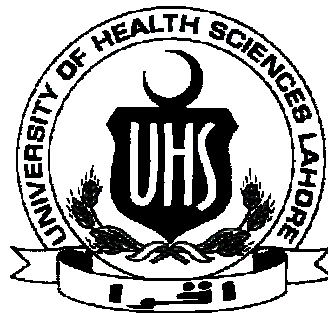

**CURRICULUM / STATUTES & REGULATIONS
FOR
5 YEARS DEGREE PROGRAMME
IN
ANAESTHESIOLOGY
(MS Anaesthesiology)**



**UNIVERSITY OF HEALTH SCIENCES,
LAHORE**

STATUTES

1. Nomenclature Of The Proposed Course

The name of degree programme shall be MS Anaesthesiology. This name is well recognized and established for the last many decades worldwide.

2. Course Title:

MS Anaesthesiology

3. Training Centers

Departments of Anaesthesiology (accredited by UHS) in affiliated institutes of University of Health Sciences Lahore.

4. Duration of Course

The duration of MS Anaesthesiology course shall be five (5) years (first year in Part I, first two years in Part II and next three years in Part III) with structured training in a recognized department under the guidance of an approved supervisor. The course is structured in three parts:

Part I is structured for the 1st calendar year. The candidate shall undertake didactic training in Basic Medical Sciences, Physics & Equipment, Behavioural Sciences and Biostatistics & Research Methodology. At the end of first year the examination shall be held in above mentioned disciplines. The clinical training in fundamental concepts of Surgery shall start from the 1st day of enrollment.

Part II is structured for the 1st and 2nd calendar year. The candidate shall undertake clinical training in fundamental concepts of Surgery. At the end of 2nd year, the examination shall be held in fundamental concepts of Surgery. The clinical training in Anaesthesiology shall start from 3rd year onwards in the in recognized institutions.

Part III is structured for 3rd, 4th and 5th calendar years in MS Anaesthesiology. It has two components; Clinical and Research. The candidate shall undergo clinical training to achieve educational objectives of MS Anaesthesiology (knowledge & skills) along with rotation in relevant fields. Over the five years

duration of the course, candidate will spend total time equivalent to one calendar year for research during the training. Research can be done as one block in 5th year of training or it can be done in the form of regular periodic rotations over five years as long as total research time is equivalent to one calendar year.

5. Admission Criteria

- I. For admission in MS Anaesthesiology course, the candidate shall be required to have:
 - MBBS degree
 - Completed one year House Job
 - One year experience in Anaesthesiology / General surgery /Allied surgical discipline in the given order of preference
 - Registration with PMDC
 - Passed Entry Test conducted by the University & aptitude interview by the Institute concerned
 - Having up to the mark credentials as per UHS rules (no. of attempts in each professional, any gold medals or distinctions, relevant work experience, Rural/ Army services, research experience in a recognized institution, any research article published in a National or International Journal) may also be considered on case to case basis.

- II. Exemptions: A candidate holding FCPS/MRCS/Diplomate/equivalent qualification in General Surgery shall be exempted from Part-I & Part-II Examinations and shall be directly admitted to Part-III Examinations, subject to fulfillment of requirements for the examination.

6. Registration And Enrollment

- Total number of students enrolled for the course must not exceed 2 per supervisor/year.
- The maximum number of trainees that can be attached with a supervisor at a given point of time (inclusive of trainees in all years/phases of MS training), must not exceed 6.

- Beds to trainee ratio at the approved teaching site shall be at least 5 beds per trainee.
- The University will approve supervisors for MS courses.
- Candidates selected for the courses after their enrollment at the relevant institutions shall be registered with UHS as per prescribed Registration Regulation.

7. Accreditation Related Issues of The Institution

A. Faculty

Properly qualified teaching staff in accordance with the requirements of Pakistan Medical and Dental Council (PMDC)

B. Adequate Space

Including class-rooms (with audiovisual aids), demonstration rooms, computer lab and clinical pathology lab etc.

C. Library

Departmental library should have latest editions of recommended books, reference books and latest journals (National and International).

- Accreditation of Anaesthesiology training program can be suspended on temporary or permanent basis by the University, if the program does not comply with requirements for residents training as laid out in this curriculum.
- Program should be presented to the University along with a plan for implementation of curriculum for training of residents.
- Programs should have documentation of residents training activities and evaluation on monthly basis.
- To ensure a uniform and standardized quality of training and availability of the training facilities, the University reserves the right to make surprise visits of the training program for monitoring purposes and may take appropriate action if deemed necessary.

AIMS AND OBJECTIVES OF THE COURSE

AIM

The aim of five years MS programme in Anaesthesiology is to train residents to acquire the competency of a specialist in the field so that they can become good teachers, researchers and clinicians in their specialty after completion of their training.

GENERAL OBJECTIVES

MS Anaesthesiology training should enable a student to:

1. Access and apply relevant knowledge to clinical practice:
 - Maintain currency of knowledge
 - Apply scientific knowledge in practice
 - Appropriate to patient need and context
 - Critically evaluate new technology
2. Safely and effectively performs appropriate surgical procedures:
 - Consistently demonstrate sound surgical skills
 - Demonstrate procedural knowledge and technical skill at a level appropriate to the level of training
 - Demonstrate manual dexterity required to carry out procedures
 - Adapt their skills in the context of each patient and procedure
 - Maintain and acquire new skills
 - Approach and carries out procedures with due attention to safety of patient, self and others
 - Critically analyze their own clinical performance for continuous improvement
3. Design and implement effective management plans:
 - Recognize the clinical features, accurately diagnose and manage anaesthesia related problems
 - Formulate a well-reasoned provisional diagnosis and management plan based on a thorough history and examination
 - Formulate a differential diagnosis based on investigative findings

- Manage patients in ways that demonstrate sensitivity to their physical, social, cultural and psychological needs
- Recognize disorders of the human body and differentiate those amenable to surgical treatment
- Effectively manage the care of patients with trauma including multiple system trauma
- Effectively recognize and manage complications
- Accurately identify the benefits, risks and mechanisms of action of current and evolving treatment modalities
- Indicate alternatives in the process of interpreting investigations and in decision-making
- Manage complexity and uncertainty
- Consider all issues relevant to the patient
- Identify risk
- Assess and implement a risk management plan
- Critically evaluate and integrate new technologies and techniques.

4. Organize diagnostic testing, imaging and consultation as needed:

- Select medically appropriate investigative tools and monitoring techniques in a cost-effective and useful manner
- Appraise and interpret appropriate diagnostic imaging and investigations according to patients' needs
- Critically evaluates the advantages and disadvantages of different investigative modalities

5. Communicate effectively:

- Communicate appropriate information to patients (and their family) about procedures, potentialities and risks associated with different anaesthesias in ways that encourage their participation in informed decision making
- Communicate with the patient (and their family) the treatment options including benefits and risks of each
- Communicate with and co-ordinate health management teams to achieve an optimal surgical environment
- Initiate the resolution of misunderstandings or disputes

- Modify communication to accommodate cultural and linguistic sensitivities of the patient

6. Recognize the value of knowledge and research and its application to clinical practice:

- Assume responsibility for self-directed learning
- Critically appraise new trends in Anaesthesiology
- Facilitate the learning of others.

7. Appreciate ethical issues associated with Anaesthesiology:

- Consistently apply ethical principles
- Identify ethical expectations that impact on medico-legal issues
- Recognize the current legal aspects of informed consent and confidentiality
- Be accountable for the management of their patients.

8. Professionalism by:

- Employing a critically reflective approach to Anaesthesiology
- Adhering with current regulations concerning workplace harassment
- Regularly carrying out self and peer reviewed audit
- Acknowledging and have insight into their own limitations
- Acknowledging and learning from mistakes

9. Work in collaboration with members of an interdisciplinary team where appropriate:

- Collaborate with other professionals in the selection and use of various types of treatments assessing and weighing the indications and contraindications associated with each type
- Develop a care plan for a patient in collaboration with members of an interdisciplinary team
- Employ a consultative approach with colleagues and other professionals
- Recognize the need to refer patients to other professionals.

10. Management and Leadership

- Effective use of resources to balance patient care and system resources
- Identify and differentiate between system resources and patient needs

- Prioritize needs and demands dealing with limited system resources.
- Manage and lead clinical teams
- Recognize the importance of different types of expertise which contribute to the effective functioning of clinical team.
- Maintain clinically relevant and accurate contemporaneous records

11. Health advocacy:

- Promote health maintenance of patients
- Advocate for appropriate health resource allocation
- Promote health maintenance of colleagues and self scholar and teacher

SPECIFIC LEARNING OUTCOMES

On completion of the training programme, Anaesthesiology trainees pursuing an academic pathway will be expected to have demonstrated competence in all aspects of the published syllabus. The specific training component would be targeted for establishing clearly defined standards of knowledge and skills required to practice Anaesthesiology at secondary and tertiary care level with proficiency in the Basic and applied clinical sciences, Basic anaesthesiological care, intensive care units, Emergency (A&E) medicine and Complementary surgical disciplines.

Anaesthetic equipment and safety

- Physical principles underlying the function of the anaesthetic machine, pressure regulators, flow meters, vaporizers, breathing systems.
- Absorption of carbon dioxide
- Principles of lung ventilators, disconnection monitors
- Manufacture and storage of oxygen, nitrous oxide, carbon dioxide, compressed air.
- Pipeline and suction systems, gas cylinders
- Humidification devices
- Minimum monitoring requirements
- Environmental control of the operating theatre including scavenging systems for waste anaesthetic gases and vapours
- Pre-use checks of anaesthetic machine, breathing systems and monitoring apparatus
- Anaesthetic records and critical incidents
- Function and use of related anaesthetic and resuscitation equipment including that used for regional anaesthesia ; Airways, tracheal tubes, tracheostomy tubes, laryngeal masks, oxygen therapy equipment, self-inflating bags, spinal and epidural needles, intravenous cannulae and transfusion devices
- Sterilization and cleaning of equipment

Preoperative assessment

- Implications for anaesthesia of more common medical conditions. In particular, respiratory diseases (e.g. asthma, chronic obstructive airway disease), cardiac disease (e.g. angina pectoris, valvular disease, myocardial infarction, pacemakers, arrhythmias), vascular disease (e.g. hypertension), sickle cell disease and anaemias, rheumatoid arthritis, renal dysfunction and insufficiency, plasma electrolyte disturbance (e.g. hyper- and hypokalaemia), diabetes mellitus, liver disease
- Implications for anaesthesia of more common surgical conditions, trauma, intestinal obstruction and acute abdominal emergencies
- ASA classification and other pre-anaesthetic scoring systems such as Glasgow Coma Scale
- Interpretation of relevant preoperative investigations, plasma electrolytes, haematology, disturbances of acid/base status, ECG, X-rays, pulmonary function tests and clotting abnormalities
- Preoperative assessment of a patient of any age (excluding neonates) for elective or emergency surgery
- Restriction of food and fluid by mouth, cessation of smoking, correction of dehydration
- Assessment of difficulty of tracheal intubation
- Precautions in the management of the infective patient (e.g. hepatitis sero- positive or HIV positive)
- Anaesthetic implications of current drug therapy such as beta blockers, antihypertensive drugs, tricyclic antidepressant agents and monoamine oxidase inhibitors, insulin, anti-diabetic drugs, anticoagulants, contraceptives
- Assessment of postoperative analgesic needs

Premedication

- Rationale for premedicant drugs.
- Choice of drugs, advantages and disadvantages
- Induction
- Intravenous and inhalational induction of anaesthesia; advantages and disadvantages; techniques

- Recognition and management of anaphylactic and anaphylactoid reactions, including follow-up and patient information
- Indications for tracheal intubation
- Management of difficult intubation and failed intubation
- Recognition of correct placement of tracheal tube, oesophageal and endobronchial intubation, complications
- Causes of regurgitation and vomiting during induction, prevention and management
- Technique of cricoid pressure; pulmonary aspiration
- Induction of anaesthesia in special circumstances, head injury, full stomach, upper airway obstruction

Intraoperative assessment

- Ability to deal with emergencies before, during and after anaesthesia and the ability to stabilize a patient's condition until senior assistance can be obtained.
- Techniques of maintenance of anaesthesia.
- To provide adequate analgesia using opioids and other analgesic drugs.
- Management of appropriate intermittent positive pressure ventilation.
- Intraoperative fluid therapy.
- Diagnosis and management of important critical incidents during anaesthesia including: cyanosis, hypertension, hypotension, cardiac arrhythmias, bronchospasm, respiratory obstruction, increased peak inspiratory pressure, hyper- and hypocarbia, failed intubation, failed reversal
- Management of massive haemorrhage, volume expansion, blood transfusion (hazards including incompatibility reaction), gas embolism, malignant hyperthermia
- Correct intraoperative positioning on theatre table - complications, prone position
- Diagnosis and treatment of pneumothorax

Postoperative assessment

- Causes and treatment of failure to breathe at end of operation, suxamethonium apnoea management
- Care of the unconscious patient
- Recovery room diagnosis and treatment of inadequate pulmonary ventilation, cyanosis, hypo- and hypertension, shivering, stridor.
- Oxygen therapy, indications and techniques
- Methods of pain management. Assessment of pain and analgesic techniques
- Prevention, diagnosis and treatment of postoperative pulmonary atelectasis, deep vein thrombosis and pulmonary embolus
- Postoperative fluid therapy
- Causes and treatment of postoperative nausea and vomiting
- Minor and major adverse sequelae to anaesthesia and their management

Anaesthesia in special circumstances

- Principles of obstetric anaesthesia
- Principles of the care of children (excluding neonates and infants) undergoing anaesthesia for straightforward surgical procedures, including ENT, eye and dental operations
- Principles of general anaesthesia for simple ophthalmic procedures and a penetrating eye injury
- Patients with a pacemaker
- Advantages and problems associated with day surgery, appropriate anaesthetic techniques
- Principles of neurosurgical anaesthesia as applied to the management of the head-injured patient
- Problems of anaesthesia in the obese patient
- Repeat anaesthesia - hepatic injury
- Implications for the anaesthetist of viral hepatitis and HIV infections
- Laparoscopic and minimally invasive procedures
- Management of patients requiring transfer

Regional anaesthesia

- Indications, technique and management of the complications of spinal and epidural (including caudal approach) analgesia.
- Techniques including intravenous regional anaesthesia, brachial plexus block, femoral nerve block, inguinal field block, ankle block and dorsal nerve of the penis block
- Local anaesthesia for awake tracheal intubation

Resuscitation

- Immediate care and resuscitation in patients of all ages.

Patient assessment

- The principles and practice of life support
- The principles and practice of recognition and management of life threatening arrhythmias including defibrillation and drug therapy
- The techniques of venous access and the intraosseous route
- Management of the airway and ventilation in the emergency situation, including care of cervical spine
- Specific problems in paediatric resuscitation
- Ethical aspects of resuscitation

Trauma

- Pathophysiology of trauma and hypovolaemia
- Assessment, immediate care and management of trauma patients of all ages
- Performance and interpretation of the primary and secondary survey
- Immediate specific treatment of life-threatening illness or injury, with special reference to thoracic and abdominal trauma
- Care of cervical spine injury
- Emergency airway management and oxygen therapy
- Cannulation of major vessels for resuscitation and monitoring
- Management of hypovolaemic shock
- Chest drain insertion and management
- Pain management in trauma victims

Research Experience:

All residents in the categorical program are required to complete an academic outcomes-based research project during their training. This project can consist of original bench top laboratory research, clinical research or a combination of both. The research work shall be compiled in the form of a thesis, which is to be submitted for evaluation by each resident before end of the training. The designated Faculty will organize and mentor the residents through the process, as well as journal clubs to teach critical appraisal of the literature.

Curriculum/Statutes & Regulations -MS Anaesthesiology
REGULATIONS

1. Scheme of the Course

A summary of five years course in MS Anaesthesiology is presented as under:

Course Structure	Components	Examination
Part I	<p>Basic Medical Sciences Anatomy, Physiology, Biochemistry, Pathology, Pharmacology, Physics & Equipment, Behavioural Sciences and Biostatistics & Research Methodology</p>	<p>Part-I examination at the end of 1st year of MS Anaesthesiology programme.</p> <ul style="list-style-type: none"> • Written: Paper I: MCQs Paper II: SEQs
Part-II	<p>Fundamental Concepts in Surgery : Training in basic clinical techniques of Surgery with compulsory rotations for two years starting from first day of enrollment</p>	<p>Part-II examination at the end of 2nd year of MS Anaesthesiology programme.</p> <ul style="list-style-type: none"> • Written: Papers 1 & 2 : Basic Principles of Surgery • Oral & Practical/ Clinical Examination <ul style="list-style-type: none"> • OSCE • Clinical Examination (Long case, Short cases) • Log Book
Part-III	<p style="text-align: center;"><u>Clinical component of Part III</u></p> <ul style="list-style-type: none"> • Professional Education in Anaesthesiology <p>Training in Anaesthesiology during 3rd, 4th & 5th year of MS Anaesthesiology programme.</p> <p>Three years of training with compulsory & optional rotations in relevant fields</p> <p style="text-align: center;"><u>Research component of Part III</u></p> <p>Research work/Thesis writing project must be completed and thesis be submitted before the end of training.</p>	<p>Part-III examination in specialized components of Anaesthesiology at the end of 5th year of MS Anaesthesiology programme.</p> <ul style="list-style-type: none"> • Written: Papers 1 & 2: Problem-based questions in the subject • Oral & Practical/ Clinical Examination <ul style="list-style-type: none"> • OSCE/ • Clinical Examination (Long case, Short cases) • Log Book <p>Part-III thesis examination with defense at the end of fifth (5th) year of MS Anaesthesiology programme.</p>

2. Examinations

Part-I Examination

1. All candidates admitted in MS Anaesthesiology courses shall appear in Part-I examination at the end of first calendar year.
2. The examination shall be held on biannual basis.
3. The candidate who fails to pass the examination in 3 consecutive attempts availed or un-availed, shall be dropped from the course.
4. The examination shall have two components:
 - Paper-I MCQs (single best) 100 Marks
 - Paper-II SEQs 100 Marks
5. Subjects to be examined shall be Basic Sciences relevant to Anaesthesiology (Anatomy, Physiology, Biochemistry, Pathology, Pharmacology), Physics & Equipment, Behavioural Sciences and Biostatistics & Research Methodology.
6. To be eligible to appear in Part-I examination the candidate must submit;
 - i. duly filled, prescribed Admission Form to the Controller of Examinations duly recommended by the Principal/Head of the Institution in which he/she is enrolled;
 - ii. a certificate by the Principal/Head of the Institution, that the candidate has attended at least 75% of the lectures, seminars, practical/clinical demonstrations;
 - iii. Examination fee as prescribed by the University
7. To be declared successful in Part-I examination the candidate must secure 60% marks in each paper.

Part-II Examination

1. All candidates admitted in MS Anaesthesiology courses shall appear in Part-II examination at the end of second calendar year.
2. The examination shall be held on biannual basis.
3. The candidate who fails to pass the examination within 3 years of passing the Part-I examination shall be dropped from the course.
4. The examination shall have the following components:
 - a. Written 200 Marks
 - b. OSCE 50 Marks
 - c. Clinical examination 100 Marks
 - d. Log Book Evaluation 80 Marks (40 marks per year)
5. There shall be two written papers of 100 marks each:

Papers 1 & 2: Principles of General Surgery
6. The type of questions shall be of Short/Modified essay type and MCQs (single best).
7. Oral & practical/clinical examination shall be held in clinical techniques in General Surgery.
8. To be declared successful in Part-II examination the candidate must secure 60% marks in each component and 50% in each sub-component.
9. Only those candidates, who pass in theory papers, will be eligible to appear in the Oral & Practical/clinical Examination.
10. The candidates, who have passed written examination but failed in oral & practical/ clinical examination, will re-appear only in oral & practical/clinical examination.
11. The maximum number of attempts to re-appear in oral & practical /clinical Examination alone shall be three, after which the candidate shall have to appear in both written and oral & practical/clinical examinations as a whole.
12. To be eligible to appear in Part-II examination the candidate must submit;
 - i. duly filled, prescribed Admission Form to the Controller of Examinations duly recommended by the Principal/Head of the Institution in which he/she is enrolled;

- ii. a certificate by the Principal/Head of the Institution, that the candidate has attended at least 75% of the lectures, seminars, practical/clinical demonstrations;
- iii. a certificate of having passed the Part-I examination;
- iv. Examination fee as prescribed by the University.

Part-III Examination

1. All candidates admitted in MS Anaesthesiology course shall appear in Part-III (clinical) examination at the end of structured training programme (end of 5th calendar year), and having passed the part I & II examinations. However, a candidate holding FCPS / MRCS / Diplomate / equivalent qualification in General Surgery shall be exempted from Part-I & Part-II Examinations and shall be directly admitted to Part-III Examinations, subject to fulfillment of requirements for the examination.
2. The examination shall be held on biannual basis.
3. To be eligible to appear in Part-III examination the candidate must submit;
 - i. duly filled, prescribed Admission Form to the Controller of Examinations duly recommended by the Principal/Head of the Institution in which he/she is enrolled;
 - ii. a certificate by the Principal/Head of the Institution, that the candidate has attended at least 75% of the lectures, seminars, practical/clinical demonstrations;
 - iii. Original Log Book complete in all respect and duly signed by the Supervisor (for Oral & practical/clinical Examination);
 - iv. certificates of having passed the Part-I & part-II examinations;
 - v. Examination fee as prescribed by the University.
4. The Part-III clinical examination shall have the following components:

▪ Written	300 marks
▪ Oral & practical/clinical examination	300 marks
▪ Log Book Evaluation	120 marks (40 marks per year)
5. There shall be two written papers of 150 marks each.
6. Both papers shall have problem-based Short/Modified essay questions and MCQs.
7. Oral & practical/clinical examination shall have 300 marks for:
 - i. 1 Long Case 100
 - ii. 4 Short Cases 100 (25 marks each)

iii. OSCE

8. To be declared successful in Part-III examination the candidate must secure 60% marks in each component and 50% in each sub-component.
9. Only those candidates, who pass in theory papers, will be eligible to appear in the Oral & Practical/ Clinical Examination.
10. The candidates, who have passed written examination but failed in Oral & Practical/ Clinical Examination, will re-appear only in Oral & Practical / Clinical examination.
11. The maximum number of attempts to re-appear in oral & practical /clinical Examination alone shall be three, after which the candidate shall have to appear in both written and oral & practical/clinical examinations as a whole.
12. The candidate with 80% or above marks shall be deemed to have passed with distinction.
13. *Log Book/Assignments:* Through out the length of the course, the performance of the candidate shall be recorded on the Log Book.
14. The Supervisor shall certify every year that the Log Book is being maintained and signed regularly.
15. The Log Book will be developed & approved by the Advanced Studies & Research Board.
16. The evaluation will be maintained by the Supervisor (in consultation with the Co- Supervisor, if appointed).
17. The performance of the candidate shall be evaluated on annual basis, e.g., 40 marks for each year in five years MS Anaesthesiology course. The total marks for Log Book shall be 200. The log book shall reflect the performance of the candidate on following parameters:
 - Year wise record of the competence of skills.
 - Year wise record of the assignments.
 - Year wise record of the evaluation regarding attitude & behaviour
 - Year wise record of journal club / lectures / presentations / clinico-pathologic conferences attended & / or made by the candidate.

3. Submission / Evaluation of Synopsis

1. The candidates shall prepare their synopsis as per guidelines provided by the Advanced Studies & Research Board, available on UHS website.
2. The research topic in clinical subject should have 30% component related to basic sciences and 70% component related to applied clinical sciences. The research topic must consist of a reasonable sample size and sufficient numbers of variables to give training to the candidate to conduct research, to collect & analyze the data.
3. Synopsis of research project shall be submitted by the end of the 3rd year of MS program. The synopsis after review by an Institutional Review Committee shall be submitted to the University for consideration by the Advanced Studies & Research Board, through the Principal / Dean /Head of the institution.

4. Submission of Thesis

1. Thesis shall be submitted by the candidate duly recommended by the Supervisor.
2. The minimum duration between approval of synopsis and submission of thesis shall be one year, but the thesis can not be submitted later than 8 years of enrolment.
3. The research thesis must be compiled and bound in accordance with the Thesis Format Guidelines approved by the University and available on website.
4. The research thesis will be submitted along with the fee prescribed by the University.

5. Thesis Examination

1. All candidates admitted in MS course shall appear in Part-III thesis examination at the end of 5th year of their training course.
2. Only those candidates shall be eligible for thesis evaluation who have passed Part I, II & III (clinical) Examinations.
3. The examination shall include thesis evaluation with defense.

4. The Vice Chancellor shall appoint three external examiners for thesis evaluation, preferably from other universities and from abroad, out of the panel of examiners approved by the Advanced Studies & Research Board. The examiners shall be appointed from respective specialty. Specialists from General Surgery and Allied surgical Disciplines may also be appointed/co-opted, where deemed necessary.
5. The thesis shall be sent to the external examiners for evaluation, well in time before the date of defense examination and should be approved by all the examiners.
6. After the approval of thesis by the evaluators, the thesis defense examination shall be held within the University on such date as may be notified by the Controller of Examinations. The Controller of Examinations shall make appropriate arrangements for the conduct of thesis defense examination in consultation with the supervisor, who will co-ordinate the defense examination.
7. The thesis defense examination shall be conducted by two External Examiners who shall submit a report on the suitability of the candidate for the award of degree. The supervisor shall act as coordinator.

6. Award of MS Anaesthesiology Degree

After successful completion of the structured courses of MS Anaesthesiology and qualifying Part-I, Part-II and Part-III examinations, the degree with title MS Anaesthesiology shall be awarded.

CONTENT OUTLINE

Part I MS Anaesthesiology

Basic Sciences:

Student is expected to acquire comprehensive knowledge of Anatomy, Physiology, Pathology (Microbiology), Biochemistry, Pharmacology relevant to surgical practice appropriate for Anaesthesiology.

1. Anatomy

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

Embryology

- General Features of Human Development
- Features of mitotic and meiotic modes of cell division. Genetic consequences of meiotic division.
- Abnormal mitotic and meiotic divisions of clinical importance.
- Gametogenesis: origin of germ cells.
- Oogenesis: prenatal and postnatal development of ova.
- Spermatogenesis: proliferation and maturation of male germ cells. Abnormal gametes, their clinical significance.
- Ovulation, fertilization and the consequences of fertilization.

Early Embryonic Development:

- Cleavage, morula and blastocyst formation and implantation.
- Formation of the three primary germ layers.
- List of the derivatives of the respective germ layers.

Period of the Growing Fetus:

- Various stages and salient features of the fetus development

Extraembryonic Membranes:

- Development, functions and anomalies of yolk sac, amnion, chorion, allantois, umbilical cord and placenta.

Development of the External Body Form:

- Shaping of the head and neck. Common developmental anomalies associated.

The Branchial Apparatus:

- Development and fate of the bronchial grooves, arches and pouches. Their derivatives and anomalies.

Teratogenesis:

- Factors known to be involved in the development of congenital anomalies especially related to the Anaesthesiological system.
- Concept of critical periods.

Histology:

Structural and Functional Organization of the Tissues of Body

- Classification of tissues and identification of various tissues particularly those related to the musculoskeletal system, in routine histological preparations under the light microscope.

The Epithelial Tissue

- General structure, functions and classification of epithelia
- Their location in the body
- General characters of serous and mucous membranes
- General structural features of exocrine and endocrine glands

The Connective Tissue

- Cartilage
- Structure of bone marrow. Cell lines seen in haemopoiesis.
- Factors required for bone growth.

The Muscular Tissue

- Structural and functional differences between the smooth skeletal and cardiac types of muscle.
- Fine structure of skeletal and cardiac muscle fibers, and its relationship to the mechanism of contraction.
- Specialized conducting tissue of the heart.

The Neural Tissue

- The neuron, morphology of the perikaryon and its processes.
- Coverings of the axons in the peripheral nerves and the central nervous system.
- Types of neuroglia and their functions.
- Process of myelination in the peripheral nerves and the central nervous system.
- Axon terminals and synapses. Nerve fiber degeneration and regeneration.

Surface and Imaging Anatomy

Respiratory System

- Mouth, nose, pharynx, larynx, trachea, main bronchi, segmental bronchi, structure of bronchial tree, Pleura, mediastinum, Lungs, lobes, bronchopulmonary segments. Structure of lungs, Innervation of respiratory tract, blood supply and lymphatic drainage of lung, Diaphragm: functions, structures and attachments, openings and structures transmitted, nerve and blood supply, muscles of respiration and innervation, abdominal wall, inguinal region).

Cardiovascular system

- Heart, chambers, conducting system, blood and nerve supply. Pericardium, Great vessels, Large veins of neck, Large veins of leg, main peripheral arteries and veins, Fetal circulation, common developmental anomalies i.e. Septal defects, PDA, Fallot's Tetralogy

Nervous system

- Brain and spinal cord anatomy and blood supply, effects of spinal cord section, CSF, spinal and extradural space, dermatomes, Cervical plexus, brachial plexus, nerve supply of upper limb, Intercostal nerves, Lumbar plexus, nerve supply of lower limb & perineum, nerve supply of abdominal wall, Sacral and coccygeal plexuses, Autonomic nervous system, sympathetic innervation, sympathetic chain, ganglia and plexuses, Stellate ganglion, Parasympathetic innervation. Coeliac plexus, Cranial nerves. (in particular 5,7,10), Trigeminal ganglion, Vertebral column, Cervical, thoracic and lumbar vertebrae, Sacrum, sacral hiatus.

Miscellaneous

- Thoracic inlet and 1st rib, typical rib, Intercostal spaces including paravertebral space
- Abdominal wall (including the inguinal region)
- Antecubital fossa, axilla
- Large veins of neck, Large veins of leg
- Anatomy of tracheostomy, cricothyrotomy, pain pathways, functional anatomy of hepatobiliary and renal system.

2. Physiology

- General organization of the human body and control of internal environment
- Function of cells; Cell membrane characteristics; receptors.
- Body fluids and their functions and constitutions, Capillary dynamics and interstitial fluid
- Osmolarity: osmolality, partition of fluids across membranes, lymphatic system, Regulation of fluid and electrolyte balance, Regulation of acid-base balance
- **Haematology, Immunology and Red blood cells:** Haemoglobin and its variants. Blood groups, Haemostasis and coagulation, White blood cells, platelets, the inflammatory response, Immunity and allergy.
- **Nerve & Muscle:** Action potential generation and its transmission , Neuromuscular junction and, transmission, Muscle types, Skeletal muscle contraction, Smooth muscle contraction , Motor unit
- **Nervous System:** Functions of nerve cells and synaptic mechanisms
- The brain: Functions, divisions – cortex, midbrain, medulla, limbic system, brain stem and cerebellum. Intracranial pressure; cerebrospinal fluid, blood flow, Autonomic nervous system. Spinal cord: blood supply, effects of spinal cord section. Neurological reflex. Motor function: spinal and peripheral. Senses : receptors, nociception, pain pathways

- **Heart & Circulation:** Cardiac muscle contraction, The cardiac cycle: pressure and volume relationships, Regulation of cardiac function; general and cellular, Control of cardiac output, Rhythmicity of the heart, Electrocardiogram and arrhythmias, Neurological and humoral control of systemic blood pressures, blood volume and blood flow (at rest and during physiological disturbances e.g. exercise, haemorrhage and Valsalva manoeuvre) Peripheral circulation: capillaries, vascular endothelium and arteriolar smooth muscle, tissue, coronary circulation.
- **Renal tract:** Blood flow and glomerular filtration and plasma clearance
- Tubular function and urine formation, Micturition
- **Respiration:** Gaseous exchange: O₂ and CO₂ transport, hypoxia and hyper- and hypocapnia, hyper – and hypobaric pressures. Pulmonary ventilation: volumes, flows, dead space. Effect of IPPV on lungs. Mechanism of respiration: ventilation/Perfusion abnormalities. Regulation of respiration. Non-respiratory function of the lungs.
- **Liver & GIT:** Functional anatomy and blood supply, Metabolic functions, Gastric function; secretions, nausea and vomiting, Gut motility, sphincters and reflex control
- **Metabolism:** Nutrients: carbohydrates, fats, proteins, vitamins and minerals, Metabolic pathways, energy production and enzymes: metabolic rate, Hormonal control of metabolism: regulation of plasma glucose, response to trauma, Physiological alterations in starvation, obesity, exercise and the stress response, Body temperature and its regulation
- **Endocrinology:** Mechanisms of hormonal control: feedback mechanisms, effect on membrane and intracellular receptors, Hypothalamic and pituitary function, Adrenocortical hormones. Adrenal medulla, Pancreas, Thyroid and parathyroid hormones and calcium homeostasis

3. Pharmacology

- The evolution of medical drugs
- British pharmacopia
- Introduction to pharmacology
- Receptors
- Mechanisms of drug action
- Pharmacokinetics
- Pharmacokinetic process
 - Absorption
 - Distribution
 - Metabolism
 - Desired plasma concentration
 - Volume of distribution
 - Elimination
 - Elimination rate constant and half life
 - Creatinine clearance
- Drug effect
 - Beneficial responses
 - Harmful responses

- Allergic responses
 - Drug dependence, addiction, abuse and tolerance
 - Drug interactions
 - Dialysis
 - Drug use in pregnancy and in children
- Special pharmacology
- General Anaesthetics
 - Intravenous induction agents
 - Inhalation agents: Nitrous oxide, halothane, Isoflurane, desflurane, Sevoflurane
 - Local anaesthetics
 - Sedatives
 - Benzodiazepines
 - Butyrophenones
 - ALPHA Adrenergic Agonists
 - Clonidine, Dexmetatomidine
 - Phenothiazines
 - Analgesics: Simple analgesics, NSAIDs, Opiates
 - Muscle Relaxants
 - Depolarizing & non-depolarizing, reversal agents
 - Anti-Cholinergics
 - Atropine
 - Glycopyrolate
 - Medical Gases
 - Oxygen
 - Nitrous oxide
 - Operation theatre environment and recovery area humidity
 - Entonox
 - Co₂
 - Medical Air
 - Inotropes and vasopressors
 - Beta blockers
 - Antihypertensive agents, vasodilators
 - Antiarrhythmic drugs
 - Diuretics
 - Insulin and Oral Hypoglycaemics
 - Antiemetics
 - Anti-Histaminics
 - Antacids
 - Corticosteroids
 - Diuretics
 - Crystalloids and colloids

4. Biochemistry

- Membrane biochemistry and signal transduction
- Gene expression and the synthesis of proteins
- Bioenergetics; fuel oxidation and the generation of ATP
- Enzymes and biologic catalysis
- Tissue metabolism

Vitamins

- Classification, components, sources, absorption and functions (physiological and biochemical role).
- Daily requirements, effects of deficiency and hypervitaminosis.
- Salient morphologic features of diseases related to deficiency or excess of vitamins.

Minerals

- Sources of calcium, phosphorous, iron, iodine, fluorine, magnesium and manganese.
- Trace elements and their clinical importance.
- Absorption and factors required for it.
- Functions and fate.

Metabolism

- Metabolic rate and basal metabolic rate
- Factors influencing metabolic rate, principles of measurement.

Carbohydrates

- Classification and dietary sources.
- Digestion, absorption and utilization of dietary carbohydrates. Glucose tolerance test.
- Glycogenesis, glycolysis, gluconeogenesis, glycogenolysis, processes with the steps involved and effects of hormones.
- Citric acid cycle, steps involved, its significance and the common final metabolic pathway.
- Hexose monophosphate shunt: mechanism and significance.

Lipids

- Classification of simple, derived and compound lipids.
- Dietary sources.
- Digestion, absorption, utilization and control.
- Fatty acid oxidation with steps involved.
- Ketogenesis and its significance.
- Lipotropic factors and their actions. Lipoproteins, types and importance.

Proteins and Amino Acids

- Classification and dietary sources of proteins.
- Digestion, absorption, utilization and control.
- Fate of amino acids.
- Urea formation with steps involved.
- Functions and effects of deficiency.
- Nucleoproteins:
 - Structure and metabolism.
- Pigment Metabolism
 - Basic concept of endogenous and exogenous pigments.
 - Causes of pigmentation and depigmentation.
- Disorders of pigment metabolism, inherited disorders, acquired disorders from deficiency or excess of vitamins, minerals, fats, carbohydrates, proteins etc.

Balanced Diet

- Requisites of an adequate diet.
- Role of carbohydrates, fats, proteins, minerals, vitamins and water in diet.
- Principles of nutrition as applied to medical problems
- Biotechnology and concepts of molecular biology with special emphasis on use of recombinant DNA techniques in medicine and the molecular biology of cancer

5. Pathology

Pathological alterations at cellular and structural level in infection, inflammation, ischaemia, neoplasia and trauma affecting the ear, nose and upper respiratory tract

Cell Injury and adaptation

- Reversible and Irreversible Injury
- Fatty change, Pathologic calcification
- Necrosis and Gangrene
- Cellular adaptation
- Atrophy, Hypertrophy,
- Hyperplasia, Metaplasia, Aplasia

Inflammation

- Acute inflammation
- Cellular components and chemical mediators of acute inflammation
- Exudates and transudate
- Sequelae of acute inflammation
- Chronic inflammation
- Etiological factors and pathogenesis
- Distinction between acute and chronic (duration) inflammation
- Histologic hallmarks
- Types and causes of chronic inflammation, non-granulomatous & granulomatous,

Haemodynamic disorders

- Etiology, pathogenesis, classification and morphological and clinical manifestations of Edema, Haemorrhage, Thrombosis, Embolism, Infarction & Hyperaemia
- Shock; classification etiology, and pathogenesis, manifestations.
- Compensatory mechanisms involved in shock
- Pathogenesis and possible consequences of thrombosis
- Difference between arterial and venous emboli

Neoplasia

- Dysplasia and Neoplasia
- Benign and malignant neoplasms
- Etiological factors for neoplasia
- Different modes of metastasis
- Tumor staging system and tumor grade

Immunity and Hypersensitivity

- Immunity

- Immune response
- Diagnostic procedures in a clinical Immunology laboratory
- Protective immunity to microbial diseases
- Tumour immunology
- Immunological tolerance, autoimmunity and autoimmune diseases.
- Transplantation immunology
- Hypersensitivity
- Immunodeficiency disorders
- Immunoprophylaxis & Immunotherapy

Related Microbiology

- Role of microbes in various Anaesthesiological procedures
- Infection source
- Nosocomial infections
- Bacterial growth and death
- Pathogenic bacteria
- Vegetative organisms
- Spores
- Important viruses
- Important parasites
- Surgically important microorganisms
- Sources of infection
- Asepsis and antisepsis
- Sterilization and disinfection
- Infection prevention
- Immunization
- Personnel protection from communicable diseases
- Use of investigation and procedures in laboratory
- Basics in allergy and immunology

6. Physics & Equipment

- Basic definitions
- For example: types of flow, vapour pressure, critical pressure, critical temperature, boiling point, thermal conductivity
- Basic laws of physics applicable to anaesthesia
- Operation theatre environment and recovery area
- For instance, humidity, temperature, light, electrical safety, pollution, infection, post-anaesthesia care unit (PACU)
- Medical gas supply system via (vacuum insulated evaporator), manifolds, cylinders, regulation
- Anaesthesia machines, machine check, safety feature, flow meters, vaporizers, pressure relief valves
- Delivery system / breathing systems
- Mapelsons circuits, circle absorber
- Ventilation
- Basic principles of minutes' volume dividers,
- (pressure generator, flow generation)
- Scavenging system
- Anaesthesia sundries

- Laryngoscopes, guedel airways, face masks, laryngeal mask airways, endotracheal tubes, bougies, stiletos, connectors monitoring
- Standards / principles of monitoring
- Record keeping
- Critical incident monitoring
- Principles of oximetry
- Principles of capnography
- Electrocardiography
- Temperature monitoring
- Neuromuscular monitoring
- Blood pressure monitoring, non-invasive and invasive
- Central venous pressure monitoring
- Airways pressures / spirometry

7. Biostatistics & Research Methodology

- Introduction to Bio-Statistics
- Introduction to Bio- Medical Research
- Why research is important?
- What research to do?
 - Selecting a Field for Research
 - Drivers for Health Research
 - Participation in National and International Research
 - Participation in Pharmaceutical Company Research
 - Where do research ideas come from
 - Criteria for a good research topic
- Ethics in Health Research
- Writing a Scientific Paper
- Making a Scientific Presentation
- Searching the Literature

8. Behavioural Sciences

- Bio-psycho-social (BPS) model of health care
- Use of non-medicinal interventions in clinical practice
- Communication skills
- Counseling
 - Informational skills
 - Crisis intervention/disaster management
 - Conflict resolution
 - Breaking bad news
- Medical ethics, professionalism and doctor-patient relationship
 - Hippocratic oath
 - Four pillars of medical ethics (autonomy, beneficence, non-maleficence and justice)
 - Informed consent and confidentiality
 - Ethical dilemmas in a doctor's life

- Delivery of culturally relevant care and cultural sensitivity
 - Psychological aspects of health and disease
 - Psychological aspect of health
 - Psychological aspect of disease
 - Stress and its management
 - Psychological aspect of pain
 - Psychological aspect of aging

Part II

MS Anaesthesiology

Fundamental Principles of Surgery

- History of surgery
- Preparing a patient for surgery
- Principles of operative surgery: asepsis, sterilization and antiseptics
- Surgical infections and antibiotics
- Basic principles of anaesthesia and pain management
- Acute life support and critical care:
 - Pathophysiology and management of shock
 - Fluids and electrolyte balance/ acid base metabolism
 - Haemostasis, blood transfusion
- Trauma: assessment of polytrauma, triage, basic and advanced trauma
- Accident and emergency surgery
- Wound healing and wound management
- Nutrition and metabolism
- Principles of burn management
- Principles of surgical oncology
- Principles of laparoscopy and endoscopy
- Organ transplantation
- Informed consent and medicolegal issues
- Molecular biology and genetics
- Operative procedures for common surgical manifestations e.g. cysts, sinuses, fistula, abscess, nodules, basic plastic and reconstructive surgery

Common Surgical Skills

Incision of skin and subcutaneous tissue:

- Langer's lines
- Healing mechanism
- Choice of instrument
- Safe practice

Closure of skin and subcutaneous tissue:

- Options for closure
- Suture and needle choice
- Safe practice

Knot tying:

- Choice of material
- Single handed
- Double handed
- Superficial
- Deep

Tissue retraction:

- Choice of instruments
- Placement of wound retractors
- Tissue forceps

Use of drains:

- Indications
- Types
- Insertion
- Fixation
- Management/removal

Incision of skin and subcutaneous tissue:

- Ability to use scalpel, diathermy and scissors

Closure of skin and subcutaneous tissue:

- Accurate and tension free apposition of wound edges

Haemostasis:

- Control of bleeding vessel (superficial)
- Diathermy
- Suture ligation
- Tie ligation
- Clip application
- Plan investigations
- Clinical decision making
- Case work up and evaluation; risk management

Pre-operative assessment and management:

- Cardiorespiratory physiology
- Diabetes mellitus
- Renal failure
- Pathophysiology of blood loss
- Pathophysiology of sepsis
- Risk factors for surgery
- Principles of day surgery
- Management of comorbidity

Intraoperative care:

- Safety in theatre
- Sharps safety
- Diathermy, laser use
- Infection risks
- Radiation use and risks
- Tourniquets
- Principles of local, regional and general anaesthesia

Post-operative care:

- Monitoring of postoperative patient
- Postoperative analgesia
- Fluid and electrolyte management
- Detection of impending organ failure
- Initial management of organ failure
- Complications specific to particular operation
- Critical care

Blood products:

- Components of blood
- Alternatives to use of blood products
- Management of the complications of blood product transfusion including children

Antibiotics:

- Common pathogens in surgical patients
- Antibiotic sensitivities
- Antibiotic side-effects
- Principles of prophylaxis and treatment

Safely assess the multiply injured patient:

- History and examination
- Investigation
- Resuscitation and early management

Technical Skills

- Central venous line insertion
- Chest drain insertion
- Diagnostic peritoneal lavage
- Bleeding diathesis & corrective measures, e.g. warming, packing
- Clotting mechanism; Effect of surgery and trauma on coagulation
- Tests for disorders of coagulation
- Anticoagulation, heparin and warfarin
- Role of V/Q scanning, CT angiography and thrombolysis
- Place of pulmonary embolectomy
- Awareness of symptoms and signs associated with pulmonary embolism and DVT

Diagnosis and Management of Common Paediatric Surgical Conditions:

- Child with abdominal pain
- Vomiting child
- Trauma
- Abdominal wall pathologies
- Urological conditions
- Head / neck swellings
- Abscess

In terms of general experience it is expected that trainees would have gained exposure to the following procedures and to be able to perform those marked (*) under direct supervision.

- Elective Procedures
 - Lymph node biopsy*
 - Insertion of CV lines
 - Excision of skin lesions*
- Emergency Procedures
 - Incision and drainage of abscess*
 - Insertion of pleural drain*
 - Insertion of suprapubic catheter*
 - Reduction of intussusception

Part III- MS Anaesthesiology **Clinical Component**

- In the 3rd, 4th and 5th year and of M.S Anaesthesiology, knowledge base of general and regional anaesthesia in the following disciplines will be required. The supervisor will make rotation according to their circumstances.

Preoperative assessment and preparation

- Preoperative assessment
- Disease and drug therapy
- Assessment of risk
- Preparation of patients
- Preoperative information of patients
- Preoperative medication

General anaesthesia: methods and techniques

- Components of general anaesthesia
- Narcosis
- Neuromuscular blockade and muscle relaxation
- Analgesia
- Inhalational anaesthesia
- Intravenous anaesthesia
- Major complications: prevention and treatment
- (malignant hyperthermia, shortness of breath)

Local and regional anaesthesia

- Epidural anaesthesia
- Spinal anaesthesia
- Local intravenous anaesthesia
- Nerve blocks and plexus blocks
- Major complications: prevention and treatment

Anaesthesia for special situations

- Day stay surgery
- Urology
- Gynaecology
- Obstetric anaesthesia and analgesia
- Immediate care of the newborn
- Paediatric surgery
- Ear, nose and throat surgery
- Ophthalmic surgery
- Endocrine surgery
- Neurosurgery
- Thoracic surgery
- Cardiac surgery
- Vascular surgery

- Transplantation
- Orthopaedic surgery
- Anaesthesia for nonsurgical procedures
- Positioning of the patient

Postoperative care

- Postoperative recovery
- Later postoperative management including transfusion and fluid therapy
- Postoperative pain
- Control of nausea and vomiting
- Communication with patients, relatives, nurses, and other health care personnel

Technical equipment and monitoring

- Central gas supplies
- Anaesthetic machines and systems
- Ventilators
- Ventilation systems
- Equipment for haemodilution and blood sparing
- Monitoring of pacemakers and defibrillators
- Measuring pressure, flow and volume of gases with respect to anaesthetic apparatus
- Analysis and monitoring of breathing including capnography
- Gas and vapour concentrations
- Pulse oximetry
- Electrocardiogram
- Arterial pressure and haemodynamics
- Cardiac function
- Neuromuscular transmission
- Temperature
- Level of sedation
- Electrical safety

Intensive care medicine

Diagnostic and therapeutic problems of the respiratory system

- Monitoring of the respiratory system
- Diagnostic investigations
- Oxygen therapy
- Artificial ventilation
- Artificial airway
- Management of postoperative pulmonary complications
- Management of respiratory failure

Diagnostic and therapeutic problems of the cardiovascular system

- Monitoring of the cardiovascular system
- Diagnostic investigations
- Myocardial infarction
- Cardiac failure
- Cardiogenic shock and other types of shock

- Management of haemorrhage
- Haemostasis, thrombosis

Head injury and other CNS affections

- Head injury
- Multitrauma
- Sepsis
- Fluid, electrolyte, nutrition, and acid-base disorders
- Care of the unconscious patient regardless of aetiology
- Sedation

Care of the patient with multiple organ system failure, injury or disease

- Care of the patient requiring life support techniques
- Renal failure
- Hepatic failure
- Understanding and treatment of underlying disease
- Principles of hyperbaric oxygen therapy

Communication skills

- Communication with patients and relatives
- Communication with other health care personnel
- Management of organ transplant coordination

Pain management

Pharmacology

- Opioids
- Non-steroidal anti-inflammatory drugs
- Other systemic analgesics including adjuvants
- Neurolytics
- Local anaesthetic agents

Anatomy and physiology of pain

- Peripheral mechanisms of pain
- Central mechanisms for pain transmission
- Pain modulation
- Factors which perpetuate pain
- Psychological aspects of pain

General principles of pain evaluation and management

Pain assessment

- History taking and physical examination in patients suffering from postoperative, cancer, and neuropathic pain
- Pain measurement in man, basic concepts and bias,
- Scoring systems (VAS, VRS, NRS, etc.)
- Psychological aspects of pain (individual differences, sociocultural influence, situational and environmental factors, the family and pain).

Techniques

- Transcutaneous nerve stimulation
- Perispinal opioid administration systems
- Frequently used analgesic nerve blocks (diagnostic purposes and pain control)

Surgical and non-surgical methods

- Neurosurgical pain relieving procedures (basic knowledge, indications, contraindications, and complications)
- Psychological, psychiatric, and behavioural interventions
- Multidisciplinary pain management

Acute pain

- Postoperative pain (mechanisms, physiological effects, treatment modalities, acute pain service)
- Pain following trauma
- Acute pain in children

Chronic pain

Diagnostic characteristics and treatment modalities of:

- Headaches (migraine, tension headache, headache of cervical origin, cluster headache, atypical facial pain, trigeminal neuralgia)
- Low back pain (anterior and posterior compartment syndrome, radicular and pseudoradicular syndrome);
- Neuropathic pain and pain syndromes (deafferentation pain, phantom pain, sympathetic reflex dystrophy, causalgia, neuromata, postherpetic neuralgia, central thalamic pain)
- Cancer pain
 - Pharmacological treatment with opioids, NSAIDs, Acetaminophen, antidepressant drugs, anticonvulsives
 - Drugs and other mixed agents (co-analgesics)
 - Indications and treatment possibilities using Perispinal opioid administration systems
 - Transcutaneous nerve stimulation: indications and procedures
 - Indications and treatment modalities using specific radiofrequency and neurolytic blockade techniques.
 - Case management and communication skills

Pre-hospital and emergency medicine

General principles of emergency medicine

- Principles of triage
- Airway management
- Prehospital care
- Cardiopulmonary resuscitation including advanced life support
- Transport of gravely ill patients
- Injured patients
- Multiple injuries
- Management of shock
- Head injury
- Injuries to the neck and face
- Chest injury
- Burns
- Spinal injury
- Intoxications and poisoning

Rotations

▪ General Surgery/burns/plastic	6 months
▪ Orthopaedics and trauma	6 months
▪ Gynae & Obs	6 months
▪ Urology	4 months
▪ ENT	2 months
▪ Eye/ Dental / Faciomaxillary	2 months
▪ ICU & Post anaesthesia care unit	3 months
▪ Neurosurgery	3 months
▪ Paediatrics	2 months
▪ Cardiothoracic	1 months
▪ Pain management	1 months

36 months

Part-III Thesis Component
(Fifth year of MS Anaesthesiology Programme)

RESEARCH/ THESIS WRITING

Total of one year will be allocated for work on a research project with thesis writing. Project must be completed and thesis be submitted before the end of training. Research can be done as one block in 5th year of training or it can be stretched over five years of training in the form of regular periodic rotations during the course as long as total research time is equivalent to one calendar year.

Research Experience

The active research component program must ensure meaningful, supervised research experience with appropriate protected time for each resident while maintaining the essential clinical experience. Recent productivity by the program faculty and by the residents will be required, including publications in peer-reviewed journals. Residents must learn the design and interpretation of research studies, responsible use of informed consent, and research methodology and interpretation of data. The program must provide instruction in the critical assessment of new therapies and of the surgical literature. Residents should be advised and supervised by qualified staff members in the conduct of research.

Clinical Research

Each resident will participate in at least one clinical research study to become familiar with:

1. Research design
2. Research involving human subjects including informed consent and operations of the Institutional Review Board and ethics of human experimentation
3. Data collection and data analysis
4. Research ethics and honesty
5. Peer review process

This usually is done during the consultation and outpatient clinic rotations.

Case Studies or Literature Reviews

Each resident will write, and submit for publication in a peer-reviewed journal, a case study or literature review on a topic of his/her choice.

Laboratory Research

Bench Research

Participation in laboratory research is at the option of the resident and may be arranged through any faculty member of the Division. When appropriate, the research may be done at other institutions.

Research involving animals

Each resident participating in research involving animals is required to:

1. Become familiar with the pertinent Rules and Regulations of the University of Health Sciences Lahore i.e. those relating to "Health and Medical Surveillance Program for Laboratory Animal Care Personnel" and "Care and Use of Vertebrate Animals as Subjects in Research and Teaching"
2. Read the "Guide for the Care and Use of Laboratory Animals"
3. View the videotape of the symposium on Humane Animal Care

Research involving Radioactivity

Each resident participating in research involving radioactive materials is required to

1. Attend a Radiation Review session
2. Work with an Authorized User and receive appropriate instruction from him/her.

METHODS OF INSTRUCTION/COURSE CONDUCTION

As a policy, active participation of students at all levels will be encouraged.

Following teaching modalities will be employed:

1. Lectures
2. Seminar Presentation and Journal Club Presentations
3. Group Discussions
4. Grand Rounds
5. Clinico-pathological Conferences
6. SEQ as assignments on the content areas
7. Skill teaching in ICU, Operation theatres, emergency and ward settings
8. Attend genetic clinics and rounds for at least one month.
9. Self study, assignments and use of internet
10. Bedside teaching rounds in ward
11. OPD & Follow up clinics
12. Long and short case presentations

In addition to the conventional teaching methodologies interactive strategies like conferences will also be introduced to improve both communication and clinical skills in the upcoming consultants. Conferences must be conducted regularly as scheduled and attended by all available faculty and residents. Residents must actively request autopsies and participate in formal review of gross and microscopic pathological material from patients who have been under their care. It is essential that residents participate in planning and in conducting conferences.

1. Clinical Case Conference

Each resident will be responsible for at least one clinical case conference each month. The cases discussed may be those seen on either the consultation or clinic service or during rotations in specialty areas. The resident, with the advice of the Attending Surgeon on the Consultation Service, will prepare and present the case(s) and review the relevant literature.

2. Monthly Student Meetings

Each affiliated medical college approved to conduct training for MS Anaesthesiology will provide a room for student meetings/discussions such as:

- a. Journal Club Meeting
- b. Core Curriculum Meetings
- c. Skill Development

a. Journal Club Meeting

A resident will be assigned to present, in depth, a research article or topic of his/her choice of actual or potential broad interest and/or application. Two hours per month should be allocated to discussion of any current articles or topics introduced by any participant. Faculty or outside researchers will be invited to present outlines or results of current research activities. The article should be critically evaluated and its applicable results should be highlighted, which can be incorporated in clinical practice. Record of all such articles should be maintained in the relevant department.

b. Core Curriculum Meetings

All the core topics of Anaesthesiology should be thoroughly discussed during these sessions. The duration of each session should be at least two hours once a month. It should be chaired by the chief resident (elected by the residents of the relevant discipline). Each resident should be given an opportunity to brainstorm all topics included in the course and to generate new ideas regarding the improvement of the course structure

c. Skill Development

Two hours twice a month should be assigned for learning and practicing clinical skills.

List of skills to be learnt during these sessions is as follows:

1. Residents must develop a comprehensive understanding of the indications, contraindications, limitations, complications, techniques, and interpretation of results of those technical procedures integral to the discipline
2. Residents must acquire knowledge of and skill in educating patients about the technique, rationale and ramifications of procedures and in obtaining procedure-specific informed consent. Faculty supervision of residents in their performance is required, and each resident's experience in such procedures must be documented by the program director.
3. Residents must have instruction in the evaluation of medical literature, clinical epidemiology, clinical study design, relative and absolute risks of disease, medical statistics and medical decision-making.
4. Training must include cultural, social, family, behavioral and economic issues, such as confidentiality of information, indications for life support systems, and allocation of limited resources.
5. Residents must be taught the social and economic impact of their decisions on patients, the primary care physician and society. This can be achieved by attending the bioethics lectures

6. Residents should have instruction and experience with patient counseling skills and community education.
7. This training should emphasize effective communication techniques for diverse populations, as well as organizational resources useful for patient and community education.
8. Residents should have experience in the performance of Anaesthesiology related clinical laboratory and radionuclide studies and basic laboratory techniques, including quality control, quality assurance and proficiency standards
9. Each resident will manage at least the following essential Anaesthesiological cases and observe and participate in each of the following procedures, preferably done on patients under supervision initially and then independently. (pg. 35-38)

3. Annual Grand Meeting

Once a year all residents enrolled for MS Anaesthesiology should be invited to the annual meeting at UHS Lahore.

One full day will be allocated to this event. All the chief residents from affiliated institutes will present their annual reports. Issues and concerns related to their relevant courses will be discussed. Feedback should be collected and suggestions should be sought in order to involve residents in decision making.

The research work done by residents and their literary work may be displayed.

In the evening an informal gathering and dinner can be arranged. This will help in creating a sense of belonging and ownership among students and the faculty.

LOG BOOK

The residents must maintain a log book and get it signed regularly by the supervisor. A complete and duly certified log book should be part of the requirement to sit for MS examination. Log book should include adequate number of diagnostic and therapeutic procedures observed and performed, the indications for the procedure, any complications and the interpretation of the results, routine and emergency management of patients, case presentations in CPCs, journal club meetings and literature review.

Proposed Format of Log Book is as follows:

Candidate's Name: _____

Roll No. _____

The above mentioned procedures shall be entered in the log book as per format:

Procedures Performed

Sr.#	Date	Name of Patient, Age, Sex & Admission No.	Diagnosis	Procedure Performed	Supervisor's Signature
1					
2					
3					
4					

Emergencies Handled

Sr.#	Date	Name of Patient, Age, Sex & Admission No.	Diagnosis	Procedure/Management	Supervisor's Signature
1					
2					
3					
4					

Case Presented

Sr.#	Date	Name of Patient, Age, Sex & Admission No.	Case Presented	Supervisor's Signature
1				
2				
3				
4				

Seminar/Journal Club Presentation

Sr.#	Date	Topic	Supervisor's signature
1			
2			
3			
4			

Evaluation Record

(Excellent, Good, Adequate, Inadequate, Poor)

At the end of the rotation, each faculty member will provide an evaluation of the clinical performance of the fellow.

Sr.#	Date	Method of Evaluation (Oral, Practical, Theory)	Rating	Supervisor's Signature
1				
2				
3				
4				

EVALUATION & ASSESSMENT STRATEGIES

Assessment

It will consist of action and professional growth oriented ***student-centered integrated assessment*** with an additional component of ***informal internal assessment, formative assessment*** and measurement-based ***summative assessment***.

Student-Centered Integrated Assessment

It views students as decision-makers in need of information about their own performance. Integrated Assessment is meant to give students responsibility for deciding what to evaluate, as well as how to evaluate it, encourages students to '**own**' the evaluation and to use it as a basis for self-improvement. Therefore, it tends to be growth-oriented, student-controlled, collaborative, dynamic, contextualized, informal, flexible and action-oriented.

In the proposed curriculum, it will be based on:

- Self Assessment by the student
- Peer Assessment
- Informal Internal Assessment by the Faculty

Self Assessment by the Student

Each student will be provided with a pre-designed self-assessment form to evaluate his/her level of comfort and competency in dealing with different relevant clinical situations. It will be the responsibility of the student to correctly identify his/her areas of weakness and to take appropriate measures to address those weaknesses.

Peer Assessment

The students will also be expected to evaluate their peers after the monthly small group meeting. These should be followed by a constructive feedback according to the prescribed guidelines and should be non-judgmental in nature. This will enable students to become good mentors in future.

Informal Internal Assessment by the Faculty

There will be no formal allocation of marks for the component of Internal Assessment so that students are willing to confront their weaknesses rather than hiding them from their instructors.

It will include:

- a. Punctuality

- b. Ward work
- c. Monthly assessment (written tests to indicate particular areas of weaknesses)
- d. Participation in interactive sessions

Formative Assessment

Will help to improve the existing instructional methods and the curriculum in use

Feedback to the faculty by the students:

After every three months students will be providing a written feedback regarding their course components and teaching methods. This will help to identify strengths and weaknesses of the relevant course, faculty members and to ascertain areas for further improvement.

Summative Assessment

It will be carried out at the end of the programme to empirically evaluate cognitive, psychomotor and affective domains in order to award diplomas for successful completion of courses.

MS Anaesthesiology Examinations

Part I MS Anaesthesiology

Total Marks: 200

All candidates admitted in MS Anaesthesiology course shall appear in Part-I examination at the end of first calendar year.

Components of Part-I Examination:

Paper-I, 100 MCQs (single best, having one mark each)	100 Marks
Paper-II, 10 SEQs (having 10 marks each)	100 Marks

Topics included in papers:

	Paper-I	Paper-II
1. Anatomy	(20 MCQs)	(2 SEQs)
2. Physiology	(20 MCQs)	(2 SEQs)
3. Pathology	(20 MCQs)	(2 SEQs)
4. Biochemistry	(10 MCQs)	(1 SEQs)
5. Pharmacology	(15 MCQs)	(1 SEQ)
6. Physics & Equipment	(05 MCQs)	-----
7. Behavioural Sciences	(05 MCQs)	(1 SEQ)
8. Biostatistics & Research Methodology	(05 MCQs)	(1 SEQ)

Part II- MS Anaesthesiology

Total Marks: 430

All candidates admitted in MS Anaesthesiology course shall appear in Part-II examination at the end of second calendar year.

There shall be two written papers of 100 marks each, Oral & practical/clinical examination of 150 marks and log book assessment of 80 marks.

Topics included in papers 1 & 2:

Basic Principles of Surgery

Components of Part II Examination

Theory:

Paper 1:	<u>100 Marks</u>	3 Hours
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10 SEQs (No Choice; 05 marks each)	50 Marks
50 MCQs	50 Marks

Paper 2:	<u>100 Marks</u>	3 Hours
10 SEQs (No Choice; 05 marks each)	50 Marks	
50 MCQs	50 Marks	

Only those candidates, who pass in theory papers, will be eligible to appear in the Oral & Practical/Clinical Examination.

Oral & Practical/ Clinical Examination shall be held in clinical techniques relevant to General Surgery.

<u>OSCE</u>	<u>50 Marks</u>
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10 stations each carrying 05 marks of 10 minutes duration; each evaluating performance based assessment with five of them interactive

<u>Clinical</u>	<u>100 Marks</u>
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Four short cases (each 15 marks)	60 Marks
One long case:	40 Marks

<u>Log Book</u>	<u>80 Marks</u>
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Part III MS Anaesthesiology**Total Marks: 920**

All candidates admitted in MS Anaesthesiology course shall appear in Part-III examination at the end of structured training programme (end of 5th calendar year and after clearing Part I & II examinations).

There shall be two written papers of 150 marks each, practical/ clinical examination of 300 marks, log book assessment of 120 marks and thesis examination of 200 marks.

Part III MS Anaesthesiology**Clinical Examination****Total Marks: 720****Topics included in paper 1**

- | | |
|--|-----------|
| 1. Preoperative assessment and preparation | (15 MCQs) |
| 2. General anaesthesia: methods and techniques | (20 MCQs) |
| 3. Local and regional anaesthesia | (20 MCQs) |
| 4. Anaesthesia for special situations | (20 MCQs) |

Topics included in paper 2

- | | |
|--|-----------|
| 1. Pre-hospital and emergency medicine | (15 MCQs) |
| 2. Postoperative care | (15 MCQs) |
| 3. Intensive care medicine | (15 MCQs) |
| 4. Technical equipment and monitoring | (15 MCQs) |
| 5. Pain management | (15 MCQs) |

Components of Part III Clinical Examination**Theory**

Paper I	<u>150 Marks</u>	3 Hours
15 SEQs (No Choice)	75 Marks	
75 MCQs	75 Marks	
 Paper II	 <u>150 Marks</u>	 3 Hours
15 SEQs (No Choice)	75 Marks	
75 MCQs	75 Marks	

The candidates who pass in theory papers, will be eligible to appear in the clinical & viva voce.

OSCE/ Viva

100 Marks

10 stations each carrying 10 marks of 10 minutes duration; each evaluating performance based assessment with five of them interactive

Clinical

200 Marks

Four short cases (each 25 marks)

100 Marks

One long case:

100 Marks

Log Book

120 Marks

Part III MS Anaesthesiology

Thesis Examination

Total Marks: 200

All candidates admitted in MS Anaesthesiology course shall appear in Part-III (thesis examination) at the end of 5th year of the MS programme and not later than 8th calendar year of enrolment. The examination shall include thesis evaluation with defense.

RECOMMENDED BOOKS

1. Aithenhead A. R., Smith G., Rowbotham D. J. ***Textbook of Anaesthesia***. 5th ed. Churchill Livingstone
2. Morgan G. E., Mikail M. S., Murray M. J. ***Clinical Anaesthesiology***. 4th ed. Lange
3. Yao and Artusio's. ***Anaesthesiology:Problem oriented Patient Management*** 5th ed. Lippincott Williams and Wilking
4. David P. D. and Kenny G. N. C. ***Basic Physics and Measurement in Anaesthesia***. 5th ed. Butterworth Heinmann
5. Rana M. H., Ali S. Mustafa M. ***A Handnook of Behavioural Sciences for Medical and Dental Students***. Lahore: University of Health Science; 2007.
6. Fathalla M. F. and Fathalla M. M. F. ***A Practical Guide for Health Researcher***. Cairo: World Health Organization; 2004.

RECOMMENDED JOURNALS

1. British Journal of Anaesthesiology
2. Anaesthesia (British Journal)
3. Anaesthesia and Analgesia (American Journal)
4. Anaesthesia and Critical Care (British Journal)