalities of medical education and experience as teachers especially for the undergraduate students.
10. Undertake accurate self-appraisal, develop a personal continuing education strategy and pursue lifelong mastery of Transfusion Medicine.

SYLLABUS CONTENT

THEORY

Paper I: Basic applied aspects related to Transfusion Medicine (including Hematology and Immunology)

Paper-II: Immunohematology, immunogenetics, and applied serology (Including Molecular biology and HLA)

Paper III: Blood Center Operation, donor organization, blood preservation and technology of Blood Components.

Paper IV: Recent advances & technology in Transfusion Medicine and Hemotherapy

PRACTICAL

Practical/clinical and oral examination: shall include following Laboratory and clinical skills related to Transfusion Medicine (inclusive of but not limited to):

- blood donor/apheresis donor selection
 - component processing
 - immunohematology
 - antenatal serology
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- management of transfusion reaction
- quality control of reagents, equipment, components
- coagulation testing,
- basic hematology tests
- transfusion-transmitted infection screening
- stem cell transplantation and transplant immunology
- Interpretation of Flow cytometry/HPLC/TEG
- Clinical hemotherapy

TEACHING AND LEARNING METHODS

- Seminar: Slide seminar
- Seminar/Discussion: Topic seminar
- Clinicopathological presentation:
The postgraduate students are encouraged to attend lectures and grand rounds offered by
- other clinical and basic science departments of the hospital.
- Journal Club: Critical appreciation and discussion of research articles in indexed journals.
- The PG student shall be required to participate in the teaching of undergraduate students.
- The PG student must have attended Mandatory training in Research Methodology during his tenure.
- A postgraduate student of a postgraduate degree course would be required to present one poster presentation, to read one paper at a national/state conference and to present one research paper which should be published/accepted for publication/sent for publication during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination.
- Special Seminars/Workshop: The postgraduate students are expected to attend meetings related to transfusion medicine and present papers/posters in these meetings.
- Log Book: Postgraduate students shall maintain a logbook of the work carried out by them and the training programme undergone during the period of training including details of work

experience during their postings, including programs implemented under supervision and those performed independently. The logbook shall be checked and assessed periodically by the faculty members imparting the training.

DEPARTMENTAL TRAINING SCHEDULE AND POSTING OF RESIDENTS:

SPECIFIC LEARNING OBJECTIVES

During the post-graduate training the student/resident should get adequate knowledge as per following domains:

A. Cognitive Domain

1. Basic Sciences (Immunology, Medical Genetics, Hemostasis & Physiology of Formed Elements of blood)

- Demonstrate familiarity with the current concepts of structure and function of the immune system, its aberrations and mechanisms thereof. The student should be able to demonstrate an understanding of the basic principles of immunoglobulins, antigen, antibody and complement system, antibody development after immunization and infection.
- Understand the basic concepts and their clinical relevance of the following:
- Mechanisms of acute inflammation, healing and repair, cellular model of coagulation hemostasis, biochemistry & physiology of elements of blood-like red cells, white blood cells and platelets, physiology of immune system, hypersensitivity reactions, autoimmunity, transplantation immunology, demonstrate familiarity with the scope, principles, limitations and interpretations of the results of important procedures employed in clinical and experimental studies relating to immunology – this is inclusive of but not limited to:
 - ELISA techniques
 - Radioimmunoassay

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- HLA typing
 - Hybridoma technology
 - Isolation of T & B lymphocytes
 - CD4 / CD8 count
 - Microlymphocytotoxicity test
 - Cellular assays
 - Electrophoresis and Immunofluorescence
 - Understand the principles of basic genetics with regard to Mendelian Laws of Inheritance, phenotype/genotype and population genetics.
 - Know the nomenclature, organization and polymorphism of the human major histocompatibility complex, including HLA class I, II, and III genes. Understand the role of HLA typing in organ and bone marrow/stem cell transplantation and association with disease.
 - Understand the basic concept of hematopoiesis and bone marrow kinetics.
 - Understand the basic physiology and biochemistry of red cells, platelets and leukocytes in terms of their kinetics, function, life span and antigenic systems. Know the membrane structure and function of red cells, platelets and leukocytes and be able to apply their implication in Transfusion Medicine
 - Understand haemoglobin structure, synthesis, function, its aberrations and degradation including iron and bilirubin metabolism, laboratory diagnosis anaemia and management.
 - Learn the disorders of white blood cells, their laboratory diagnosis and management and the role of Transfusion Medicine in the management of these disorders.
 - Understand the composition and function of plasma constituents.
 - Know the pathophysiology and laboratory features of intravascular and extravascular hemolysis
 - Understand the physiology of hemostasis with regard to the role of platelets, coagulation pathway and fibrinolysis, its aberrations and mechanisms thereof such as coagulopathy of liver disease, vitamin K deficiency, disseminated intravascular coagulation & hemophilias (A, B, and C) etc.
 - Understand the hemodynamics of blood flow and shock; estimation of blood volume and be able to interpret the application of radionuclides tagging for blood volume estimation.
 - Should understand the principles of Molecular Biology and blood group genetics especially related to the understanding of disease processes and its use in various diagnostic tests.
- 2. Blood Collection/Blood Center/Component Processing**
- The student/resident should be able to demonstrate an understanding of the processes associated with Blood Donor motivation (motivation strategies), recruitment, selection and proper donor care in blood centre as well as in outdoor blood donation camps and be able to understand importance of cold chain maintenance. The student should:
- Be able to understand donor counselling and notification (Pre- and Post-donation).
 - Be familiar with various categories of blood donors including autologous and directed donors and be able to know their clinical relevance.
 - Understand the process of apheresis including troubleshooting and demonstrate proficiency in the selection of apheresis machine, apheresis donor and be able to obtain apheresis product meeting quality standards.
 - Understand the mechanisms of adverse effects of blood/apheresis donation, its clinical features, management and prevention.
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- Demonstrate understanding of various anticoagulants/preservatives used for collection and storage of blood and components.
 - Be familiar with various storage lesions in blood components, factors affecting the storage lesions and its prevention.
 - Be able to demonstrate an understanding of various plasticizers used in blood banking and their clinical relevance.
 - Understand the principles of component preparation by various methods, be familiar with the preparation of modified components such as leukofiltered, irradiated or saline washed, pooled or volume reduced components following aseptic conditions.
 - Be able to demonstrate an understanding of the basic principles of preparation and composition of recombinant products such as Factor VII, Factor VIII, Factor IX, concentrate and hematopoietic growth factors.
 - Understand the factors influencing the quality of blood and blood components including quality of blood bag/apheresis.
 - Be able to understand the maintenance of quality of blood components as per recommended standards by various agencies (DGHS, DCGI, NABH, NACO, AABB, EC)
 - Be able to identify problems in the blood/apheresis collection and component preparation area and offer viable solutions

3. Transfusion transmitted infection (TTI)

- Be able to understand various strategies for improving blood safety in general and TTI testing, in particular, pertaining to Indian conditions.
- Be able to understand the typical time course of appearance and disappearance of serum antigens and antibodies used in the screening of major transfusion-transmitted infection, including HIV, hepatitis B, hepatitis C, syphilis and malaria and others.

- Be able to demonstrate understanding the principles of blood safety including testing for various transfusion-transmitted infection (TTI), proper disposal of infectious waste, laboratory safety, personnel safety.
- Demonstrate understanding of newer advanced technologies that are being introduced in the field of TTI testing. Understand the feasibility of NAT (Nucleic acid testing) in Indian blood transfusion services.
- Demonstrate understanding of the new emerging threats (including Prions, vCJD, Lyme Disease, West Nile Virus, Dengue, Chikungunya etc.) to the blood supply in the country including bacterial contamination, their detection and prevention and application of pathogen activation system in combating the emerging pathogens in blood and blood products.

4. Immunoematology / Blood Group Serology / Compatibility testing

- Demonstrate understanding of the knowledge of various major and minor blood group systems including their biosynthesis, antigen/antibodies, phenotype/genotype frequency, clinical significance.
- Demonstrate understanding of the various Immunoematological laboratory tests including its quality essentials.
- Demonstrate knowledge of the principle of pre-transfusion testing, including ABO/Rh testing, RBC antibody screen, and antibody identification. The student should also demonstrate understanding of resolution of discrepant results in ABO/Rh grouping and pretransfusion testing and be able to provide solutions for the management of such cases.
- Demonstrate understanding of the use of various potentiators and their applications in solving immunohistological problems such as polyagglutination, subgroups of ABO system, red cell antibody detection by Enzymes, Lectins, LISS / Albumin and extended cell panels.

- The student should have knowledge of various advances in this field including automation and computerization.
- Be able to understand the pathophysiology, clinical features, lab diagnosis & management of various clinical conditions requiring immunohematological and transfusion support including
 - Multi-transfused patients such as thalassemia, sickle cell disease etc
 - Alloimmunized antenatal cases (HDN)
 - Transfusion reactions
 - Immune hemolytic anaemias
 - ABO mismatched transplants (BMT / Solid organ)
- Be able to understand the pathophysiology, clinical features, lab diagnosis & management of Rh, ABO and other blood group incompatibility in antenatal patients including exchange transfusion / intra-uterine transfusion.
- Demonstrate knowledge regarding rare blood group donor including identification, cryo-preservation of rare blood and making their registry.

5. Clinical Transfusion Service

- Demonstrate knowledge of the principles of patient/ unit identification and its importance in blood safety.
- Understand the principles of blood inventory management.
- Demonstrate understanding of the rational use of blood and components in various clinical conditions including monitoring of transfused patients.
- Recognize the symptoms and signs of hemolytic and non-hemolytic transfusion reactions and demonstrate knowledge of pathophysiology, treatment, and prevention of these complications
- Demonstrate understanding of the major non-infectious complications of blood transfusions, including red cell alloimmunization, transfusion-related acute lung injury, transfusion-associated graft versus host disease, transfusion-related immunomodulation, volume overload, post-transfusion purpura, iron overload etc. and the risk of these complications, and strategies to prevent them.
- The student should have knowledge of pathophysiology, clinical features, diagnosis and management of these conditions.
- Demonstrate knowledge of pathophysiology, diagnosis & management of anaemia
 - Iron deficiency anaemia
 - Megaloblastic anaemia
 - Aplastic anaemia
 - Anaemia of chronic diseases
 - Neonatal anaemia
- Demonstrate understanding of pathophysiology, clinical / laboratory diagnosis and treatment of patients with bleeding disorders such as Hemophilia, von Willebrand's disease, thrombophilia, acquired coagulation disorders including DIC, liver disease etc.
- Demonstrate understanding of the pathophysiology, clinical features, lab diagnosis and platelet support in thrombocytopenic conditions such as aplastic anaemia, ITP, NAIT, haematological malignancies etc. The student should also demonstrate understanding of complications of platelet transfusion including refractoriness to platelets, its diagnosis and management.
- Demonstrate understanding of the basic principles of neonatal transfusions including serological testing, type of transfusion support, exchange transfusion, intrauterine transfusion and monitoring.
- Demonstrate knowledge of pathophysiology, diagnosis and transfusion support in acute blood loss including massive transfusion protocols, complications of massive transfusion and their prevention.

- Demonstrate understanding of the knowledge of various methods of blood conservation, including pre- and peri-operative autologous blood collection, and approaches to “bloodless” surgery.
- Demonstrate knowledge of the use of various point-of-care tests (TEG, ROTEM) for hemostasis & recommend component therapy depending on the results.
- Demonstrate knowledge of principles of transfusion support in general surgery and special procedures such as cardiac surgery or oncological surgery.
- Demonstrate knowledge of the principles of hematopoietic stem cell transplantation, including collection, processing, and storage of these stem cell products, and the indications for use (e.g., bone marrow, peripheral blood, and cord blood). Demonstrate knowledge of the principles of the HLA system in organ transplant and transplant immunogenetics and its application in solid organ and bone marrow transplant.
- Demonstrate understanding of guidelines for stem cell research by regulatory agencies like ICMR, DBT etc.

6. Therapeutic Apheresis, Therapeutic Plasma Exchange and Cytapheresis

- Understand the principles of apheresis technology, including centrifugation, filtration, and immunoabsorption.
- Demonstrate knowledge of the indications for therapeutic apheresis including cytapheresis and of the appropriate replacement fluids to be used in various situations.

7. Regulatory Skills / Quality Assurance/ Quality Control in blood transfusion

- Demonstrate knowledge concerning the requirements and applications of all applicable regulatory and accrediting agencies. [e.g., DCGI, NABH, AABB].
- Become familiar with the patient/blood donor privacy and data security requirements,

including the use of Institutional Review Board (IRB) protocols for conducting clinical research, for **conducting stem cell research- ICSCRT (Institutional Committee for Stem Cell Research and Treatment)**.

- Understand training, certification, licensing, and competency assessment standards for transfusion laboratory professionals, including medical laboratory technicians.
- Understand the importance of a comprehensive transfusion laboratory safety policy and programme.
- Understand how SOPs are used, developed, authored, and reviewed and their importance in mandatory laboratory inspection by various accrediting agencies.
- Understand the role of quality assurance, quality management, and process improvement principles in laboratory operation and planning.
- Demonstrate understanding of the elements of current good manufacturing practices as they apply to the collection, processing, and storage of all blood components/products.
- Understand the principles & objectives of total quality management in transfusion service including premises, personnel, instruments/reagents, biosafety and external/internal quality control.
- Operational aspects: Understand the importance of EQAS in blood transfusion services.
- Understand the principles and objectives of equipment management including specification, equipment selection, installation, calibration/standardization/validation, and preventive maintenance.
- Know the fundamental concepts of medical statistics. Demonstrate familiarity with the importance of statistical methods in assessing data from patient material and experimental studies e.g., correlation coefficients, expected versus observed, etc. and their interpretation.

- Understand the principles of specimen collection (e.g., phlebotomy technique, safety, and specimen tubes) and specimen processing and traceability.
- Demonstrate understanding of knowledge of error management in blood bank including root cause analysis and CAPA.
- Demonstrate knowledge of various records and their maintenance as per regulatory requirements.
- demonstrate compassion and sensitivity in the care of patients and respect for their privacy and dignity.
- Show respect for donor/patient autonomy.
- Demonstrate professionalism during blood donor selection, counselling and notification. Always adopt ethical principles and maintain proper etiquette in her/his dealings with blood donors, outdoor camp organizers and other health personnel.

B. Affective Domain

1. Basic Sciences (Immunology, Medical Genetics, Hemostasis & Physiology of Formed Elements of blood)

The student should:

- Demonstrate honesty and integrity in all interactions.
- Demonstrate responsibility and trustworthiness in the execution of all duties.
- Demonstrate the ability to accept criticism and to understand the limitations of ones own knowledge and skills.
- Demonstrate a commitment to excellence and ongoing professional development.
- The student should demonstrate professionalism in taking a bleeding history from a patient.

2. Blood Collection/Blood Center/Component Processing

The student should:

- be able to function as a part of a team that is essential for the selection and management of a blood donor. She/He should, therefore, develop an attitude of cooperation with colleagues so necessary for this purpose. It is implied that she/he will, whenever necessary, interact with the blood donor, patient, clinician and other colleagues to provide the best possible blood transfusion support, diagnosis or opinion.

- Be able to obtain informed consent from the donor.
- Respect the rights of the blood donor including the right to information and maintaining confidentiality.
- Develop communication skills not only to word reports and professional opinions but also to interact with blood donors, outdoor camp organizers, peers and paramedical staff.
- Always adopt principles of laboratory/personnel safety and respect documentation required as per law.

3. Transfusion transmitted infection:

The student should:

- Respect the rights of the seropositive blood donor including confidentiality, right to information.
- Adopt ethical principles and maintain proper documentation while interacting with other interrelated labs such as ICTCs, counsellor, state AIDS Control Societies etc.
- Follow all safety policies and adhere to the department's laboratory safety plan and personal hygiene plan.

4. Immunohematology / Blood Group Serology / Compatibility testing:

The student should:

- Should be able to interact with clinical colleagues in a professional manner to provide best possible transfusion support

and opinion in immunohematological problems.

- Demonstrate improvement in the affective traits of organizational skills, work habits, attitude, interpersonal skills, and problem-solving ability.
- The student should maintain a clean and orderly work area.

5. Clinical Transfusion Service:

The student should:

- Be able to function as a part of a team that is essential for the diagnosis and management of a patient. She/he should, therefore, develop an attitude of cooperation with colleagues so necessary for this purpose.
- Be able to interact with clinical colleagues in a professional manner to provide best possible transfusion support and opinion.
- Demonstrate improvement in the affective traits of organizational skills, work habits, attitude, interpersonal skills, and problem-solving ability.
- Maintain a clean and orderly work area.
- Accept constructive criticism as a learning process. Utilize constructive criticism to correct deficiencies and improve performance.
- The student should demonstrate inquisitiveness by asking necessary questions concerning practical performance or theoretical application of laboratory procedures.

6. Therapeutic Apheresis, Therapeutic Plasma Exchange and Cytapheresis:

- The student should communicate effectively with clinicians and patients regarding emergent or scheduled therapeutic apheresis procedures through conversations and writing of consult notes

C. Psychomotor Domain

At the end of the course, the student should acquire the following skills:

- Demonstrate competency in performing & interpretation of various methods of haemoglobin estimation and complete hemogram of blood donor.

1. Blood Collection/Blood Center/Component Processing:

The student should:

- Be able to compare and contrast the eligibility requirements for allogeneic, autologous & apheresis blood donations.
- Demonstrate proficiency in the selection of whole blood donors (minimum 500) and apheresis donors (minimum 30)
- Demonstrate competency in various types of autologous blood collection and their application in clinical transfusion service.
- Demonstrate proficiency in the collection of whole blood with regard to preparation of phlebotomy site, proper volume and sample collection in minimum 500 donors.
- Demonstrate proficiency in evaluating and managing minimum 25 adverse reactions associated with blood donation/phlebotomy (whole blood and apheresis donations).
- Demonstrate the proficiency in the organization of at least 10 blood donation camps and demonstrate skills to motivate blood donors/organizers.
- Demonstrate knowledge of the indications for therapeutic phlebotomy and demonstrate proficiency in at least 05 cases.
- Demonstrate proficiency in preparation of following components 500 each as per department SOP
 - Packed red blood cells
 - Fresh Frozen Plasma
 - Platelet concentrate
 - Cryoprecipitate (Minimum 50)

- Understand the significance of storage of blood components at the appropriate temperature and demonstrate proficiency incompatibility, labelling requirements of various components
- Proficient in donor notification and counselling (Pre- and Post- donation) and the donor look-back process.
- Demonstrate proficiency in various modifications of blood components such as irradiation, cell washing, volume depletion and leuko depletion.
- Demonstrate proficiency in performing leuko-filtration in at least 20 blood components
- Demonstrate proficiency in the selection of apheresis machine, blood donor and be able to obtain apheresis product meeting quality standards in at least 25 procedures.
- Demonstrate proficiency in performing quality control tests on at least 50 each blood components such as PRBC, FFP, Platelets, Cryoprecipitate.

2. Transfusion transmitted infection:

The student should be able to:

- Compare & contrast various methodologies such as ELISA, rapid & chemiluminescence used in the screening of transfusion-transmitted infections.
- Demonstrate proficiency in performing, interpretation, documentation of at least 500 blood donor screening tests for TTIs as per departmental SOP.
- Demonstrate proficiency in preparation and interpretation of LJ Chart (5 nos.) and root cause analysis (RCA) and Corrective and Preventive Action (CAPA) as and when required.
- Perform and be able to interpret non-treponemal and treponemal antibody tests used to diagnose syphilis.
- Demonstrate proficiency in proper handling and disposal of biohazardous material as per regulatory requirements.

- Demonstrate proficiency in the preparation and use of in-house external controls in transfusion-transmitted infection screening.

3. Laboratory Hematology, Transplant Immunology and Molecular Techniques:

- The student should be able to demonstrate competency in the preparation and interpretation of peripheral blood smear in health and disease conditions.
- Demonstrate competency in performing and interpretation of laboratory tests (Minimum of 10 tests of PT and APTT) in coagulation and thrombosis such as prothrombin time, activated partial thromboplastin time (APTT), fibrinogen, thrombin time, platelet function testing, mixing tests, factor assays, investigations in DIC etc.
- Demonstrate competency in interpretation of Hb electrophoresis/HPLC (Minimum of 20 test result interpretation)
- Demonstrate proficiency in performing and interpreting various laboratory immunological tests pertaining to Transfusion Medicine such as
 - isolation of T & B lymphocytes
 - immunoelectrophoresis
 - flow cytometry
 - CD4 / CD8 counts
- Demonstrate proficiency in HLA typing techniques, including serological and molecular methods, micro-cytotoxicity assays, nucleic acid assays and lymphocyte culture test interpretation.
- Should be conversant with the steps of a Polymerase Chain Reaction (PCR) and should demonstrate competence in the steps and interpretation of Western Blot and Hybridization procedures.

4. Immunoematology / Blood Group Serology / Compatibility testing

The student should be able to:

- Demonstrate proficiency in preparation of cell suspensions of appropriate concentration

following cell washing techniques correctly & grade and interpret antibody-antigen reactions according to the established criteria.

- Demonstrate proficiency in performing ABO/Rh grouping in at least 500 donor/patient samples using department SOP.
- Demonstrate proficiency in performing, interpretation and resolving discrepant results in pre-transfusion testing, ABO/Rh grouping, red cell antibody screen, and antibody identification.
- Compare and contrast conventional cross-matching versus type and screen using various advanced technologies. Demonstrate proficiency in performing at least 50 cross matches as per department SOP.
- The student should be able to differentiate between the direct and indirect antiglobulin tests and identify appropriate uses for each. The student should be able to perform direct and indirect antiglobulin test on appropriate specimens, grading and recording the results appropriately with the use of “check cells”. (Minimum of 50 tests)
- The student should be able to identify sources of error in antiglobulin testing.
- Using a cell panel, perform antibody identification procedures and correctly interpret the results. Identify clinically significant RBC antibodies from an antibody panel including multiple alloantibodies and mixtures of alloantibodies and autoantibodies; determine how difficult it will be to obtain blood for this patient, and effectively communicate these results to clinicians.
- Demonstrate proficiency in performing & interpretation of various immunohistological tests
 - Direct Antiglobulin test (50 tests)
 - Indirect Antiglobulin test (50 tests)
 - Red cell antibody detection and identification (50 tests)

- Titration of Anti D and Anti A and Anti B (25 tests)
- Elution (10 tests)
- Adsorption (10 tests)
- Minor blood group typing (25 tests)
- Saliva Inhibition Test (05 tests)
- Resolution of ABO discrepancy (20 cases)

- Demonstrate proficiency in the selection of blood unit for a patient with autoimmune hemolytic anaemia in at least 5 cases.

5. Clinical Transfusion Service:

The student should be able to:

- Demonstrate proficiency in evaluating and recommending treatment plans for a minimum of 10 transfusion reactions.
- Be able to identify irregular antibodies in pregnant patients that are clinically significant and make appropriate recommendations for blood products. Demonstrate proficiency in preparation and transfusion of blood for intrauterine transfusion/exchange transfusion.
- Choose appropriate blood components and derivatives based on a thorough knowledge of the indications for transfusion.
- Demonstrate proficiency in the evaluation and appropriate transfusion therapy of thrombocytopenic patients (both adult and pediatric) including neonatal alloimmune thrombocytopenia.
- Demonstrate proficiency in the provision of transfusion support in special patient populations (e.g., hematology/ oncology, pediatrics, thalassemia, hemophilia, transplantation, cardiac surgery and burn/trauma).
- Demonstrate proficiency in the appropriate use of blood components in several clinical conditions such as (inclusive of but not limited to) hemoglobinopathies, hemophilia, autoimmune hemolytic anaemia, massive transfusion, obstetric conditions etc.

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- Demonstrate familiarity with the appropriate use of highly specialized blood products (e.g., granulocytes, donor lymphocyte infusions, HLA-matched platelets, and coagulation factor concentrates).
 - Demonstrate competence in the management of blood inventory and the ability to communicate effectively the hospital's needs to the blood donor recruiters, Triage and screen requests for blood components appropriately during inventory shortages.
 - Demonstrate proficiency in evaluating the effectiveness of platelet transfusion including patient's with refractoriness to platelet transfusions. Outline the principles of histocompatibility testing and platelet cross-matching and apply this knowledge in selecting appropriate platelet products when indicated.
 - Demonstrate competency in providing transfusion and immunohistological support to patients with bone marrow/stem cell transplantation including cryo-preservation of stem cell, quality control and infusion.

6. Therapeutic Apheresis, Therapeutic Plasma Exchange and Cytapheresis:

The student should be able to:

- Demonstrate proficiency in evaluating and preparing patients for therapeutic apheresis, including discussion with the patient of the risks and benefits associated with apheresis procedures and obtaining informed consent.
- Should be able to perform plasma exchange including calculation & type of replacement fluid to be used and monitoring patient for complications and efficacy of the procedure.
- Demonstrate proficiency in evaluating and treating adverse reactions associated with therapeutic apheresis.
- Demonstrate proficiency in the treatment of patients using specialized methods (e.g., photopheresis and immunoabsorption columns).

7. Regulatory Skills / Quality Assurance/ Quality Control in blood transfusion:

The student should be able to:

- Demonstrate proficiency in preparing/revision of at least 05 SOP for the department.
- Be able to understand the proper use of instrumentation and computerization in a transfusion laboratory.
- Compare and contrast the various means of performing blood utilization reviews.
- Explain the logistics required in determining appropriate blood inventory for a geographic region and the process of meeting daily weekly and monthly collection goals.
- Recognize sources of pre-analytical variation and the role of biological variability in laboratory assessment.
- Be able to calculate means, standard deviation and standard error from the given experimental data.
- Demonstrate the proficiency in preparedness for getting accreditation.
- Ability to generate various reports required for the various regulatory authorities.
- Be able to perform root cause analysis in at least 5 cases.

A. Department training programme

S. No	Section/Subject of Posting	The brief activity of posting	Duration in months/weeks
1	Orientation	A brief orientation to the workflow of Blood bank activities and teaching program	1 month
2	Blood donor management	Donor recruitment & motivation, Donor Selection Phlebotomy, Post donation care of donor.	3 months
3	Blood Component preparation & quality control	Preparation of blood components. Product manipulation such as Leucocyte removal or Irradiation. Storage & quality control.	4 months
4	Pretransfusion testing & cross match	Investigation of the difficult cross match, formal consultation on transfusion support in complex cases, checking indications & dosage for blood components, emergent issue of blood, transfusion in special cases such as massive transfusion, organ transplantation, platelet refractoriness	3 months
5	Immunohematology	Diagnosis & transfusion support in AIHA, PNH Evaluation of transfusion reaction. Investigations in antenatal serology. ABO-Rh typing, antibody screening, identification, evaluation of positive DAT.	4 months
6	Transfusion Transmitted infection screening	Screening for various markers such as HIV, HCV, HBs Ag, Syphilis. Methodology such as Elisa, spot, rapid, automated analyzer like chemiluminescence and NAT techniques such as PCR, TMA. Laboratory safety	4 months
7	Apheresis – donor and therapeutic	Access evaluation, donor suitability, selection of machine, product manipulation, QC of product, donor observation for adverse effects and its management Indications, contraindications, replacement fluids, frequency, monitoring of TPE.	4 months
8	Transplant immunology/ Immunogenetics	Training in the areas of histocompatibility and immunogenetics for providing support for organ transplant programs.	2 months
9	Stem cell, Regenerative medicine & Cellular Therapy	Knowledge on a different source of stem cells and processing, storage, thawing, infusion of stem cells, monitoring of ABO mismatch transplants, Transfusion support –irradiation, CMV issues.	2 months
10	Quality control/ records	Quality control of components, equipment, reagents. Quality assurance. Development of documents, SOPs, Regulatory compliance.	1 month

B. Training in Allied Department:

S. No	Section/Subject of Posting	The brief activity of posting	Duration in months/weeks
1	Laboratory hematology	Training on Peripheral blood smear, bone marrow examination, hemoglobinopathies, flow cytometry and coagulation	3 months
2	Microbiology	Training on Bacterial culture, PCR for virology, knowledge on parasitology related to Blood Transfusion	2 weeks
3	Clinical Hematology	Management of thalassemia, sickle cell disease, hemophilia, coagulopathies, bleeding disorder and AIHA etc	2 months
4	Obstetrics (Fetal Medicine)	Antenatal serology, IUT	2 weeks
5	Neonatology	Neonatal transfusion practices and exchange transfusion.	2 weeks
6	Trauma and Critical care	Knowledge and management of massive blood transfusion and its complications	1 month
7	Molecular Biology	Basics of molecular testing PCR NAT testing	2 weeks
Total Duration			36 months

Academic activity:

- Topic seminar-once in every week
- Journal club – once in every week
- Case discussion-once in a fortnight
- Bedside and Bench Side Practices: – once in a month

Each student is expected to present in at least 75% of the academic activity during his/ her total residency period.

Undergraduate teaching

- It is mandatory for the postgraduate student to attend the undergraduate practical and take active participation in demonstration of Blood grouping serology, TTI testing and component preparation to the undergraduate, MLT and nursing students.

ASSESSMENT

The marks distribution of the examination:

Internal Examinations Timeline:

- Examination on research methodology and biostatistics – end of 2nd semester.
- End of the 3rd, 4th and 5th semester, pre-final (2 months before final examination).
- Marks distribution: Theory 100 marks, and practical with viva and logbook (Practical –70, viva –20, logbook –10).
- The marks of the 4 internal examinations will be averaged to 100 each for theory and practical.

Summative/Final Examinations:

Theory :

- 4 papers (100 marks each)
- Question Paper Format :
- One Long question –20 marks
- Eight Short question/notes – 8 x 10 = 80 marks

Total marks in theory: 500 marks

Theory papers in the final examination –400 marks

Practical examination:

Total marks: 500

Practical and viva in the final examination –400 marks

Average of 4 internals (practical + viva + logbook) examinations –100 marks

The format of the practical examination (400 marks)

Practical examination will be conducted for two (02) days in Part A and Part B covering following aspects of Transfusion Medicine (inclusive of but not limited to).

- Blood donor / Apheresis donor selection
- Component processing
- Immunohematology
- Antenatal serology
- Transfusion reaction management
- Quality control of reagents, equipment, components

- Coagulation testing,
- Basic hematology tests
- Transfusion transmitted infection screening
- Stem cell transplantation, Transplant Immunology and Immunogenetics
- Interpretation of Flow cytometry/HPLC/TEG
- Clinical Hemotherapy

From the above topics Practical exam will be conducted in following format:

Part	Components	Marks allotted
Part A** 200 marks	Longcase (1)	100
	Short cases (2)	50
	OSCE/OSPE	50
Part B 200 marks	Operative procedure/Pedagogy/ Department specific activity	50
	Critical appraisal of a scientific paper	25
	Thesis presentation and evaluation	50
	Viva	75

** Students should pass (secure 50% marks) separately in Part A

RECOMMENDED BOOKS

1. Bain BJ, Bates I, Laffan MA, Lewis SM. Dacie and Lewis Practical Hematology: Expert Consult: Elsevier Health Sciences UK; 2016.
2. Brecher ME, Banks AAoB. Technical Manual: American Association of Blood Banks; 2002.
3. Gottschall J. Blood Transfusion Therapy: A Physician's Handbook: AABB; 2005.
4. Harmening DM. Modern Blood Banking & Transfusion Practices: F.A. Davis Company; 2018.
5. Hillyer CD, Silberstein LE, Ness PM, Anderson KC, Roback JD. Blood Banking and Transfusion Medicine: Basic Principles and Practice: Elsevier Health Sciences; 2006.
6. Issitt PD, Issitt CH. Applied Blood Group Serology: Spectra Biologicals; 1975.
7. Klein HG, Anstee DJ. Mollison's Blood Transfusion in Clinical Medicine: Wiley; 2014.
8. McCullough J. Transfusion Medicine: Wiley; 2011.
9. McLeod BC. Apheresis: Principles and Practice: AABB Press; 2010.
10. Mintz PD, Banks AAoB. Transfusion Therapy: Clinical Principles and Practice: AABB Press; 2010.
11. Murphy MF, Roberts DJ, Yazer MH. Practical Transfusion Medicine: Wiley; 2017.

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12. Perkins S. Donor Recruitment: Tips, Techniques, and Tales: S. Karger AG; 2005.
 13. Quinley ED. Immunohematology: Principles and Practice: Lippincott Williams & Wilkins; 2010.
 14. Saran RK, Services IDGoH. Transfusion Medicine: Technical Manual: Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India; 2003.
 15. Simon TL, McCullough J, Snyder EL, Solheim BG, Strauss RG. Rossi's Principles of Transfusion Medicine: Wiley; 2016.

Standards and Regulatory documents

- DGHS Standards
- Drugs and Cosmetic Act 1940, Amended Drug Rules 1945
- NACO Standards for Blood Banks
- NABH Standards for Blood Banks
- NABH Standards for Storage Centres
- AABB Standards
- NACO Training Modules

MODEL SAMPLE QUESTION PAPERS

PAPER 1

APPLIED ASPECTS OF BASIC SCIENCES

Maximum marks: 100

Time: 3hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the various platform of platelet crossmatch and its role. (20)
2. Enumerate the hemoglobin variants and describe their clinical relevance. (10)
3. Describe importance of Mendelian theory of inheritance in Transfusion Medicine. (10)
4. Enumerate various types of lymphocytes and its function. (10)
5. Discuss the role of alternatives to blood transfusion. (10)
6. Describe the mechanism of cryopreservation and enumerate various cryoprotectants. (10)
7. Describe the pathophysiology of Paroxysmal Nocturnal hemoglobinuria. (10)
8. Discuss various methods of blood volume determination. (10)
9. Describe methods for laboratory diagnosis of G6PD deficiency. (10)

PAPER 2

IMMUNOHEMATOLOGY, IMMUNOGENETICS AND APPLIED SEROLOGY

Maximum marks: 100

Time: 3hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe Auto Immune Hemolytic Anemia (AIHA). (20)
2. Discuss the role of Bombay phenotype. (10)
3. Describe various enzymes used in red cell serology. (10)
4. Describe the importance of HLA in renal transplantation. (10)
5. Discuss types of ABO discrepancies and its resolution. (10)
6. Describe the importance of Secretor status. (10)
7. Describe fetal alloimmune thrombocytopenia. (10)
8. Discuss the role of platelet transfusion in Immune thrombocytopenic purpura (ITP). (10)
9. Describe the classification and diagnosis of transfusion reaction. (10)

PAPER 3

BLOOD CENTER OPERATION, DONOR ORGANIZATION, BLOOD PRESERVATION AND TECHNOLOGY OR COMPONENTS

Maximum marks: 100

Time: 3hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Discuss the role of blood donor counselling. (20)
2. Enumerate the various anticoagulants & preservatives for blood storage. (10)
3. Discuss the medico-legal aspects of blood transfusion services in India. (10)
4. Describe the preparation & uses of cryoprecipitate. (10)
5. Describe various methods of leucodepletion. (10)
6. Describe the quality control criteria of various blood components. (10)
7. Discuss the requirement & preparation of outdoor blood donor program. (10)
8. Describe the intra-operative hemodilution technique. (10)
9. Describe the uses of various growth factors. (10)

PAPER 4

RECENT ADVANCES IN TRANSFUSION TECHNOLOGY AND HEMOTHERAPY

Maximum marks: 100

Time: 3hrs

Answer all questions

Illustrate your answer with suitable diagrams

1. Describe the sources of hematopoietic stem cells and discuss the advantage of peripheral blood stem cell transplantation. (20)
2. Describe viral inactivation of cellular blood products. (10)
3. Describe perfluorocarbons & its uses. (10)
4. Discuss the current trends in the management and prevention of beta Thalassemia. (10)
5. Describe the role of information technology in blood donor motivation. (10)
6. Describe the principles, advantages & disadvantages of different apheresis machines. (10)
7. Diagnosis & component therapy in disseminated intravascular coagulation (DIC). (10)
8. Enumerate indications & describe quality control of irradiated blood products. (10)
9. Discuss the emerging transfusion transmitted pathogens. (10)

ENTRUSTABLE PROFESSIONAL ACTIVITIES

S. No.	Entrustable Professional Activities	Competencies							Expected level		
		MK	P/DC	ICS	P	PBLI	SBP	1 st year	2 nd year	3 rd Year	
1	Demonstrate proficiency in the selection of whole blood donors and apheresis donors.	Y	Y	Y	Y	Y	Y	2	3	4	
2	Demonstrate proficiency in the collection of whole blood with regard to the preparation of phlebotomy site, proper volume and sample collection.	Y	Y	Y	Y	Y	Y	1	3	4	
3	Demonstrate proficiency in evaluating and managing minimum adverse donor reactions.	Y	Y	Y	Y	Y	Y	1	3	4	
4	Proficiency in organization blood donation camps and demonstrate skills to motivate blood donors/organizers.	Y	Y	Y	Y	Y	Y	2	3	4	
5	Demonstrate knowledge and proficiency in performing therapeutic phlebotomy.	Y	Y	Y	Y	Y	Y	2	3	4	
6	Demonstrate competency in performing & interpretation of various methods of haemoglobin estimation.	Y	Y	---	Y	Y	Y	2	3	4	
7	Demonstrate proficiency in preparation of blood components.	Y	--	--	Y	Y	Y	2	3	4	
8	Demonstrate proficiency incompatibility, labelling requirements and storage of various components	Y	Y	Y	Y	Y	Y	1	3	4	
9	Demonstrate proficiency in various modifications of blood components such as irradiation, cell washing, volume depletion and leuko depletion.	Y	Y	Y	Y	Y	Y	2	3	4	
10	Demonstrate proficiency in performing quality control tests of blood components.	Y	Y	--	Y	Y	Y	1	3	4	
11	Demonstrate proficiency in performing, interpretation, documentation of blood donor screening tests for TTIs.	Y	Y	---	Y	Y	Y	1	2	3	
12	Demonstrate proficiency in preparation and interpretation of Lj Chart and root cause analysis (RCA) and Corrective and Preventive Action (CAPA).	Y	Y	--	Y	Y	Y	1	2	3	

S. No.	Entrustable Professional Activities	Competencies							Expected level		
		MK	P/DC	ICS	P	PBLI	SBP	1 st year	2 nd year	3 rd Year	
13	Should be able to compare & contrast various methodologies such as ELISA, rapid & chemiluminescence used in the screening of transfusion-transmitted infections.	Y	Y	--	Y	Y	Y	1	3	4	
14	Demonstrate proficiency in the preparation and use of in-house external controls.	Y	Y	--	Y	Y	Y	1	2	3	
15	Demonstrate proficiency in proper handling and disposal of biohazardous material.	Y	Y	--	Y	Y	Y	1	3	4	
16	Demonstrate proficiency in preparation of cell suspensions of appropriate concentration following cell washing techniques correctly & grade and interpret antibody-antigen reactions.	Y	Y	--	Y	Y	Y	1	3	4	
17	Demonstrate proficiency in performing ABO/Rh grouping in donor/patient Samples.	Y	Y	Y	Y	Y	Y	1	3	4	
18	Demonstrate proficiency in performing, interpretation and resolving discrepant results in pre-transfusion testing, ABO/Rh grouping,	Y	Y	Y	Y	Y	Y	1	3	4	
19	Demonstrate proficiency in performing, interpretation of red cell antibody screen, and antibody identification.	Y	Y	Y	Y	Y	Y	1	2	3	
20	should be able to perform direct and indirect antiglobulin test on appropriate specimens, grading and recording the results appropriately with the use of "check cells".	Y	Y	Y	Y	Y	Y	1	3	4	
21	Demonstrate proficiency in the selection of the blood unit for a patient with autoimmune hemolytic anaemia.	Y	Y	Y	Y	Y	Y	1	2	3	
22	Demonstrate proficiency in evaluating and recommending treatment plans for transfusion reactions.	Y	Y	Y	Y	Y	Y	1	3	4	
23	Be able to identify irregular antibodies in pregnant patients that are clinically significant and make appropriate recommendations for blood products.	Y	Y	Y	Y	Y	Y	1	2	3	
24	Demonstrate proficiency in preparation and transfusion of blood for intrauterine transfusion/exchange transfusion.	Y	Y	Y	Y	Y	Y	1	2	4	

S. No.	Entrustable Professional Activities	Competencies							Expected level		
		MK	P/DC	ICS	P	PBLI	SBP	1 st year	2 nd year	3 rd Year	
25	Demonstrate proficiency in the evaluation and appropriate transfusion therapy of thrombocytopenic patients (both adult and pediatric) including neonatal alloimmune thrombocytopenia.	Y	Y	Y	Y	Y	Y	1	2	3	
26	Demonstrate proficiency in evaluating the effectiveness of platelet transfusion including patient's with refractoriness to platelet transfusions.	Y	Y	Y	Y	Y	Y	1	2	3	
27	Demonstrate competency in providing transfusion and immunohistological support to patients with solid organ and bone marrow/stem cell transplantation.	Y	Y	Y	Y	Y	Y	1	2	3	
28	Demonstrate knowledge of the principles of hematopoietic stem cell transplantation, including collection, processing, and storage of these stem cell products, and the indications for use (e.g., bone marrow, peripheral blood, and cord blood).	Y	Y	Y	Y	Y	Y	1	2	3	
29	Demonstrate proficiency in performing molecular/serologic HLA testing, interpretation in organ and bone marrow transplant.	Y	Y	Y	Y	Y	Y	1	2	3	
30	Demonstrate familiarity with the appropriate use of highly specialized blood products (e.g., granulocytes, donor lymphocyte infusions, HLA-matched platelets).	Y	Y	Y	Y	Y	Y	1	2	3	
31	Demonstrate competence in the management of blood inventory and the ability to communicate effectively the hospital's needs to the blood donor recruiters, Triage and screen requests for blood components appropriately during inventory shortages.	Y	Y	Y	Y	Y	Y	1	3	4	
32	Demonstrate proficiency in evaluating and preparing patients for therapeutic apheresis, including discussion with the patient of the risks and benefits associated with apheresis procedures and obtaining informed consent.	Y	Y	Y	Y	Y	Y	1	2	4	

S. No.	Entrustable Professional Activities	Competencies							Expected level		
		MK	P/DC	ICS	P	PBLI	SBP	1 st year	2 nd year	3 rd Year	
33	Should be able to perform plasma exchange including calculation & type of replacement fluid to be used and monitoring patient for complications and efficacy of the procedure.	Y	Y	Y	Y	Y	Y	1	2	3	
34	Demonstrate proficiency in evaluating and treating adverse reactions associated with therapeutic apheresis.	Y	Y	Y	Y	Y	Y	1	2	3	
35	Demonstrate proficiency in evaluating and preparing donor for platelet apheresis, including discussion with the clinician and obtaining informed consent.	Y	Y	Y	Y	Y	Y	1	2	4	
36	Demonstrate proficiency in the treatment of patients using specialized methods (e.g., photopheresis and immunoabsorption columns)	Y	Y	Y	Y	Y	Y	1	2	3	
37	Should be able to prepare, stain and interpret peripheral smear and interpret routine haematological investigations like haemoglobin, TLC, DLC, ESR PCV, Blood indices.	Y	Y	Y	Y	Y	Y	1	2	4	
38	Should be able to perform and interpret coagulation profile testing like PT, APTT, Fibrinogen etc	Y	Y	Y	Y	Y	Y	1	2	3	
39	Demonstrate proficiency of the use of various point-of-care tests (TEG, ROTEM) for hemostasis & recommend component therapy depending on the results.	Y	Y	Y	Y	Y	Y	1	3	4	
40	Should be able to perform and interpret special investigations like Retic count, a Sickling test, Osmotic fragility test, haemoglobin electrophoresis, Fetal Hemoglobin, etc.	Y	Y	Y	Y	Y	Y	1	2	3	
41	Should be able to present oral and poster presentations, write the paper in conferences	Y	Y	Y	Y	Y	Y	--	2	3	
42	Should be able to teach Transfusion Medicine to undergraduates (MBBS), and allied health sciences like BSc (Nursing), BSc MLT etc.	Y	Y	Y	Y	Y	Y	--	2	3	

S. No.	Entrustable Professional Activities	Competencies						Expected level		
		MK	P/DC	ICS	P	PBLI	SBP	1 st year	2 nd year	3 rd Year
43	Demonstrate knowledge concerning the requirements and applications of all applicable regulatory and accrediting agencies. [e.g., DCGI, NABH, AABB].	Y	Y	Y	Y	Y	Y	-	2	3

Abbreviations:

MK: Medical knowledge

PC: Patient Care

PBLI: Problem Based Learning and Improvement

SBP: Systems-Based Practice

P: Professionalism

ICS: Interpersonal and Communication Skills

Levels of competence:

Level 1: Knowledge only; can observe

Level 2: Can do under strict supervision

Level 3: Can do under loose supervision

Level 4: Can do independently

Level 5: Has the expertise to teach others



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