MAHATMA GANDHI UNIVERSITY
of
MEDICAL SCIENCES & TECHNOLOGY
JAIPUR

Syllabus

MD – ANAESTHESIOLOGY

(3 Years Post Graduate Degree Course)

Notice

1. Amendment made by the Medical Council of India in Rules/Regulations of Post Graduate Medical Courses shall automatically apply to the Rules/Regulations of the Mahatma Gandhi University of Medical Sciences & Technology (MGUMST), Jaipur.

2. The University reserves the right to make changes in the syllabus/books/guidelines, fees-structure or any other information at any time without prior notice. The decision of the University shall be binding on all.

3. The Jurisdiction of all court cases shall be Jaipur Bench of Hon'ble Rajasthan High Court only.

RULES & REGULATIONS

MD ANAESTHESIOLOGY (9090)
(3 Years Post Graduate degree course)

TITLE OF THE COURSE:
It shall be called Doctor of Medicine.

ELIGIBILITY FOR ADMISSION:
No candidate of any category (including NRI quota) shall be eligible for admission to MD/MS courses, if he or she has not qualified NEET PG (MD/MS) conducted by National Board of Examinations or any other Authority appointed by the Government of India for the purpose.

(1) General Seats

(a) Every student, selected for admission to postgraduate medical course shall possess recognized MBBS degree or equivalent qualification and should have obtained permanent Registration with the Medical Council of India, or any of the State Medical Councils or should obtain the same within one month from the date of his/her admission, failing which the admission of the candidate shall be cancelled;

(b) Completed satisfactorily one year's rotatory internship or would be completing the same before the date announced by the University for that specific year as per MCI rules after passing 3rd professional MBBS Part II Examination satisfactorily.

(c) In the case of a foreign national, the Medical Council of India may, on payment of the prescribed fee for registration, grant temporary registration for the duration of the postgraduate training restricted to the medical college/institution to which he/she is admitted for the time being exclusively for postgraduate studies; however temporary registration to such foreign national shall be subject to the condition that such person is duly registered as medical practitioner in his/her own country from which he has obtained his basic medical qualification and that his degree is recognized by the corresponding Medical Council or concerned authority.

(2) NRI Seats

(a) Students from other countries should possess passport, visa and exchange permits valid for the period of their course of study in this Institution and should also observe the regulations of both central and state governments regarding residential permits and obtain no-objection certificate from the same.

(b) The candidate should have a provisional "Student Visa". If he comes on any other visa and is selected for admission, he will have to first obtain a student visa from his country and then only he will be allowed to join the course. Therefore it is imperative to obtain provisional student visa before coming for Counseling.

(c) This clause is applicable to NRI/Foreign Students only.

CRITERIA FOR SELECTION FOR ADMISSION:

(1) NRI Quota

(a) 15% of the total seats are earmarked for Foreign National / PIO / OCI/ NRI / Ward of NRI/NRI sponsored candidates who would be admitted on the basis of merit obtained in NEET PG or any other criteria laid down by Central Government/MCI.

(2) Remaining Seats (Other than NRI Quota Seats)

(a) Admissions to the remaining 85% of the seats shall be made on the basis of the merit obtained at the NEET conducted by the National Board of Examinations or any other Authority appointed by the Government of India for the purpose.

(b) The admission policy may be changed according to the law prevailing at the time of admission.

COUNSELING/INTERVIEW:

(1) Candidates in order of merit will be called for Counseling/Interview and for verification of original documents and identity by personal appearance.
(2) Counseling will be performed and the placement will be done on merit-cum-choice basis by the Admission Board appointed by the Government of Rajasthan.

RESERVATION:

Reservation shall be applicable as per policy of the State Government in terms of scheduled caste, scheduled tribe, back ward class, special back ward class, women and handicapped persons.

ELIGIBILITY AND ENROLMENT:

Every candidate who is admitted to MD/MS course in Mahatma Gandhi Medical College & Hospital shall be required to get himself/herself enrolled and registered with the Mahatma Gandhi University of Medical Sciences & Technology after paying the prescribed eligibility and enrolment fees.

The candidate shall have to submit an application to the MGUMST for the enrolment/eligibility along with the following original documents with the prescribed fees (upto November 30 of the year of admission without late fees and upto December 31 of the year of admission with late fees) –

(a) MBBS pass Marks sheet/Degree certificate issued by the University (Ist MBBS to Final MBBS)
(b) Certificate regarding the recognition of medical college by the Medical Council of India.
(c) Completion of the Rotatory Internship certificate from a recognized college.
(d) Migration certificate issued by the concerned University.
(e) Date of Birth Certificate
(f) Certificate regarding registration with Rajasthan Medical Council / Medical Council of India / Other State Medical Council.

REGISTRATION

Every candidate who is admitted to MD/MS course in Mahatma Gandhi Medical College & Hospital shall be required to get himself/herself registered with the Mahatma Gandhi University of Medical Sciences & Technology after paying the prescribed registration fees.

The candidate shall have to submit an application to the MGUMST for registration with the prescribed fees (upto November 30 of the year of admission without late fees upto December 31 of the year of admission with late fees).

DURATION OF COURSE:

The course shall be of 3 years duration from the date of commencement of academic session.

PERIOD OF TRAINING:

(1) The period of training for obtaining Post graduate degrees (MD/MS) shall be three completed years including the period of examination.
(2) It shall however be two years for candidates who have obtained the recognised PG Diploma in the subject.

MIGRATION:

No application for migration to other Medical Colleges will be entertained from the students already admitted to the MD/MS course at this Institute.

METHODS OF TRAINING FOR MD/MS:

Method of training for MD/MS courses shall be as laid down by the Medical Council of India.

ONLINE COURSE IN RESEARCH METHODS

i. All postgraduate students shall complete an online course in Research Methods to be conducted by an Institute(s) that may be designated by the Medical Council of India by way of public notice, including on its website and by Circular to all Medical Colleges. The students shall have to register on the portal of the designated institution or any other institute as indicated in the public notice.
ii. The students have to complete the course by the end of their 2nd semester.
iii. The online certificate generated on successful completion of the course and examination thereafter, will be taken as proof of completion of this course
iv. The successful completion of the online research methods course with proof of its completion shall be essential before the candidate is allowed to appear for the final examination of the respective postgraduate course.
v. This requirement will be applicable for all postgraduate students admitted from the academic year 2019-20 onwards

ATTENDANCE, PROGRESS AND CONDUCT:

(1) Attendance:

(a) 80% attendance in each course is compulsory. Any one failing to achieve this, shall not be allowed to appear in the University examination.
(b) A candidate pursuing MD/MS course shall reside in the campus and work in the respective department of the institution for the full period as a full time student. No candidate is permitted to run a clinic/work in clinic/laboratory/ nursing home while studying postgraduate course. No candidate shall join any other course of study or appear for any other examination conducted by this university or any other university in India or abroad during the period of registration. Each year shall be taken as a unit for the purpose of calculating attendance.
(c) Every candidate shall attend symposia, seminars, conferences, journal review meetings, grand rounds, CPC, CCR, case presentation, clinics and lectures during each year as prescribed by the department and not absent himself / herself from work without valid reasons. Candidates should not be absent continuously as the course is a full time one.

(2) Monitoring Progress of Studies- Work diary/Log Book:

(a) Every candidate shall maintain a work diary in which his/her participation in the entire training program conducted by the department such as reviews, seminars, etc. has to be chronologically entered.
(b) The work scrutinized and certified by the Head of the Department and Head of the Institution is to be presented in the University practical/clinical examination.

(3) Periodic tests:

There shall be periodic tests as prescribed by the Medical Council of India and/ or the Board of Management of the University, tests shall include written papers, practical/clinical and viva voce.

(4) Records:

Records and marks obtained in tests will be maintained by the Head of the Department and will be made available to the University when called for.

THESIS:

(1) Every candidate pursuing MD/MS degree course is required to carry out work on research project under the guidance of a recognized post graduate teacher. Then such a work shall be submitted in the form of a Thesis.
(2) The Thesis is aimed to train a postgraduate student in research methods & techniques.
(3) It includes identification of a problem, formulation of a hypothesis, designing of a study, getting acquainted with recent advances, review of literature, collection of data, critical analysis, comparison of results and drawing conclusions.
(4) Every candidate shall submit to the Registrar of the University in the prescribed format a Plan of Thesis containing particulars of proposed Thesis work within six months of the date of commencement of the course on or before the dates notified by the University.
(5) The Plan of Thesis shall be sent through proper channel.
(6) Thesis topic and plan shall be approved by the Institutional Ethics Committee before sending the same to the University for registration.
(7) Synopsis will be reviewed and the Thesis topic will be registered by the University.
(8) No change in the thesis topic or guide shall be made without prior notice and permission from the University.
(9) The Guide, Head of the Department and head of the institution shall certify the thesis. Three printed copies and one soft copy of the thesis thus prepared shall be submitted by the candidate to the Principal. While retaining the soft copy in his office, the Principal shall send the three printed copies of the thesis to the Registrar six months before MD/MS University Examinations. Examiners appointed by the University shall evaluate the thesis. Approval of Thesis at least by two examiners is an essential pre-condition for a candidate to appear in the University Examination.
(10) Guide: The academic qualification and teaching experience required for recognition by this University as a guide for thesis work is as laid down by Medical Council of India/Mahatma Gandhi University of Medical Sciences & Technology, Jaipur.
(11) Co-guide: A co-guide may be included provided the work requires substantial contribution from a sister department or from another institution recognized for teaching/training by Mahatma Gandhi University of Medical Sciences & Technology, Jaipur/Medical Council of India. The co-guide shall be a recognized postgraduate teacher.
(12) Change of guide: In the event of a registered guide leaving the college for any reason or in the event of death of guide, guide may be changed with prior permission from the University.

ELIGIBILITY TO APPEAR FOR UNIVERSITY EXAMINATION:

The following requirements shall be fulfilled by every candidate to become eligible to appear for the final examination:

(1) Attendance: Every candidate shall have fulfilled the requirement of 80% attendance prescribed by the University during each academic year of the postgraduate course. (as per MCI rules)
(2) Progress and Conduct: Every candidate shall have participated in seminars, journal review meetings, symposia, conferences, case presentations, clinics and didactic lectures during each year as designed by the department.
(3) Work diary and Logbook: Every candidate shall maintain a work diary for recording his/her participation in the training program conducted in the department. The work diary

and logbook shall be verified and certified by the Department Head and Head of the Institution.

(4) Every student would be required to present one poster presentation, to read one paper at a National/State Conference and to have one research paper which should be published/accepted for publication/ sent for publication to an indexed journal during the period of his/her post graduate studies so as to make him/her eligible to appear at the Post Graduate Degree Examination.

(5) Every student would be required to appear in and qualify the Pre-University Post graduate degree Mock examination. Post graduate students who fail to appear in or do not qualify the Pre-University Post graduate degree Mock examination shall not be permitted to appear in the final examination of the University.

The certification of satisfactory progress by the Head of the Department/ Institution shall be based on (1), (2), (3), (4) and (5) criteria mentioned above.

ASSESSMENT:

(1) The progress of work of the candidates shall be assessed periodically by the respective guides and report submitted to the Head of the Institution through the Head of the Department at the end of every six months. The assessment report may also be conveyed in writing to the candidate who may also be advised of his/her shortcomings, if any.

(2) In case the report indicate that a candidate is incapable of continuing to do the work of the desired standard and complete it within the prescribed period, the Head of the Institution may recommend cancellation of his/her registration at any time to the University.

(3) Formative Assessment:

(a) General Principles

i. The assessment is valid, objective, constructive and reliable.
ii. It covers cognitive, psychomotor and affective domains.
iii. Formative, continuing and summative (final) assessment is also conducted.
iv. Thesis is also assessed separately.

(b) Internal Assessment

i. The internal assessment is continuous as well as periodical. The former is based on the feedback from the senior residents and the consultants concerned. Assessment is held periodically.
ii. Internal assessment will not count towards pass/fail at the end of the program, but will provide feedback to the candidate.
iii. The performance of the Postgraduate student during the training period should be monitored throughout the course and duly recorded in the log books as evidence of the ability and daily work of the student.
iv. Marks should be allotted out of 100 as under

1) Personal Attributes - 20 marks

a. Behavior and Emotional Stability: Dependable, disciplined, dedicated, stable in emergency situations, shows positive approach.
b. Motivation and Initiative: Takes on responsibility, innovative, enterprising, does not shirk duties or leave any work pending.
c. Honesty and Integrity: Truthful, admits mistakes, does not cook up information, has ethical conduct, exhibits good moral values, loyal to the institution.

2) Clinical Work - 20 marks

a Availability: Punctual, available continuously on duty, responds promptly on calls and takes proper permission for leave.

b Diligence: Dedicated, hardworking, does not shirk duties, leaves no work pending, does not sit idle, competent in clinical case work up and management.

c Academic Ability: Intelligent, shows sound knowledge and skills, participates adequately in academic activities and performs well in oral presentation and departmental tests.

d Clinical Performance: Proficient in clinical presentations and case discussion during rounds and OPD work up. Preparing Documents of the case history/examination and progress notes in the file (daily notes, round discussion, investigations and management) Skill of performing bed side procedures and handling emergencies.

3) Academic Activities - 20 marks
Performance during presentation at Journal club/ Seminar/Case discussion/Stat meeting and other academic sessions. Proficiency in skills as mentioned in job responsibilities.

4) End of term theory examination - 20 marks
End of term theory examination conducted at end of 1st, 2nd year and after 2 years 9 months.

5) End of term practical examination - 20 marks
   a. End of term practical/oral examinations after 2 years 9 months.
   b. Marks for personal attributes and clinical work should be given annually by all the consultants under whom the resident was posted during the year. Average of the three years should be put as the final marks out of 20.
   c. Marks for academic activity should be given by the all consultants who have attended the session presented by the resident.
   d. The Internal assessment should be presented to the Board of examiners for due consideration at the time of Final Examinations.
   e. Yearly (end of 1st, 2nd & 3rd year) theory and practical examination will be conducted by internal examiners and each candidate will enter details of theory paper, cases allotted (2 long & 2 short) and viva.
   f. Log book to be brought at the time of final practical examination.

APPOINTMENT OF EXAMINERS:

Appointment of paper setters, thesis evaluators, answer books evaluators and practical & viva voce examiners shall be made as per regulations of the Medical Council of India.

SCHEME OF EXAMINATION:

Scheme of examination in respect of all the subjects of MD/MS shall be as under :

(1) The examination for MD/MS shall be held at the end of three Academic Years.
(2) Examinations shall be organized on the basis of marking system.
(3) The period of training for obtaining MD/MS degrees shall be three completed years including the period of examination.
(4) The University shall conduct not more than two examinations in a year for any subject with an interval of not less than 4 months and not more than 6 months between the two examinations.
(5) The examinations shall consist of:
   (a) Thesis :
      i. Thesis shall be submitted at least six months before the main Theory examinations.

ii. The thesis shall be examined by a minimum of three examiners – one Internal and two External examiners who shall not be the examiners for Theory and Clinical/Practical.
iii. In departments where besides the two earmarked practical/clinical examiners no one else is a qualified P.G. teacher, in that case the Thesis shall be sent to the third external examiner who shall actually be in place of the internal examiner.
iv. Only on the acceptance of the thesis by any two examiners, the candidate shall be eligible to appear for the final examination.
v. A candidate whose thesis has been once approved by the examiners will not be required to submit the Thesis afresh, even if he/she fails in theory and/or practical of the examination of the same branch.
vi. In case the Thesis submitted by a candidate is rejected, he/she should be required to submit a fresh Thesis.

(b) Theory papers:
i. There shall be four theory papers.
ii. Out of these, one shall be of Basic Sciences and one shall be of Recent Advances.
iii. Each theory paper examination shall be of three hours duration.
iv. Each theory paper shall carry maximum 100 marks having 10 short structured questions with 10 marks each.
v. The question papers shall be set by the External Examiners.

vi. The answer books of theory paper examination shall be evaluated by two External and two internal examiners. Out of the four paper setters, the two paper setters will be given answer books pertaining to their papers and the answer books of the remaining two papers will be evaluated by two Internal Examiners. It will be decided by the President as to which paper is to be assigned to which Internal Examiner for evaluation.
vii. A candidate will be required to pass theory and practical examinations separately in terms of the governing provisions pertaining to the scheme of examination in the post graduate regulations. The examinee should obtain minimum 40% marks in each theory paper and not less than 50% marks cumulatively in all the four papers for degree examination to be cleared as "passed" at the said Degree examination.

(c) Clinical/ Practical & Oral examinations:
i. Clinical/Practical and Oral Examination of 400 marks will be conducted by at least four examiners, out of which two (50%) shall be External Examiners.
ii. A candidate will be required to secure at least 50% (viz. 200/400) marks in the Practical including clinical and viva voce examinations.

(6) If a candidate fails in one or more theory paper(s) or practical, he/she shall have to reappear in the whole examination i.e. in all theory papers as well as practical.

GRACE MARKS

No grace marks will be provided in MD/MS examinations.

REVALUATION / SCRUTINY:

No Revaluation shall be permitted in the MD/MS examinations. However, the student can apply for scrutiny of the answer books as per University Rules.

GUIDELINES FOR COMPETENCY BASED POSTGRADUATE TRAINING PROGRAMME FOR MD IN ANAESTHESIOLOGY (9090)

Preamble

The purpose of PG education is to create specialists who would provide high quality health care and advance the cause of science through research & training.

A post graduate specialist having undergone the required training in anesthesiology should be able to recognize the health needs of the community. He or she should be competent to handle effectively medical problems and should be aware of the recent advances pertaining to his/her specialty. She/he should be highly competent anesthesiologist with broad range of skills that will enable him/her to practice anesthesiology independently. The PG student should also acquire the basic skills in teaching of medical/para-medical students. She/he is also expected to know the principles of research methodology and modes of consulting library. She/he should attend conferences, workshops and CMEs regularly to upgrade his/her knowledge.

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 the 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 training should have clear objective, is competency based, is well planned & evaluated, is supervised and delivered by well trained teachers. It will have special emphasis on attitude and behavior, safety, communication, presentation, audit, teaching, ethics and law and management.

No limit can be fixed and on the number of topics that can be prescribed as course contents. The student is expected to know his/her subject in depth from various text books and journals; however more 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 specialty should get high priority. Competency in anaesthesia skills commensurate with the specialty (actual hand on training) must be ensured.

Specific learning objectives:

1. **Theoretical knowledge:** The student should have fair knowledge of basic sciences (Anatomy, Physiology, Biochemistry, Microbiology, Pathology, Pharmacology, Statistics and Physics) as applied to Anaesthesia. The student should acquire in-depth knowledge including recent advances. He/she should be fully conversant with the bedside procedures (diagnostic and therapeutic) and have knowledge of latest diagnostics and therapeutics procedures available including radiological methods.
2. **Teaching:** The student should learn the basic methodology of teaching and develop competence in teaching medical/paramedical students. The student should be familiar with the latest teaching (computer and power point presentation) modes including simulators training and evidence based medical education.

3. **Attitude development:** The student should develop attitude that leads to appropriate communication with colleagues to function in a group in Operating Room /Intensive Care Unit, and develop the ability to function as a leader in the operating room.

SUBJECT SPECIFIC COMPETENCIES

The student during the training programme, should acquire the following competencies:

A. Cognitive domain

- Demonstrate knowledge of Anatomy related to;
  - Diaphragm, upper and lower airway, heart and coronary circulation
  - Regional anaesthesia - field block, central neuraxial, blockade, block for acute pain states
  - Procedures like -Intramuscular injections, arterial and venous cannulations and
  - Patient Positioning under anaesthesia
- Demonstrate knowledge of Physiology of various systems (respiratory, cardiovascular, hepatobiliary, renal, endocrine, pregnancy, haematological, neuromuscular, regulation of temperature and metabolism, stress response, cerebral blood flow and ICP, central, autonomic and peripheral nervous systems, metabolic response to stress and trauma) in detail and translate its application in a problem solving manner.
- Demonstrate knowledge of Biochemistry relevant to fluid balance and blood transfusion, perioperative fluid therapy, acid base homeostasis in health and diseases.
- Demonstrate knowledge of commonly used drugs in anaesthesia practice (premedication, induction agents - intra-venous and inhalational, neuromuscular blocking agents and reversal of muscle relaxants) - general principles, concepts of pharmacokinetics and pharmacodynamics, drug interactions with the other drugs taken concomitantly by the patient and anaphylactoid reactions.
- Demonstrate knowledge of gas laws, medical gas supply system, fluidics, electricity, diathermy and oxygen therapy.
- Demonstrate knowledge of 'principles of physics' that govern functions of basic anaesthesia delivery equipment, airway devices – (laryngoscopes, airways etc), breathing systems and monitors, fiber optics, Lasers, Pacemakers and defibrillators, monitoring equipments (used for assessment of cardiac functions, temperature, respiratory functions, blood gases, intracranial pressure, depth of anaesthesia and neuromuscular block), Sterilization of equipments, manufacture, filling and transport of gases and liquid oxygen. etc.
- Demonstrate knowledge of importance of pre-anaesthetic assessment and optimization of a patient; consisting of evaluation, interpretation of laboratory investigation as applied to the care of the patients in planning and conduct of general anaesthesia.
- Demonstrate knowledge of basic life support, advanced cardiac, trauma life support, and neonatal resuscitation according to latest guidelines.
- Demonstrate knowledge of principles of sterilization and universal precautions, selection, maintenance and sterilization of anaesthesia and related equipment, Infection control, cross contamination in OT and ICU. Immune response and anaesthesia.
- Describe the development and history of anaesthesia as a specialty with knowledge of important personalities who have contributed towards it.
- Demonstrate knowledge of principles of artificial ventilation, management of unconscious patients, oxygen therapy, shock- (pathophysiology and management) and various protocols related to Intensive Care Unit.

- Demonstrate knowledge of post-operative care in the post-anaesthesia recovery room, in terms of management of
  - Post-operative pain: various modalities
  - Nausea and vomiting
  - Identified emergencies and postoperative complications.
  - Special precautions to be taken in specific surgical patients.
- Demonstrate knowledge of acute pain management, chronic pain therapy & therapeutic nerve blocks, acupuncture, acupressure and other non-conventional methods of treatment.
- Describe documentation, medico-legal aspects of anaesthesia and concept of informed consent.
- Demonstrate knowledge of research methodology and basics of biostatistics relevant to data collection, analysis, record keeping in anaesthesia, comparison and estimation of significance.
- Demonstrate ability to interpret blood gas analysis and other relevant biochemical values, various function tests and basics of measurement techniques, ECG.
- Explain blood coagulation mechanism, and their disturbances, rational use of blood and blood components.
- Demonstrate knowledge pertaining to special anaesthetic techniques as relevant to:
  - Outpatient anaesthesia, hypotensive anaesthesia, anaesthesia in abnormal environments including rural area and calamitous situations
  - Associated medical disorders in surgical patients
  - Geriatric and pediatric anaesthesia, Emergency, ENT, orthopedic, ophthalmology, obstetrics, dental, radio-diagnosis and radiotherapy.
  - Induced hypothermia, incidental, environmental safety of patient.
  - Malignant hyperthermia, myasthenia gravis, GB syndrome and other neuromuscular diseases, obesity, COPD, Diabetes mellitus, bronchial asthma and hypertensive crises..
  - Principles of anaesthetic management of neuro/cardiac/thoracic/vascular/ transplantation/burns and plastic surgery.
  - Anaesthesia for patients with severe cardiac, respiratory, renal and hepatobiliary disorder posted for unrelated surgery
  - Shock, types, pathogenesis and management of patients in shock, renal failure, critically ill and/or on ventilator, Multiple organ failure
- Demonstrate knowledge pertaining to care of terminally ill, Hospices management, Do not resuscitate orders.
- Demonstrate knowledge of general principles of medical audit and Critical incident reporting.
- Demonstrate knowledge of Ethics and clinical trial.
- Demonstrate knowledge of Hospital, ICU and OT design and planning.
- Demonstrate knowledge of Medical education including evidence based medical education.
- Demonstrate knowledge of principles of human resources and material management.

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 acquire skills in the following broad areas and be able to:

- Demonstrate ability **as a perioperative physician**, in terms of
  - Acquiring mastery in careful and relevant history taking, physical examination in clinical evaluation of the patient preoperatively.
  - Collecting and synthesizing preoperative data from parent hospital and other sources and to develop a rational strategy for the peri-operative care of the patient.
  - Thorough and systematic approach to preoperative evaluation of patients with and without systemic diseases, undergoing different types of operations.
  - Prioritizing problems, present cases clearly and systematically to attending consultants.
  - Developing working relationships with consultants in other specialties to assist in preoperative evaluation and get a good consultation.
  - Interacting with preoperative patients and developing effective counseling techniques for different anaesthetic techniques and peri-operative procedures.
  - Assessing and explaining risk of procedure and taking informed consent.
  - Managing information in preoperative evaluation and outcome enhancement and communication skill to patients and relatives.
  - Ability to choose and order the required investigations to be done in a particular patient peri operatively
- Demonstrate ability in performing
  - Pre-operative equipment check
  - selection of drugs
  - Preparation of work table etc.
- Identify conditions like difficult airway by following difficult airway algorithms.
- Demonstrate ability to establish topical airway anaesthesia for awake intubation
- Demonstrate management of a Failed intubation drill on a Mannequin according to latest guidelines
- Demonstrate ability to monitor and assess depth of anaesthesia
- Demonstrate abilities to manage body fluid composition; volume status; replacement of fluid and blood loss; use of whole blood and blood components.
- Demonstrate abilities to manage Electrolyte and acid base derangements; osmolarity and osmolality.
- Demonstrate acquisition of skills to initiate mechanical ventilation; select appropriate type and mode of ventilator; and monitor proper functioning of ventilator.
- Identify the need to perform intra-operative laboratory tests, blood gases, coagulation profile and interpret the results with clinical co relation
- Demonstrate ability to manage co-morbid conditions and anaesthesia
- Demonstrate ability to perform cannulation of arteries, central and peripheral veins.
- Demonstrate ability in using and interpreting the following routine non-invasive and invasive monitors intra-operatively:
  a. Electrocardiogram with ST-segment analysis
  b. Noninvasive blood pressure
  c. Capnograph: values and changes in values and waveform.
  d. Pulse oximetry: values and changes in values
  e. Neuromuscular blockade monitor

f. Invasive arterial pressure: waveform and changes in the waveform
g. Central venous pressure: values and waveform
h. Pulmonary artery pressure: Values and waveforms, pulmonary capillary wedge tracing.
i) Cardiac output
ii)Mixed venous oxygen saturation
iii)Evoked potential
iv)Transesophageal echocardiography: basic understanding

- Demonstrate skills in providing basic life support, advanced cardiac life support, trauma life support and paediatric-neonatal life support, train medical and paramedical staff in BLS and ALS.
- Demonstrate mastery in common procedures like vascular access, use of latest invasive and non-invasive monitoring equipment, lumber puncture, management of appropriate mechanical ventilation and total care of Intensive Care Patient.
- Demonstrate ability to administer general anaesthesia and regional anaesthesia for ASA I to V, under supervision.
- Demonstrate ability to give extradural block (EDB) lumbar and thoracic, Spinal Block, and Peripheral Nerve Blocks under supervision.
- Demonstrate ability to use ultrasound machine for giving blocks and venous cannulation.
- Demonstrate ability to plan and administer anaesthesia to all emergency patients under supervision including patients for Cardiac, Neurosurgery, Pediatric surgery and for all major surgeries, able to manage critically ill patients and treat intractable pain.
- Demonstrate following abilities in **Emergency Anaesthesia, Trauma and Resuscitation:**
  - Organize resources in case of mass casualty.
  - Perform triage.
  - Assess, transport and manage mass casualties / disaster management and camp anaesthesia.
  - Manage massive haemorrhage and massive blood transfusion.
  - Transport critically ill patient.
  - Perform anaesthetic management of geriatric patients with fracture neck of femur
  - Manage severe burns patients, rapidly progressing spinal compression, massive haemoptysis and lobectomy, peritonitis from various suspected causes, preparation and management of bowel obstruction, septicaemic shock, acute upper airway obstruction such as foreign body, epiglottitis, infections, cardiac tamponade from examples post cardiac surgery, malignant pericardial effusion, peri-operative management of rupture aneurysm of abdominal aorta
  - Basic Cardiac Life Support and Advanced Cardiac Life Support, Basic Trauma Life Support, Advanced Trauma Life Support, and Cerebral preservation.
  - Management of intra-operative cardiac arrest
  - Management of intra-operative bronchospasm
- Demonstrate ability to document a Medico-legal aspect.
- Demonstrate ability to provide special sedation**/anaesthesia requirements outside operating Room**, eg **Radiology**: for CT, MRI (especially in relation to dye allergy and embolization, **Oncho radiotherapy, Electroconvulsive shock therapy** (modified ECT. **Non-invasive cardio-radiologic procedures** including balloon angioplasty and cardiac catheterization, **Non-invasive neuro-radiologic procedures, lithotripsy** etc.
- Demonstrate ability to analyze data and write a thesis, present scientific data, participate in anaesthesia audit.

- Demonstrate ability to critically review and acquire relevant knowledge from the journals about the new development in the specialty
- Demonstrate following abilities in the **Post Anaesthesia Care Unit (PACU)**
  - Assess the patient's recovery and condition for a safe discharge or transfer.
  - Observe, recognize and treat the commonly occurring problems likely to arise in the Post-anaesthsia Care Unit (PACU) especially those in relation to cardio-respiratory systems:
    1. Airway integrity and compromise.
    2. Arrhythmia
    3. Hypertension
    4. Hypotension
    5. Pain prevention and pain relief
    6. Nausea and vomiting
    7. Decreased urine output
    8. Emergence delirium
    9. Delayed emergence from anaesthesia
    10. Shivering
    11. Post-obstructive pulmonary edema.
  - Assess patient recovery and the parameters for transfer from the PACU to the ward, ICU, home.
  - Score the patient's condition according to the Aldrete system, including fast tracking after out-patient surgery.
- Demonstration of following abilities in **Intensive Care Unit**
  - Understanding the spectrum of critical illnesses requiring admission to ICU.
  - Recognizing the critically ill patient who needs intensive care -Trauma, burns, all types of shock, Sepsis, SIRS and ARDS, Poisoning, infectious patient (HIV, Hepatitis) and patients with metabolic disturbances.
  - Monitoring progress of patients by physiological scoring systems
  - Practicing infection control practices and control of nosocomial infections.
  - Inserting central venous lines, arterial lines using ultrasound and interpreting the data.
  - Managing cardiovascular instability, respiratory failure and postoperative pulmonary complications
  - Understanding of the operation of mechanical ventilators including different ventilatory modalities non-invasive ventilation, complications and modes of weaning.
  - Principles and application of Oxygen Therapy
  - Glycemic control in the critically ill patient
  - Practice of Hypothermia and prevention of cerebral injury after cardiac arrest
  - Delivering appropriate nutritional support - enteral and parenteral.
  - Proper use of sedative/hypnotic drugs in the ICU.
  - Practicing ethical and legal aspects of critical care
  - Good communication skills with patient and relatives.
  - Proper Sterilization of ICU equipment.
- Demonstration of following abilities in **Acute and Chronic Pain Management**
  - Assessment of patients with pain including: history taking, physical examination, and interpretation of investigations.
  - Classify types of pain - acute chronic, traumatic, cancer pain, etc. with the knowledge of Pain pathways in detail.
  - Practice the different modalities of physical therapy that may relieve both acute and chronic pain
  - Practice the acute pain, cancer pain guidelines and WHO treatment ladder.

- Practice routes of administration and risk/benefits of drugs used for acute and chronic pain relief, patient controlled analgesia and treat the common pain syndromes.
- Demonstrate practice of pain management in patients with problem drug use, drug dependency and addiction and identify the parameters for referral to a pain medicine specialist.

- Demonstrate Organization of acute pain service and role of acute pain nurse for pain assessment in various groups of patients, Physiological changes secondary to Pain, practice different modalities of pain control. Pharmacology and side effects of opioid analgesia and non-opioid analgesia, principle of patient-controlled analgesia and assessment of its efficacy, Pharmacology and side effects of epidural/intra-thecal opioid. Neurological assessment of epidural blockade and management of failed block. Management of regional blockade – brachial plexus, para-vertebral and intra-pleural block. Management of epidural abscess. Substance abuse and acute pain control. Pain control in concurrent medical diseases – COAD, IHD, bleeding tendency, geriatric. Pain control in burns patients. Pain control in trauma patients included multiple rib fracture
- Demonstration of abilities to manage **Chronic Pain**
  - Practice different modalities of chronic pain management - physical therapy, psychotherapy, (including cognitive behavioural approaches), neuro-ablation, neuro-augmentation, spinal opioid, interventional neuro-blockade, non-opioid analgesia.
  - Anatomy, indication, technique and complication of chemical sympathectomy (lumbar sympathectomy, stellate ganglion block, celiac plexus block).
  - Practice principles of management of cancer pain, principle of management of non-cancer neuropathic pain - phantom limb pain, post-herpetic neuralgia, complex regional pain syndrome, trigeminal neuralgia. Principle of management of non-cancer nociceptive pain - myofascial pain, lower back pain, intractable angina, burns, chronic pancreatitis, PVD.
  - Practice Epidural steroid injection (all levels) and long-term epidural catheterization.
  - Observe and practice following blocks: Infra-orbital nerve, Intercostal nerve
  - Recognize complications associated with each blocks and know appropriate treatment of each
  - Know the indications for stimulation techniques such as transcutaneous electrical nerve stimulation (TENS), dorsal column stimulation, and deep brain stimulation.
  - Mechanisms and side effects of other therapies used for treating pain.
  - The principles of pain management in special patient groups including the elderly, children, disabled, intellectually handicapped and those unable to communicate.
  - Awareness of the principles for insertion and management of implantable drug delivery pumps.
  - Awareness of the basic principles of palliative care.
- Demonstrate practice of **Regional Anaesthesia**
  - Applying general principles of pharmacology of local anaesthetics and various adjuvants.
  - Familiarizing with the relevant anatomy for regional techniques.
  - Application of indications and contraindications to regional anesthetic technique including central neuraxial blocks, peripheral nerve blocks and sympathetic nerve blocks.
  - Assessing adequacy of regional anaesthesia, and learn techniques of supplementation of inadequate blocks.
  - Providing effective anxiolytics and sedation of patients by both pharmacologic and interpersonal technique.
  - Performing the following regional anaesthesia techniques:

Brachial plexus, cervical plexus, stellate ganglion block, lumbar plexus, lumbar sympathetic, Sciatic nerve block, Femoral nerve block, 3 in 1 block, Wrist block, Popliteal Nerve block, Trigeminal nerve block, Retro bulbar blocks, Paravertebral blocks, Intercostal blocks, Caudal block – adult and pediatric, Ankle block, Epidural block/Catheter, Subarachnoid block, Bier's block, All peripheral nerves of the upper and lower limbs.

- Demonstrate practice of **Thoracic Anaesthesia**
  - Pre-operative assessment of patients undergoing Thoracotomy (lung resection), thoracoscopy, video assisted thoracoscopy and mediastinoscopy
  - Various approaches and their relevant equipments for lung isolation.
  - Various double lumen tubes and their placement.
  - Application of Principle of chest drain.
  - Respiratory Physiology and management of one lung ventilation (OLV). Indications, contraindications and hazards of OLV.
  - Application of the knowledge of Anatomy of lung and broncho-pulmonary segments.
  - Anatomy and techniques for intercostals nerve block and thoracic epidural. Management of thoracic epidural anaesthesia and analgesia
  - Anatomy, techniques and placement of paravertebral block/catheter.
  - Post-operative care of patients after lung surgery.
  - Peri-operative management of patients with myasthenia gravis.
  - Peri-operative management of patients with mediastinal mass.
  - Anaesthetic management of mediastinoscopy, major airway stenting.
  - Lung volume reduction surgery and problems.
- Demonstrate practice of **Cardiovascular Anaesthesia:**
  - Application of the knowledge of Anatomy and physiology of valvular disease, coronary arteries and their territories. Pulmonary circulation, coronary circulation, cerebral circulation, visceral circulation.
  - Application of the knowledge of Distribution of blood volume to different organs and systems and their control. Microcirculation. Venous system, venous pressure, its influence on various functions.
  - Regulation of blood pressure, hypotensive anaesthesia.
  - Anatomy and physiology of all operable congenital heart disease like ASD, VSD, PDA, TOF, transposition of great vessels.
  - Application of the knowledge of anatomy and physiology of vascular heart disease like co-arctation of aorta.
  - Assessment of cardiac patient with ischaemic heart, valvular heart disease and other diseases listed above. Understanding of cardiac catheterization, echocardiography, stress testing, and radio-nucleide imaging.
  - Application of Principle and complication of cardiopulmonary bypass
  - Application of Principle of trans-esophageal echocardiography
  - Application of Principle of circulatory support: inotropes, IABP, pacing
  - Coagulation and management of coagulopathy.
  - Off pump bypass
  - Intra-operative management of aortic surgery and major peripheral vascular surgery, aneurysm grafts, recanalisation procedures.
  - Understanding of the adult patient with congenital heart disease and their management during anaesthesia.
  - Postoperative cardiac critical care, including cardiovascular problems, analgesia.
  - Insertion of invasive monitoring for arterial monitoring, central venous pressure monitoring, pulmonary artery catheter insertion and interpretation.

- Robotic cardiac surgery.

- Demonstrate practice of **Paediatric Anaesthesia**
  - Application of knowledge of Anatomical changes in paediatric patient and neonates.
  - Application of knowledge of Physiology and pharmacology in paediatric patient.
  - Guideline for pre-operative fasting in children and pre-medication.
  - Anaesthetic equipment: laryngoscopes, airways, endotracheal tubes, LMAs, PLMA and breathing circuit for children.
  - Anaesthesia management for premature and newborn.
  - Emotional problems for parent and child and principles of premedication. Consent by parents and their presence during induction. To become skilled in communicating with children, parents and other relatives.
  - Problems of transporting a sick pediatric patient from the ward to the operating room and back with regard to temperature maintenance, cardiovascular stability, ventilation and oxygenation.
  - Estimate preoperatively blood volume, hourly fluid requirements, fluid deficit, third space loss, acceptable blood loss and apply principles of fluid and blood replacement in the perioperative period.
  - Induce and maintain anaesthesia by inhalation, intravenous, intramuscular and rectal routes and monitor pediatric patients.
  - Understand the benefits, risks and techniques of regional anaesthesia in children. Anatomy and techniques of caudal, dorsal penile and inguinal regional block, spinal and epidural block
  - Learn to recognize and treat post anaesthesia complications like apnea, laryngospasm, acid-base and electrolyte disturbances, febrile and convulsing child and bleeding child.
  - Common problems related to common congenital syndromes presenting for surgery. Anaesthetic management of a child with concurrent disease – Down's, Pierre Robin syndrome, von Willebrand's disease, Goldenhar's, Sturge-Weber, Tracher-Colin, Prune-Belly, and cyanotic and non-cyanotic congenital heart disease.
  - Paediatric resuscitation: drugs, doses and defibrillation of children of all ages, from the very premature neonates to those children with complex coexisting disease.
  - Management of patients requiring paediatric intensive care, ventilatory management, and support of circulation.
  - Resuscitation of neonates and children of all ages. A period of one to two months in a PICU is recommended for all post graduate students undergoing advanced training in paediatric anaesthesia.
  - Paediatric pain management
  - Assessment of a child with URTI, with a heart murmur.
  - Management of fluid and electrolytes in children.
  - Anaesthetic management of a malignant hyperthermia susceptible child.
  - Anaesthetic management of FB bronchus, oesophagus, Wilm's tumour, congenital diaphragmatic hernia, tracheo-oesophagus fistula, thoracotomy.
  - Anaesthesia for Fetal Surgery.
  - Sedation techniques including the selection, management and monitoring of children for diagnostic and therapeutic procedures, with particular attention to working in areas outside the theatre suite.

- Demonstrate practice of **Transplant anaesthesia**
  - Application of knowledge of basic pathophysiology of renal and liver failure. Principles of anesthetizing an immuno-compromised patient.

- Principles of anesthetizing patient with end stage renal/liver disease and patient with organ transplantation. Perioperative management.

- Demonstrate practice of **Neuroanaesthesia**
  - Application of basic knowledge of cerebral circulation and intra cranial pressure and its implications
  - Anaesthesia to patients with neurologic disease, head injury undergoing neurologic or non-neurologic surgery and for diagnostic procedures requiring anaesthesia.
  - Anesthetic implications of the most common neurosurgical procedures, transnasal, trans-sphenoidal pituitary surgery. Posterior fossa surgery. Surgery for supratentorial pathology.
  - Application of basic concepts behind electrophysiologic monitoring of the brain and spinal cord.
  - Application of knowledge of general principles of positioning the patient for surgery and the advantages and disadvantages of each position.
  - Effects of anaesthesia on the electroencephalogram (EEG) and evoked potentials.
  - Differential diagnoses and treatment alternatives of intraoperative intracranial hypertension ("tight brain")
  - Management of Head Trauma, and its anesthetic management and various protocols regarding their management and associated trauma.
  - Intracranial surgery and spinal surgery, both routine and emergency.
  - Monitoring: techniques for detection and management of air embolism.
  - Lumbar puncture and CSF drainage.
  - Non-surgical management of the head trauma patient, Systemic complications of severe brain injury.
  - Management of subarachnoid haemorrhage and vasospasm.
  - Diagnosis and management of patients with brainstem death; and dealing with patient's relatives

- The following are special procedures which the post graduate student must be able to perform

Sr. No.	Name of procedure
1.	Blind Nasal intubation
2.	Failed intubation drill (includes Fiberoptic Laryngo/ Bronchoscope)
3.	Double Lumen Tube
4.	Bronchial Blocker placement
5.	Jet Ventilation
6.	Suctioning and physiotherapy of wet lung
7.	Intubation in Neonates
8.	Initiation and management of ventilation
9.	Combined Spinal Epidural
10.	Brachial Plexus Block
11.	Intravenous Regional Anaesthesia
12.	Elbow, Wrist, Digital, Sciatic, Femoral, Lateral Cutaneous Nerve of thigh, Ankle - each
13.	Cervical-Superficial and Deep, Stellate, Splanchnic - each
14.	Central Venous Line by Brachial, Jugular and Subclavian veins
15.	Radial and Femoral Artery cannulation
16.	CVP monitoring
17.	Pulmonary Capillary Wedge Pressure
18.	Neuro-muscular transmission Monitoring

19.	Anaesthetic Depth eg. BIS monitoring

- Demonstration of anesthetic abilities in the intraoperative period keeping into consideration the specific requirement of the surgical procedure – ENT, Orthopaedic, Gynaecology – Obstetrics, General surgery, Onchosurgery, replacement surgeries, urosurgery, vascular, plastic, Thoracic, Dental etc

Suggested Time Frame for Training the PG Students:
The student should be taught as per the following schedule to acquire the skills:

1. First 6 months:
- During the first 6 months, the student should be taught expertise in the management of uncomplicated cases not belonging to any super specialty (ASA I and II cases). To start with, the student will observe and slowly become independent in giving general anaesthesia and spinal aneasthesia to ASA I and II cases for minor and major surgery, under graded supervision.
- The postgraduate student should learn the basic principles of safe and effective anaesthesia, resuscitation, and both the prevention and treatment of pain, perioperative care of the surgical patient, care of handling equipments, basic techniques in anaesthesia, and anaesthetic pharmacology, and electrical safety.
- He/she should select the thesis topic and submit the protocol for his thesis.

2. Next 18 months
- The student should widen his experience and should be able to undertake anaesthetic care of all routine cases, assist in the anaesthetic care for routine obstetric practice, understand basic principles of critical care, pain management, and participate in audit.
- The student should be trained in administration of general anaesthesia and regional anaesthesia for ASA I to V under supervision. The student should be able to give extradural block (EDB) lumbar and thoracic, Spinal Block, and Peripheral Nerve Blocks under supervision, and use of Ultrasound machine for giving blocks and venous cannulation. The student should learn paediatric and trauma life supports and maintain skills for basic and advanced cardiac life support.
- It is advised that they should be posted in the following specialties: general surgery including gastrointestinal surgery, transplant, ENT, Urology, Obstetrics, Dental Surgery, Eye, ICU, Pain Clinic and peripheral theatres like ECT, radiodiagnostic and therapeutic procedures (CT scan, MRI scan, angiography).
- The student should be able to analyze data and write a thesis. He/she should be able to present scientific data.

3. Last 12 months
- Thesis should be submitted minimum of 6 months before the final MD examination.
- The post graduate student should be given experience of various super-specialties like cardiothoracic and vascular surgery, neurosurgery and transplantation, and paediatric surgery. The student should be able to plan and administer anaesthesia to all emergency patients under supervision including patients for Cardiac, Neurosurgery, Pediatric surgery, and for all major surgeries. The aim at the end is to be competent and independent soon after the third year of junior residency in providing anaesthesia to elective and emergency cases.
- The post graduate student should be able to manage critically ill patients and treat intractable pain. They should also know how to organize resources in case of mass casualty. The curriculum should be able to provide 04 months of elective Intensive Care

Unit posting (2 months during initial years under supervision and 2 months independently in the last six months).

4. **At the end of 3 years, the post graduate student should have the skills to:**

- Plan and conduct anaesthesia and provide post-operative care including pain relief for elective and emergency surgical procedures related to all surgical specialties.
- Carry out basic life support (BLS) and advanced life support (ALS) and train medical and paramedical staff in BLS and ALS.
- Manage patients admitted to an intensive care unit with the help of latest equipment.
- Manage patients suffering from acute and chronic intractable pain.
- Organize the hospital environment to manage mass casualty situation and camp anaesthesia.
- Critically review and acquire relevant knowledge from the journals about the new development in the specialty.
- Should be able to participate in anaesthesia audit.

Overall the student should acquire skills in the following practical competencies:

- Information management in preoperative evaluation and outcome enhancement and communication skill to patient and relatives.

Syllabus

The course content of **1st year** should cover the following:

1. Anatomy related to:

- Diaphragm, upper and lower airway
- Regional anaesthesia, field block, central neuraxial, blockade, block for acute pain states
- Intramuscular injections, arterial and venous cannulations and positioning.

2. Physics related to:

- Anaesthesia machine - assembly of necessary items.
- Airway equipment including laryngoscopes, airway devices
- Breathing systems
- Monitoring in anaesthesia with concepts of minimum monitoring
- Gas laws, medical gas supply system
- Fluidics
- Electricity and diathermy
- Oxygen therapy

3. Physiology related to:

- Theories of anaesthesia
- Respiratory, cardiovascular, hepatobiliary, renal and endocrine system, pregnancy, blood, muscle and N-M junction, Nerve impulse transmission, ECG, regulation of temperature and metabolism, stress response, cerebral blood flow and ICP.
- Central, autonomic and peripheral nervous systems.
- Metabolic response to stress and trauma.

4. Pharmacology related to

- General principles, concepts of pharmacokinetics and pharmacodynamics
- Drug interactions in anaesthesiology, anaphylactoid reactions

- Drugs used for premedication, induction of anaesthesia, general anaesthetics-intra-venous and inhalational, neuromuscular block and reversal of muscle relaxants.

5. **Biochemistry** relevant to fluid balance and blood transfusion, perioperative fluid therapy, acid base homeostasis in health and diseases.
6. Theoretical background of the commonly used anaesthetic techniques of general and regional anaesthesia, general principles of pre-anesthetic assessment and medication, recovery from anaesthesia and post operative care, effects of positioning during anaesthesia.
7. Introduction to the operation theatre, post-anaesthesia care rooms
8. Introduction to acute, chronic pain and pain management.
9. Documentation and medico-legal aspects of anaesthesia. Defensive anaesthesia. Concept of informed consent.
10. Resuscitation - basic and advanced life support (cardiac and trauma life support), neonatal resuscitation.
11. Intensive care of critical patients with introduction to artificial ventilation, management of unconscious patients, oxygen therapy, shock - pathophysiology and management.
12. Introduction to Research methodology, basics of biostatistics.

The course content of **2nd year** should cover the following:

Anatomy related to blocks for chronic pain, chemical neurolysis and different organ systems.

1. Physics related to:

- Equipments used in anaesthesia monitors, ventilators, vaporizers
- Fibroptics
- Laser
- Pacemaker and defibrillator
- Monitoring equipment used for assessment of cardiac functions, temperature, respiratory functions, blood gases, intracranial pressure, depth of anaesthesia and neuromuscular block.
- Sterilization of equipment
- Computers in anaesthesia

2. Pharmacology of drugs used in cardiovascular, respiratory, endocrine, renal diseases and CNS disorders.
3. Interpretation of blood gases and other relevant biochemical values, various function tests and basics of measurement techniques, ECG.
4. Blood coagulation mechanism, disturbances, blood components.
5. Special anaesthetic techniques as relevant to –
   - Outpatient anaesthesia, hypotensive anaesthesia, anaesthesia in abnormal environments including rural area and calamitous situations
   - Associated medical disorders in surgical patients
6. Geriatric and pediatric anaesthesia
7. Emergency, ENT, orthopedic, ophthalmology, obstetrics, dental, radio-diagnosis and radiotherapy.
8. Medical statistics relevant to data collection, analysis, record keeping in anaesthesia, comparison and estimation of significance.
9. Care of terminally ill, Hospices management. Do not resuscitate orders.
10. Postures and anaesthesia.
11. Induced hypothermia, incidental, environmental safety of patient.

12. Malignant hyperthermia, myasthenia gravis, GB syndrome and other neuromuscular diseases, obesity, COPD, Diabetes mellitus, bronchial asthma and hypertensive crises.
13. Third world anaesthesia.
14. Inherited metabolic diseases and anaesthesia.

The course contents of **3rd year** should cover the following:

1. Principles of anaesthetic management of neuro/cardiac/thoracic/vascular/ transplantation/ burns and plastic surgery.
2. Anaesthesia for patients with severe cardiac, respiratory, renal and hepatobiliary disorder posted for unrelated surgery
3. Shock, types, pathogenesis and management of patients in shock, renal failure, critically ill and/or on ventilator.
4. Multiple organ failure
5. Infection control, cross contamination in OT and ICU.
6. Immune response and anaesthesia.
7. Concept of cytokines, and other enzymes.
8. Selection, maintenance and sterilization of anaesthesia and related equipment
9. Chronic pain therapy and therapeutic nerve blocks.
10. Acupuncture, acupressure and other non-conventional methods of treatment.
11. Principles of neonatal resuscitation, ventilation and critical care.
12. Principles of human resources and material management.
13. General principles of medical audit. Critical incident reporting
14. Ethics and clinical trial.
15. Hospital, ICU and OT design and planning.
16. Medical education including evidence based medical education.

TEACHING AND LEARNING METHODS

Postgraduate Training

Teaching methodology

- Didactic lectures are of least importance.
- Teaching should include seminars, journal clubs, symposia, tutorials, case discussions, and research presentations.
- Reviews and guest lectures should get priority for theoretical knowledge.
- Bedside teaching, grand rounds, interactive group discussions and clinical demonstrations should be the hallmark of clinical/practical learning.
- Student should have hands-on training in performing various procedures (medical/surgical concerning his specialty) and ability to interpret various tests/investigations.
- Exposure to newer specialized diagnostic/therapeutic procedures concerning his/her subject should be given.
- A postgraduate student of a postgraduate 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.
- Log books shall be maintained regularly and should be checked and assessed periodically by the faculty members imparting the training.

- The postgraduate students shall be required to participate in the teaching and training programme of undergraduate students and interns.
- Department should encourage e-learning activities.

Thesis: Supervision

- The postgraduate is responsible to a Faculty member and the latter should be available to advise and assist the student in his clinical assignments
- Departmental teaching committee will be responsible for the educational activities of the department and the teaching schedule.
- This involves providing services for emergencies and it makes different demands upon the anaesthesiologist. It should be learned through experience, with reduced staff. The clinical work during emergency should have a close supervision. The standards should be maintained of the agreed competence on schedule. The emergency duties should be properly arranged with duty off. The postgraduates may have to do emergency duty as per schedule

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 skills laboratories in medical colleges is mandatory.

Simulators:

Simulators should be used for the events of high importance but infrequent occurrence and where there may be high risks to the patients. The simulators can also be used for assessment purposes.

Rotation:

Schedule for three years of MD Anaesthesia postings:

The post graduate student should be exposed to the following areas of clinical anaesthesia practice:

1. Pre-anaesthesia clinic
2. Pain clinic
3. Recovery and Post anaesthesia Care Unit (PACU)
4. Intensive Care Units
5. Dialysis and transplant
6. All specialty theatres
7. Peripheral areas: Radiology, MRI, ECT and other interventional laboratories

The suggested schedule of the Operating Theatre can be as follows: This may change as per availability of specialities.

Operation theatre	**Months**
General Surgery	6
Urology	1
Ophthalmology	1
Otorhinology	2
Dental	1
Orthopedics/Trauma/casualty	3
Gynecology	3
Obstetrics	3
Pediatrics surgery	2
Burns/Plastic	1

CTVS	2
Neurosurgery	2
ICU	4
Pain	1
Recovery	1
Organ Transplant posting in the other areas. ECT, Cardiac Cath)	(Radiology, Radiotherapy)

ASSESSMENT

FORMATIVE ASSESSMENT, during the training programme
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. The thesis is assessed separately.

Quarterly assessment during the MD training should be based on:
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**

The student to be assessed periodically as per categories listed in postgraduate student appraisal form (Annexure I)

SUMMATIVE ASSESSMENT ie., assessment at the end of training
The summative examination would be carried out as per the Rules given in **POSTGRADUATE MEDICAL EDUCATION REGULATIONS, 2000**.

Post graduate Examination
The examinations shall be organised on the basis of 'Grading' or 'Marking system' to evaluate and to certify post graduate student's level of knowledge, skill and competence at the end of the training. The examination for M.D./ MS shall be held at the end of 3rd academic year. An academic term shall mean six month's training period.

The final examination consists of three parts:
1. Thesis
2. Theory evaluation
3. Practical/Clinical and Oral evaluation

1. **Thesis**
   Every post graduate 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 post graduate 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.

2. **Theory** consists of four papers of 3 hours each having 10 short structured questions with 10 marks each:

   Paper I : Basic Sciences as applied to Anaesthesiology
   Paper II : Practice of Anaesthesia: Anaesthesia in relation to associated systemic and medical diseases.
   Paper III : Anaesthesia in relation to subspecialties/superspecialties
   Paper IV : Intensive Care Medicine, Pain Medicine and Recent advances.

3. **Practical/Clinical Examination:** will consist of: 3 clinical cases,

   Long case: One, duration 30 min (history, examination, Diagnosis and Management, Discussion)

   Short cases: Two, 15 minutes each for short case. In short cases only relevant history important to anaesthesia to be taken (history, clinical examination and diagnosis, discussion).

   Oral/Viva-voce should be conducted preferably on four tables with one examiner on each table:

   Table one: ECG, X-rays, ABG Cards, Pulmonary function tests, Capnographs, clinical exercises card.
   Table two: Anaesthetic Drugs, Emergency Drugs, IV Fluids, Nerve Bocks (skeleton) .
   Table three: Anaesthesia machine including circuits and Vaporizers, ETT, Supraglottic Airway devices, ICU Ventilator and oxygen therapy equipment.
   Table four: Resuscitation equipments, resuscitation demonstration, Difficult Airway Equipment, monitoring equipments.

Recommended Reading

Books (latest edition)

- Lee's Synopsis of Anaesthesia
- Clinical Anesthesiology by Morgan
- Cardiac Anaesthesia By Joel Kaplan
- Clinical Anaesthesia by Barash, Cullen and Stoelting
- Textbook of Anaesthesia by Aitkenhead Rowbotham and Smith
- Anaesthesia for neonates and infants by Smith
- Pharmacology and Physiology for Anaesthetists by Stoelting
- Principles of Obstetric Anaesthesia by Craford
- Miller's Anesthesia
- Stoelting RK, Miller RD Basics of Anaesthesia
- ICU Book, Paul Marino
- Text Book of Critical Care, by Fink et al
- Regional Anaesthesia, P Prithviraj
- Practical Management of Pain, Raj
- Stoelting and Dierdorf: Anaesthesia and Co-existing Disease
- Dorsch and Dorsch: Understanding Anaesthesia Equipments
- ECG by Shamroth/Goldman
- Anatomy for Anaesthetists by Harold Ellis

- Clinical Anesthesia by P.G.Barash
- Longneckers Anaesthesiology- Mcgraw Hill

Must refer:

- Cucchiara and Michenfelder: Clinical Neuroanaesthesia
- Cottrell and Smith: Anaesthesia and Neurosurgery
- Complications in Anaesthesiology by Orkin
- Complications in Anaesthesia by Raven
- Airway management by JL Benumof
- Obstetric Anaesthesia by Chestnut

Journals

03-05 international Journals and 02 national (all indexed) journals

Annexure - I

Postgraduate Students Appraisal Form
Pre / Para /Clinical Disciplines

Name of the Department/Unit :

Name of the PG Student :

Period of Training: FROM.....TO.....

Sr. No.	Particulars	Not satisfactory	Satisfactory	More Than Satisfactory	Remarks
		1 2 3	4 5 6	7 8 9	
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.	Thesis/Research work				
7.	Log Book Maintenance				

Publications Yes/ No

Remarks*_____
_____
_____

*REMARKS: Any significant positive or negative attributes of a postgraduate student to be mentioned. For score less than 4 in any category, remediation must be suggested. Individual feedback to postgraduate student is strongly recommended.

SIGNATURE OF ASSESSEE | SIGNATURE OF CONSULTANT | SIGNATURE OF HOD

MODEL PAPER

MD-9091 **Anaes.-I**

MD Examination Month, Year
ANAESTHESIOLOGY

Paper - I
Basic Sciences as applied to Anaesthesiology

Time: - Three Hours
Maximum Marks 100

Attempt all questions
All questions carry equal marks (**10 marks each**)
Draw diagrams wherever necessary

Q.1. Mention the nerve supply of larynx. Write techniques of upper airway anaesthetisation for awake endotracheal intubation.

Q.2. What are common causes of hypoxaemia during anaesthesia? How can GA worsen V/Q mismatch?

Q.3. Compare Phase I Block / Phase II block – causes, mechanism, diagnosis and treatment

Q.4. Anion Gap and its significance in clinical Practice.

Q.5. Sir Ivan Magill and his contribution to anaesthesia practice.

Q.6. Indications, contra indications, technique and complications of Stellate ganglion block

Q.7. Remifentanil - Discuss the pharmacokinetics/dynamics of remifentanil. What is context- sensitive half-life? What are the problems/advantages associated with use of this drug? Indications? Why should a patient not be given high-dose morphine initially?

Q.8. Discuss the benefits and pharmacokinetics of patient-controlled analgesia (PCA). What are the properties of the ideal PCA pump?

Q.9. What are the functions of the liver, how do we test for liver function? What does bile do? Describe bilirubin metabolism. Describe the effects of anaesthetic agents on the liver.

Q10. Discuss the microbiological causes of surgical infections. What can the anaesthetist do to reduce the incidence of these?

MODEL PAPER

MD-9092 **Anaes.-II**

MD Examination Month, Year
ANAESTHESIOLOGY

Paper - II
Practice of Anaesthesia: Anaesthesia in relation to associated systemic and medical diseases

Time: - Three Hours
Maximum Marks 100

Attempt all questions
All questions carry equal marks (**10 marks each**)
Draw diagrams wherever necessary

Q.1. Outline your management of a fit primigravida who suffers inadvertent dural puncture with a 16 gauge Tuohy needle during attempted epidural for pain relief in the first stage of labour (cervix 4 cm dilated).

Q.2. What are the types of anaesthetic that should be considered for fixation of a compound ankle fracture in a patient who was briefly knocked unconscious at the accident? Outline the advantages and disadvantages of each technique.

Q.3. A 60 yrs old lady scheduled for ligation of Vericose veins, who has H/O Ischaemic heart disease. What would be your peri operative management?

Q.4. Two hours after a laparotomy patient had passed only 25ml urine; list, with reasons the likely causes. What is going to be your initial plan of management?

Q.5. What are the causes and management of circulatory collapse at induction of anaesthesia?

Q6. What are the anaesthetic problems caused by morbid obesity? Write the peri operative management for a morbidly obese patient scheduled for emergency laparotomy.

Q.7. List the causes and briefly give the management of tachycardia in an adult during general anaesthesia.

Q.8. Peri operative management of 24 yrs primigravida with B.P 170/100 with pedal oedema and protinurea posted for emergency LSCS.

Q.9 Diabetic Ketoacidosis.

Q10. Assessment of depth of Anaesthesia.

MODEL PAPER

MD-9093 **Anaes.-III**

MD Examination Month, Year
ANAESTHESIOLOGY

Paper - III
Anaesthesia in relation to subspecialties/super specialties

Time: - Three Hours
Maximum Marks 100

Attempt all questions
All questions carry equal marks (**10 marks each**)
Draw diagrams wherever necessary

Q.1. A 70-year-old presents for elective open cholecystectomy. She has atrial fibrillation, LLBB, COPD and arthritis. What would be your pre operative optimisation and anaesthetic management?

Q.2. Diagnosis of brain death and maintenance of brain dead patient for cadaveric organ transplant.

Q.3. Describe the physical principles of a capnography How may it be calibrated? What information can a capnogram give about anaesthesia?

Q.4. What are the endocrine causes of secondary hypertension? Pharmacological management of each of these endocrine conditions and mechanism of action of the drugs used.

Q.5. A one day old term neonate with congenital diaphragmatic hernia has been diagnosed. The baby is already intubated and receiving artificial ventilation. Outline, with reasons the principles of preoperative management.

Q6. Indications of one lung ventilation and management of hypoxaemia during one lung ventilation.

Q.7. Somato Sensory Evoked Potential.

Q.8. Post-thoracotomy complications following pneumonectomy.

Q.9. Neurally Adjusted Ventilatory Assist Ventilation.

Q10. Anaesthetic implications in a patient with sickle cell disease, coming for surgery.

MODEL PAPER

MD-9094 **Anaes.-IV**

MD Examination Month, Year
ANAESTHESIOLOGY

Paper - IV
Intensive Care Medicine, Pain Medicine and Recent advances

Time: - Three Hours
Maximum Marks 100

Attempt all questions
All questions carry equal marks (**10 marks each**)
All the parts of one question should be answered at one place in sequential order
Draw diagrams wherever necessary

Q.1. Guidelines for assessment and management of nutrition support in a critically ill adult patient with cerebrovascular stroke on RT feeding.

Q.2. What are simulators? Describe different types of simulators and their role for medical education, training and research.

Q.3. ONSD measurement in anaesthesia and Critical Care.

Q.4. Principles involved in weaning a patient from ventilatory support in an ICU

Q.5. What is the International Association for Study of Pain (IASP) definition of pain? Classify pain. Interdisciplinary management of pain.

Q6. Extra corporeal Membrane Oxygenator – how does it works, indications, contra indications, risks, and how long it can be used.

Q.7. Indications, technique and complications of percutaneous dilatational tracheostomy.

Q.8. Management of a patient with electric shock.

Q.9. Define hyperkalemia and enumerate its causes. Describe the signs & symptoms, ECG diagnosis and management of a patient with serum potassium levels of 6.5 mEq/L.

Q10. a) What is "Fluid Responsiveness"?
b) Various static and dynamic indices of fluid responsiveness.