
CURRICULUM/STATUTES & REGULATIONS

FOR

5 YEARS DEGREE PROGRAMME

IN

PULMONOLOGY
(MD PULMONOLOGY)



**UNIVERSITY OF HEALTH SCIENCES,
LAHORE**

STATUTES

1. Nomenclature Of The Proposed Course

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

2. Course Title:

MD Pulmonology

3. Training Centers

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

4. Duration of Course

The duration of MD Pulmonology 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, Behavioural Sciences and Biostatistics & Research Methodology. At the end of first year the examination shall be held in Basic Medical Sciences. The clinical training in fundamental concepts of Internal Medicine shall start from the 1st day of enrollment.

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

Part III is structured for 3rd, 4th and 5th calendar years in MD Pulmonology. The candidate shall undergo training to achieve educational objectives of MD Pulmonology (knowledge & skills) along with rotation in relevant fields. The research component and thesis writing shall also be included in this part. 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

1. For admission in MD Pulmonology course, the candidate shall be required to have:
 - MBBS degree
 - Completed one year House Job
 - One year experience in Pulmonology/Internal Medicine/Allied medical 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.

2. Exemptions: A candidate holding FCPS/MRCP/Diplomate American Board/equivalent qualification in Internal Medicine 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 MD 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 MD courses.
- Candidates selected for the courses after their enrollment at the relevant institutions shall be registered with UHS as per prescribed Registration Regulations.

7. Accreditation Related Issues of the Institution

1. Faculty

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

2. Adequate Space

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

3. Library

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

- Accreditation of Pulmonology 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 MD programme in Pulmonology is to train residents to acquire the competency of a specialist in the field of Pulmonology so that they can become good teachers, researchers and clinicians in their specialty after completion of their training.

GENERAL OBJECTIVES

MD Pulmonology training should enable a student to:

- 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
- Safely and effectively performs appropriate clinical skills & procedures:
 - Consistently demonstrate sound clinical 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
- Design and implement effective management plans:
 - Recognize the clinical features, accurately diagnose and manage pulmonary 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 pulmonary system and differentiate those amenable to medical treatment
- 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.
- 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
- Communicate effectively:
 - Communicate appropriate information to patients (and their family) about procedures, potentialities and risks associated with surgery 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

- Recognize the value of knowledge and research and its application to clinical practice:
 - Assume responsibility for self-directed learning
 - Critically appraise new trends in Pulmonology
 - Facilitate the learning of others
- Appreciate ethical issues associated with Pulmonology:
 - 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.
- Professionalism by:
 - Employing a critically reflective approach to Pulmonology
 - 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
- 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.
- 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
- Health advocacy:
 - Promote health maintenance of patients
 - Advocate for appropriate health resource allocation

SPECIFIC LEARNING OUTCOMES

Residents completing MD Pulmonology training will have formal instruction, clinical experience, and will be able to demonstrate competence in the evaluation and management of adult and paediatric patients and applying scientific principles for the identification, prevention, treatment and rehabilitation of following acute and chronic pulmonary disorders:

- Obstructive lung diseases, including asthma, bronchitis, emphysema, bronchiectasis
- Pulmonary malignancy – primary and metastatic
- Pulmonary infections, including tuberculous, fungal, and those in the immuno-compromised host, e.g., human immunodeficiency virus-related infections
- Diffuse interstitial lung disease
- Pulmonary embolism and pulmonary embolic disease
- Pulmonary vascular disease, including primary and secondary pulmonary hypertension and the vasculitis and pulmonary hemorrhage syndromes
- Occupational and environmental lung diseases
- Iatrogenic respiratory diseases, including drug-induced disease
- Acute lung injury, including radiation, inhalation, and trauma
- Pulmonary manifestations of systemic diseases, including collagen vascular diseases that are primary in other organs
- Pulmonary physiology and pathophysiology in systemic diseases
- Disorders of the pleura and the mediastinum
- Sleep disorders, including the recognition and differential diagnosis of common sleep symptoms, the effects of sleep on pulmonary diseases and treatments, the utility and interpretation of cardiopulmonary monitoring, critical review of polysomnographic reports, and management of sleep-disordered breathing
- Management of the immuno-suppressed patient
- Genetic and developmental disorders of the respiratory system, including cystic fibrosis
- Pulmonary rehabilitation
- Pulmonary neoplasia and oncological practice
- Manage general medical problems & respiratory problems faced in Intensive Care Unit, including respiratory and haemodynamic monitoring & support.
- Manage patients on invasive and non-invasive mechanical ventilation.
- After discharge from the critical care unit
- Understanding of Basic respiratory sciences including respiratory mechanics, cell and molecular biology and immunology, as they relate to pulmonary disease
- Conduct research and able to impart patient & public education relevant to the field of Respiratory Medicine.
- Teaching residents is our highest priority: not just teaching pulmonary and critical care medicine, but teaching how to convey knowledge and enthusiasm for learning to others. Residents choosing to pursue a career as outstanding clinician-educators have opportunities to develop their

teaching skills during their residency, and receive training in curriculum design and effective teaching methods.

Professional Skills:

Residents shall learn professional skills in:

- Patient Management including eliciting pertinent history, performing physical examination, ordering and interpreting the result of appropriate investigations and thereby deciding and implementing appropriate treatment plan by maintaining follow up
- Psychosocial and emotional effects of acute and chronic illness on patients and their families
- Management of end of life issues and palliative care
- Quality improvement and patient safety activities

Procedural and Technical Skills:

Residents shall learn technical and procedural skills in:

- Flexible fiberoptic bronchoscopy procedures
- Pulmonary function tests to assess respiratory mechanics and gas exchange, including spirometry, flow volume studies, lung volumes, diffusing capacity, arterial blood gas analysis, and exercise studies
- Administer medical gases, humidification and aerosol medications
- Perform postural drainage and maintain bronchopulmonary hygiene
- Endotracheal intubation and maintaining artificial airways
- Management of mechanically ventilated patients and perform cardiopulmonary resuscitation
- Pleural aspiration and pleural biopsy
- The examination and interpretation of sputum, bronchopulmonary secretions, pleural fluid
- Chest tubes and drainage systems
- Nutritional support
- The examination and interpretation of lung tissue for infectious agents, cytology, and histopathology
- Imaging techniques commonly employed in the evaluation of patients with critical illness and/or pulmonary disorders
- Practice infection control procedures and perform continuous quality improvement.

REGULATIONS

1. *Scheme of the Course*

A summary of five years course in MD Pulmonology is presented as under:

Course Structure	Components	Examination
Part I	<ul style="list-style-type: none"> • Basic medical sciences Anatomy, Physiology, Biochemistry, Pathology, Pharmacology, Behavioural Sciences and Biostatistics & Research Methodology. 	Part-I examination at the end of 1 st year of MD Pulmonology programme. <ul style="list-style-type: none"> • Written: Paper I: MCQs Paper II: SEQs
Part-II	<ul style="list-style-type: none"> • Fundamental Concepts in Internal Medicine: Training in clinical techniques of Internal Medicine with compulsory rotations for two years starting from the first day of enrollment 	Part-II examination at the end of 2 nd year of MD Pulmonology programme. <ul style="list-style-type: none"> • Written: Papers 1 & 2: Problem-based questions in Internal Medicine • 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 Pulmonology Training in Pulmonology during 3rd, 4th and 5th years of MD programme <p>Three years of training with compulsory/ optional rotations in related fields</p> <p style="text-align: center;"><u>Research component of Part III</u></p> <ul style="list-style-type: none"> • Research and Thesis Writing: Research work/Thesis writing project must be completed and thesis be submitted before the end of training. 	Part-III examination in specialized components of Pulmonology at the end of 5th year of MD programme <ul style="list-style-type: none"> • Written: Paper 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 defence at the end of fifth (5th) year of MD Pulmonology programme.</p>

2. Examinations

Part-I Examination

1. All candidates admitted in MD Pulmonology courses shall appear in Part-I examination at the end of 1st 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 Pulmonology (Anatomy, Physiology, Biochemistry, Pathology, Pharmacology), 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 MD Pulmonology course shall appear in Part-II examination at the end of 2nd calendar year and having passed part I examination.
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:
Paper 1 & 2: Principles of Internal Medicine
6. The types 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 Internal Medicine.
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 MD Pulmonology 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 / MRCP / Diplomate American Board/equivalent qualification in Internal Medicine 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	100
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 MD Pulmonology 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 MD 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 MD 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 Internal Medicine and related fields 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 MD Pulmonology Degree

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

CONTENT OUTLINE

Part I MD Pulmonology

Basic Sciences:

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

1. Anatomy

- *Clinical and functional anatomy with pathological and applied relevance*
- *Histology and embryology of upper and lower respiratory tract structures*

- 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 otolaryngological 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 Gross Anatomy

- Respiratory Muscles & Bony cage
- Mediastinum & Hilar regions
- Pleura
- Pulmonary circulation
- Airways, Lung parenchyma & interstitium
- Lung growth & development
- Lymphatic & Nerve supply
- Cardiac anatomy for pulmonologists

2. Physiology

Cellular organization, structure function correlations and physiological alterations in the respiratory systems of body

- Regulation of respiration
- Mechanics of Ventilation
- Respiratory circulation
- Inhalation kinetics
- Gas transport & gas exchange
- Respiratory adjustments in health, disease & exercise
- Lung compliance & airway resistance
- Physiology of oxygen therapy
- Acid base balance, fluid & electrolytes
- Respiratory defences
- Metabolic functions & Surfactant
- Respiratory changes in muscular exercise
- Hypoxia, cyanosis, anoxia, asphyxia, dyspnoea, collapse of the lung
- Artificial respiration
- Therapeutic uses of oxygen
- Effects of respiration on circulation
- ABG Interpretation
- Pulmonary function tests. Basic Principles
- Advanced Principles & Clinical Application
- Cardiac physiology for pulmonologists
- Properties of cardiac muscle
- Origin and propagation of cardiac impulse
- The cardiac cycle
- The heart sounds.
- Regulation of cardiac function.
- The special excitatory and conductive system of the heart and abnormalities of the cardiac rhythms
- Brief description of normal and abnormal ECG

3. Biochemistry

- Membrane biochemistry and signal transduction
- Gene expression and the synthesis of proteins
- Bioenergetics; fuel oxidation and the generation of ATP
- Carbohydrate metabolism
- Lipid metabolism
- Nitrogen metabolism
- Enzymes and biologic catalysis
- Tissue metabolism
- Biotechnology and concepts of molecular biology with special emphasis on use of recombinant DNA techniques in medicine and the molecular biology of cancer
- General principles of biochemical investigations

- Basic techniques in molecular biology
- Cloning and gene analysis
- Immunochemical techniques
- Protein chemistry and enzymology
- Cloning & PCR
- Protein chemistry and quantification
- Electrophoretic techniques; PAGE
- Immunoblotting
- Raising and purifying antibodies
- ELISA

4. Pharmacology

- The Evolution of Medical Drugs
- British Pharmacopia
- Pharmacokinetic Processes
- Pharmacodynamic Process
- Drug Effect
- Beneficial Responses
- Harmful Responses
- Allergic Responses
- Drug Dependence, Addiction, Abuse and Tolerance
- Drug Interactions
- Drugs used in cardio-respiratory diseases
- Oxygen therapy
- Inhalation kinetics & Aerosol / medical gases / humidification therapy (includes their physical, chemical & pharmacological aspects)
- Steroids therapy
- Antibiotics therapy
- Bronchodilator therapy
- Anti tuberculosis therapy
- Cancer chemotherapy

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 respiratory disorders
- Infection source
- Nosocomial infections
- Bacterial growth and death
- Pathogenic bacteria
- Vegetative organisms
- Spores
- Important viruses
- Important parasites
- Sources of infection
- Asepsis and antisepsis
- Infection prevention
- Immunization
- Personnel protection from communicable diseases

- Use of investigation and procedures in laboratory
- Basics in allergy and immunology

Special Pathology

- Pathophysiology in different diseases and effects on lung function:
- Intrathoracic airways obstruction (asthma, chronic bronchitis, emphysema)
- Extra-thoracic airways obstruction (fixed, variable)
- Restrictive ventilatory defects (pulmonary fibrosis, diseases of the chest wall, neuromuscular disorders)
- Allergy & lung
- Bronchial asthma
- Chronic obstructive pulmonary diseases
- Lung injury
- Adult respiratory distress syndrome (ARDS)
- Systemic diseases & lung
- Congenital anomalies in lung
- Tumours
- Pulmonary tuberculosis
- Pulmonary embolism and infarction
- Bronchiectasis
- Occupational lung disease (pneumoconioses, asbestosis, farmers lung, asthma, extrinsic allergic alveolitis)
- Pleural tumours
- Pleural infection
- Empyema
- SARS and other infectious pulmonary disorders
- Congenital anomalies and oesophageal cancers
- Stricture oesophagus
- Achalasia cardia
- Mediastinal infections
- Tumours in mediastinum
- Thymus tumours
- Cardiac disease (secondary to lung disease and hypertension; secondary to left ventricular failure or mitral stenosis)
- Pericardial infections and tamponade.
- Hypoxaemia (ventilatory failure, v/q inequality, anatomical shunts)
- Hypercapnia (disorders of the respiratory centre, respiratory nerves and muscles, disorders of the chest wall, airways and lung parenchyma)
- Hyperventilation (acidaemia, psychogenic)

6. 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

7. Behavioural Sciences

- Bio-Psycho-Social (BPS) Model of Health Care
- Use of Non-medicinal Interventions in Clinical Practice
 - Communication Skills
 - Counselling
 - 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 MD Pulmonology

Internal Medicine training for first two years starting from first day of enrollment. Resident should get exposure in the following organ and system competencies (listed below) while considering and practicing each system in terms of: -

- Medical ethics
- Professional values, student teachers relationship
- Orientation of in-patient, out-patients and pulmonary labs
- Approach to the patient
- History taking
- General physical examination
- Systemic examination
- Routine investigations
- Special investigations
- Diagnostic and therapeutic procedures

Course Contents:

1. Cardiovascular Medicine

Common and / or important Cardiac Problems:

- Arrhythmias
- Ischaemic Heart Disease: acute coronary syndromes, stable angina, atherosclerosis
- Heart Failure
- Hypertension – including investigation and management of accelerated hypertension
- Valvular Heart Disease
- Endocarditis
- Aortic dissection
- Syncope
- Dyslipidaemia

Clinical Science:

- Physiological principles of cardiac cycle and cardiac conduction
- Pharmacology of major drug classes: beta blockers, alpha blockers, ACE inhibitors, Angiotensin receptor blockers (ARBs), anti-platelet agents, thrombolysis, inotropes, calcium channel antagonists, potassium channel activators, diuretics, anti-arrhythmics, anticoagulants, lipid modifying drugs, nitrates, centrally acting anti-hypertensives

2. Dermatology;

Common and / or Important Problems:

- Cellulitis
- Cutaneous drug reactions
- Psoriasis and eczema
- Skin failure: e.g. erythryoderma, toxic epidermal necrolysis
- Urticaria and angio-oedema

- Cutaneous vasculitis
- Herpes zoster and Herpes Simplex infections
- Skin tumours
- Skin infestations
- Dermatomyositis
- Scleroderma
- Lymphoedema

Clinical Science:

- Pharmacology of major drug classes: topical steroids, immunosuppressants

3. Diabetes & Endocrine Medicine

Common and / or Important Diabetes Problems:

- Diabetic ketoacidosis
- Non-acidotic hyperosmolar coma / severe hyperglycaemia
- Hypoglycaemia
- Care of the acutely ill diabetic
- Peri-operative diabetes care

Common or Important Endocrine Problems:

- Hyper/Hypocalcaemia
- Adrenocortical insufficiency
- Hyper/Hyponatraemia
- Thyroid dysfunction
- Dyslipidaemia
- Endocrine emergencies: myxoedemic coma, thyrotoxic crisis, Addisonian crisis, hypopituitary coma, pheochromocytoma crisis

Clinical Science:

- Outline the function, receptors, action, secondary messengers and feedback of hormones
- Pharmacology of major drug classes: insulin, oral anti-diabetics, thyroxine, anti-thyroid drugs, corticosteroids, sex hormones, drugs affecting bone metabolism

4. Gastroenterology and Hepatology

Common or Important Problems:

- Peptic Ulceration and Gastritis
- Gastroenteritis
- GI malignancy (oesophagus, gastric, hepatic, pancreatic, colonic)
- Inflammatory bowel disease
- Iron Deficiency anaemia
- Acute GI bleeding
- Acute abdominal pathologies: pancreatitis, cholecystitis, appendicitis, leaking abdominal aortic aneurysm
- Functional disease: irritable bowel syndrome, non-ulcer dyspepsia
- Coeliac disease
- Alcoholic liver disease
- Alcohol withdrawal syndrome
- Acute liver dysfunction: jaundice, ascites, encephalopathy
- Liver cirrhosis
- Gastro-oesophageal reflux disease

- Nutrition: indications, contraindications and ethical dilemmas of nasogastric feeding and EG tubes, IV nutrition, re-feeding syndrome
- Gall stones
- Viral hepatitis
- Auto-immune liver disease
- Pancreatic cancer

Clinical Science:

- Laboratory markers of liver, pancreas and gut dysfunction
- Pharmacology of major drug classes: acid suppressants, anti-spasmodics, laxatives, anti-diarrhoea drugs, aminosalicylates, corticosteroids, immunosuppressants, infliximab, pancreatic enzyme supplements

5. Renal Medicine

Common and / or Important Problems:

- Acute renal failure
- Chronic renal failure
- Glomerulonephritis
- Nephrotic syndrome
- Urinary tract infections
- Urinary Calculus
- Renal replacement therapy
- Disturbances of potassium, acid/base, and fluid balance (and appropriate acute interventions)

Clinical Science:

- Measurement of renal function
- Metabolic perturbations of acute, chronic, and end-stage renal failure and associated treatments

6. Respiratory Medicine

Common and / or Important Respiratory Problems:

- COPD
- Asthma
- Pneumonia
- Pleural disease: Pneumothorax, pleural effusion, mesothelioma
- Lung Cancer
- Respiratory failure and methods of respiratory support
- Pulmonary embolism and DVT
- Tuberculosis
- Interstitial lung disease
- Bronchiectasis
- Respiratory failure and cor-pulmonale
- Pulmonary hypertension

Clinical Science:

- Principles of lung function measurement
- Pharmacology of major drug classes: bronchodilators, inhaled corticosteroids, leukotriene receptor antagonists, immunosuppressants

7. Allergy

Common or Important Allergy Problems

- Anaphylaxis
- Recognition of common allergies; introducing occupation associated allergies
- Food, drug, latex, insect venom allergies
- Urticaria and angioedema

Clinical Science

- Mechanisms of allergic sensitization: primary and secondary prophylaxis
- Natural history of allergic diseases
- Mechanisms of action of anti-allergic drugs and immunotherapy
- Principles and limitations of allergen avoidance

8. Haematology

Common and / or Important Problems:

- Bone marrow failure: causes and complications
- Bleeding disorders: DIC, haemophilia
- Thrombocytopenia
- anticoagulation treatment: indications, monitoring, management of over-treatment
- Transfusion reactions
- Anaemia: iron deficient, megaloblastic, haemolysis, sickle cell,
- Thrombophilia: classification; indications and implications of screening
- Haemolytic disease
- Myelodysplastic syndromes
- Leukaemia
- Lymphoma
- Myeloma
- Myeloproliferative disease
- Inherited disorders of haemoglobin (sickle cell disease, thalassaemias)
- Amyloid

Clinical Science:

- Structure and function of blood, reticuloendothelial system, erythropoietic tissues

9. Immunology

Common or Important Problems:

- Anaphylaxis (see also 'Allergy')

Clinical Science:

- Innate and adaptive immune responses
- Principles of Hypersensitivity and transplantation

10. Infectious Diseases

Common and / or Important Problems:

- Fever of Unknown origin
- Complications of sepsis: shock, DIC, ARDS
- Common community acquired infection: LRTI, UTI, skin and soft tissue infections, viral exanthema, gastroenteritis
- CNS infection: meningitis, encephalitis, brain abscess
- HIV and AIDS including ethical considerations of testing
- Infections in immuno-compromised host
- Tuberculosis

- Anti-microbial drug monitoring
- Endocarditis
- Common genito-urinary conditions: non-gonococcal urethritis, gonorrhoea, syphilis

Clinical Science:

- Principles of vaccination
- Pharmacology of major drug classes: penicillins, cephalosporins, tetracyclines, aminoglycosides, macrolides, sulphonamides, quinolones, metronidazole, anti-tuberculous drugs, anti-fungals, anti-malarials, anti-helminthics, anti-virals

11. Medicine in the Elderly

Common or Important Problems:

- Deterioration in mobility
- Acute confusion
- Stroke and transient ischaemic attack
- Falls
- Age related pharmacology
- Hypothermia
- Continence problems
- Dementia
- Movement disorders including Parkinson's disease
- Depression in the elderly
- Osteoporosis
- Malnutrition
- Osteoarthritis

Clinical Science:

- Effects of ageing on the major organ systems
- Normal laboratory values in older people

12. Musculoskeletal System

Common or Important Problems:

- Septic arthritis
- Rheumatoid arthritis
- Osteoarthritis
- Seronegative arthritides
- Crystal arthropathy
- Osteoporosis – risk factors, and primary and secondary prevention of complications of osteoporosis
- Polymyalgia and temporal arteritis
- Acute connective tissue disease: systemic lupus erythematosus, scleroderma, poly- and dermatomyositis, Sjogren's syndrome, vasculitides

Clinical Science:

- Pharmacology of major drug classes: NSAIDS, corticosteroids, immunosuppressants, colchicines, allopurinol, bisphosphonates

13. Neurology

Common or Important Problems:

- Acute new headache
- Stroke and transient ischaemic attack
- Subarachnoid haemorrhage
- Coma
- Central Nervous System infection: encephalitis, meningitis, brain abscess
- Raised intra-cranial pressure
- Sudden loss of consciousness including seizure disorders (see also above syncope etc)
- Acute paralysis: Guillian-Barré, myasthenia gravis, spinal cord lesion
- Multiple sclerosis
- Motor neuron disease

Clinical Science:

- Pathophysiology of pain, speech and language
- Pharmacology of major drug classes: anxiolytics, hypnotics inc. benzodiazepines, anti-epileptics, anti-Parkinson's drugs (anti-muscarinics, dopaminergics)

14. Psychiatry

Common and /or Important Problems:

- Suicide and parasuicide
- Acute psychosis
- Substance dependence
- Depression

Clinical Science:

- Principles of substance addiction, and tolerance
- Pharmacology of major drug classes: anti-psychotics, lithium, tricyclic antidepressants, mono-amine oxidase inhibitors, SSRIs, venlafaxine, donepezil, drugs used in treatment of addiction (bupropion, disulpharam, acamprosate, methadone)

15. Cancer and Palliative Care

Common or Important Oncology Problems:

- Hypercalcaemia
- SVC obstruction
- Spinal cord compression
- Neutropenic sepsis
- Common cancers (presentation, diagnosis, staging, treatment principles): lung, bowel, breast, prostate, stomach, oesophagus, bladder)

Common or Important Palliative Care Problems:

- Pain: appropriate use, analgesic ladder, side effects, role of radiotherapy
- Constipation
- Breathlessness
- Nausea and vomiting
- Anxiety and depressed mood

Clinical Science:

- Principles of oncogenesis and metastatic spread
- Apoptosis
- Principles of staging
- Principles of screening

- Pharmacology of major drug classes in palliative care: anti-emetics, opioids, NSAIDS, agents for neuropathic pain, bisphosphonates, laxatives, anxiolytics

16. Clinical Genetics

Common and / or Important problems:

- Down's syndrome
- Turner's syndrome
- Huntington's disease
- Haemochromatosis
- Marfan's syndrome
- Klinefelter's syndrome
- Familial cancer syndromes
- Familial cardiovascular disorders

Clinical Science:

- Structure and function of human cells, chromosomes, DNA, RNA and cellular proteins
- Principles of inheritance: Mendelian, sex-linked, mitochondrial
- Principles of pharmacogenetics
- Principles of mutation, polymorphism, trinucleotide repeat disorders
- Principles of genetic testing including metabolite assays, clinical examination and analysis of nucleic acid (e.g. PCR)

17. Clinical Pharmacology

Common and / or Important problems:

- Corticosteroid treatment: short and long-term complications, bone protection, safe withdrawal of corticosteroids, patient counselling regarding avoid adrenal crises
- Specific treatment of poisoning with:
 - Aspirin,
 - Paracetamol
 - Tricyclic anti-depressants
 - Beta-blockers
 - Carbon monoxide
 - Opiates
 - Digoxin
 - Benzodiazepines

Clinical Science:

- Drug actions at receptor and intracellular level
- Principles of absorption, distribution, metabolism and excretion of drugs
- Effects of genetics on drug metabolism
- Pharmacological principles of drug interaction
- Outline the effects on drug metabolism of: pregnancy, age, renal and liver impairment

Investigation Competencies

Outline the Indications for, and Interpret the Following Investigations:

- Basic blood biochemistry: urea and electrolytes, liver function tests, bone biochemistry, glucose, magnesium
- Cardiac biomarkers and cardiac-specific troponin
- Creatine kinase
- Thyroid function tests
- Inflammatory markers: CRP / ESR
- Arterial Blood Gas analysis
- Cortisol and short Synacthen test
- HbA1C
- Lipid profile
- Amylase
- Full blood count
- Coagulation studies
- Haemolysis studies
- D dimer
- Blood film report
- Blood / Sputum / urine culture
- Fluid analysis: pleural, cerebro-spinal fluid, ascitic
- Urinalysis and urine microscopy
- Auto-antibodies
- Chest radiograph
- Abdominal radiograph
- Joint radiographs (knee, hip, hands, shoulder, elbow, dorsal spine, ankle)
- ECG
- Peak flow tests
- Full lung function tests

More Advanced Competencies;

- Viral hepatitis serology
- Stool testing
- HIV testing
- Ultrasound
- Detailed imaging: Barium studies, CT, CT pulmonary angiography, high resolution CT, MRI
- Echocardiogram
- 24 hour ECG monitoring
- Ambulatory blood pressure monitoring
- Exercise tolerance test
- Cardiac perfusion scintigraphy
- Tilt testing
- Neurophysiological studies: EMG, nerve conduction studies, visual and auditory evoked potentials
- Bone scan

Procedural Competencies

- The trainee is expected to be competent in performing the following procedures by the end of core training. The trainee must be able to outline the indications for these interventions. For invasive procedures, the trainee must recognize the indications for the procedure, the importance of valid consent, aseptic technique, safe use of local anaesthetics and minimization of patient discomfort.
- Venepuncture
- Cannula insertion, including large bore
- Arterial blood gas sampling
- Lumbar Puncture
- Pleural tap and aspiration
- Intercostal drain insertion: Seldinger technique
- Ascitic tap
- Abdominal paracentesis
- Central venous cannulation
- Initial airway protection: chin lift, Guedel airway, nasal airway, laryngeal mask
- Basic and, subsequently, advanced cardiorespiratory resuscitation
- Bronchoscopy
- Cytology: pleural fluid, ascitic fluid, cerebro-spinal fluid, sputum
- DC cardioversion
- Urethral catheterization
- Nasogastric tube placement and checking
- Electrocardiogram
- Temporary cardiac pacing by internal wire or external pacemaker

Part-III Specialty training in Pulmonology

Specific Program Content

1. Specialized training in Pulmonology
2. Compulsory rotations
3. Research & thesis writing
4. Maintaining of Log-book

1. Specialized training in Pulmonology

- Diagnosis & evaluation
- History & examination
- Symptoms & signs in respiratory medicine
- Diagnostic approach to common respiratory problems (dyspnoea, haemoptysis, chest pain, etc)
- Imaging in respiratory diseases e.g. chest x-ray, CT scan & ultrasound, MRI, PET scan & nuclear medicine
- Pulmonary function tests
 - Spirometry
 - Static lung volumes
 - Diffusion capacity
 - Bronchoprovocation Tests
 - Cardiopulmonary exercise testing
 - Six minutes walk test
 - Impairment & disability assessment
- Pleural procedures
 - Pleural aspiration
 - Pleural biopsy
 - Intercostal drainage
 - Pleuroscopy
- Bronchoscopy & associated procedures

Obstructive lung diseases

- Approach to a patient with obstructive &/ or bullous diseases
- COPD
- Chronic bronchitis
- Emphysema
- Asthma (Incl. Occupational / exercise / drug induced, ABPA)
- Bronchiectasis & cystic fibrosis
- Upper & central airways diseases

Occupational disorders

- General principles
- Asbestos-related lung disease
- Coal workers lung disease
- Occupational asthma
- Byssinosis
- Industrial bronchitis

- Chronic beryllium and hard metal lung disease
- Toxic inhalation
- Miscellaneous

Environmental disorders

- Air pollution
- Pulmonary disorders related to high altitude
- Diving injuries
- Air embolism
- Thermal lung injury
- Acute smoke inhalation

Drug induced lung disorders

- Diseases due to non-chemotherapeutic agents
- Diseases due to chemotherapeutic agents

Interstitial & inflammatory lung diseases

- An overview of interstitial lung diseases
- Systemic sarcoidosis
- Idiopathic pulmonary fibrosis
- Hypersensitivity pneumonitis
- Radiation pneumonitis
- Eosinophilic pneumonias
- Pulmonary manifestations of collagen vascular disorders
- Others

Depositional & infiltrative disorders

- Pulmonary histiocytosis X
- Pulmonary lymphangiomyomatosis and tuberous sclerosis
- In born errors of metabolism and lungs

Alveolar disorders

- Alveolar haemorrhage syndrome
- Pulmonary alveolar proteinosis

Disorders of pulmonary circulation

- Pulmonary hypertension
- Cor-pulmonale
- Pulmonary thrombembolism
- Pulmonary oedema/ ARDS
- Pulmonary vasculitis
- Pulmonary AV malformations

Disorders of pleural space

- Pleural effusions
- Pneumothorax
- Pleural tumors

Tuberculosis (TB) and Opportunistic diseases

- Causes of TB and other opportunistic mycobacterial diseases

- Multi-drug resistant TB
- Investigation including imaging and use of various pleural biopsy techniques, skin tests and gamma interferon tests
- Differential diagnosis of TB and opportunistic mycobacterial diseases
- Treatment and management of patients with
- Infection control
- Tuberculin skin testing
- Role of appropriate tests in diagnosis
- Pulmonary disease in the immuno-compromised host
- HIV/AIDS
- Transplant patients
- Patients on immunosuppressive drugs
- Immunodeficiency patients.
- Causes of immuno-compromise in patients
- Causes of lung disease in immuno-compromised patients
- Investigation of lung disease in immuno-compromised patients
- Differential diagnosis of lung disease in immuno-compromised patients
- Treatment and management of lung disease in immuno-compromised patients
- Pharmacology of drugs used
- Interpretation of other appropriate lung function tests

Diseases of mediastinum, Chest wall, tumors & cysts

- Mediastinitis & pneumomediastinum
- Disorders of chest walls
- Neuromuscular disorders
- Surgical aspects of pulmonology
- Chest trauma
- Lung transplantation
- Sleep control & sleep disorders

Neoplasms of lung

- Solitary pulmonary nodule
- Small cell and non-small cell ca
- Other lung tumors
- Extra-pulmonary manifestations of lung tumors

Acute respiratory failure

- Lung failure
- Systemic inflammatory response and multiple organ dysfunction syndrome
- Acute respiratory failure in surgical patient
- Respiratory distress syndrome in newborn
- Nutrition in respiratory failure
- Oxygen therapy & oxygen utility
- Upper airways management (intubation)
- Mechanical ventilation

Respiratory manifestations of extra-pulmonary disorders

- Cardiac diseases
- Renal diseases

- Abdominal diseases
- Hematologic diseases
- Endocrine diseases
- Obstetric & gynecologic diseases
- Transplant & immunodeficiency disorders (HIV)
- Paediatric aspects of pulmonology

Haemodynamics & respiratory monitoring

Critical care situation

- Sedation & analgesia in ICU
- Infectious diseases of lungs (pulmonary TB, pneumonia, viral & fungal infection etc)
- Ethics in critical care situation
- Prevention, palliation & pulmonary rehabilitation
- Intensive care medicine
- Advanced airway & ventilator management
- Care of the patient on ventilator
- Cardiovascular problems in ICU
- Renal, fluid & electrolyte problems & acid base balance in ICU
- Infectious disease problems in ICU

Procedures in critical care medicine

- Airway management & intubation
- Central venous catheter
- Arterial line placement & care
- Tracheostomy
- Cardiopulmonary resuscitation

Paediatric Pulmonary medicine

- Reactive airway disease
- Recurrent pneumonia / pulmonary infections
- Tuberculosis
- Sleep disorder breathing
- Allergy
- Wheezing, apnea and hypoventilation
- Asthma and wheezing disorders
- Chronic lung disease of prematurity
- Congenital malformations of the respiratory tract
- Cystic fibrosis
- Acute and chronic infection
- Recurrent croup
- Vocal cord dysfunction
- Bronchiectasis
- Tracheostomy
- Nasal and sinus disorders
- Asthma management and education
- Laryngo, tracheo or bronchomalacia
- Exercise intolerance/ limitation and shortness of breath
- Bronchopulmonary dysplasia (BPD)

- Oxygen and ventilator dependency
- Chest wall and pulmonary abnormalities or dysfunction
- Aerosol therapy
- Practical procedures and investigations
- Pharmacology and therapeutics

2. Compulsory rotations in the relevant fields for 3-6 months

Clinical training experiences are described below:

1. Intensive Care Units

On this 3 month rotation, the resident shall develop competence in the differential diagnosis and management of the critically ill, and learn to integrate these clinical skills with the biomedical instrumentation of bedside hemodynamic measurements, right heart catheterization, measurement and computation of gas exchange variables, cardiac output determination, and all aspects of mechanical ventilation and airway care. These principles, and those governing fluid therapy, nutritional support, and antimicrobial therapy in severely ill patients, shall be reviewed extensively.

2. Outpatient Services

Pulmonary outpatient training shall be provided during the entire residency in a continuity to review findings and to discuss patient care issues. Residents shall assume primary responsibility for managing their patients

3. Bronchoscopy/PFT Service

Residents shall perform bronchoscopy in a dedicated bronchoscopy suite using state of the art equipment and quickly become proficient at: airway inspection, bronchoalveolar lavage, endobronchial biopsy, transbronchial lung biopsy and transbronchial needle aspiration (TBNA). In addition to performing bronchoscopy, residents shall be instructed in interpreting pulmonary function tests and learn airway mechanics, cardiopulmonary exercise testing, and bronchoprovocation challenge testing.

4. Pulmonary Consultation Service

The resident shall learn to assess all types of primary data that contribute to the accurate diagnosis of lung disease: pulmonary function tests, chest radiographs and computerized tomography, ventilation-perfusion lungs scans, pulmonary histopathology and cytology, and the bacteriology of respiratory pathogens.

5. Lung Transplantation

This popular rotation shall provide residents with an intense introduction to the selection of transplant candidates and the management of these patients after transplantation. Residents shall perform a number of bronchoscopies on lung transplant patients and work with a dedicated group of lung transplant physicians.

6. Sleep Medicine Rotation

The rotation in sleep medicine shall allow residents to learn basic principles of sleep-disordered breathing. Residents will learn a multidisciplinary approach to sleep medicine and learning the basics of sleep physiology and polysomnogram interpretation.

7. Pulmonary Rehabilitation / DOT Rotation

This rotation shall expose residents to issues in rehabilitation of patients with chronic pulmonary diseases as well as the use of non-invasive ventilation in patients with neuromuscular disease and respiratory muscle weakness. Residents shall also be required to maintain currency of knowledge in tuberculosis and chest diseases with special reference to DOT therapy in Pakistan

8. Elective experiences in chest radiology, Cardiology and Thoracic surgery for 1 month each in the relevant departments

RESEARCH/ THESIS WRITING

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, emergency and ward settings
8. Attend genetic clinics and rounds for at least one month.
9. Attend sessions of genetic counseling
10. Self study, assignments and use of internet
11. Bedside teaching rounds in ward
12. OPD & Follow up clinics
13. 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 Physician 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 MD Pulmonology 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 Pulmonology 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 (mentioned in pg. 10).
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 and becoming familiar with Project Professionalism Manual such as that of the American Board of Internal Medicine.
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 may attend the series of lectures on Nuclear Medicine procedures (radionuclide scanning and localization tests and therapy) presented to the Radiology residents.
10. Residents should have experience in the performance of clinical laboratory and radionuclide studies and basic laboratory techniques, including quality control, quality assurance and proficiency standards.
11. Each resident will observe and participate in each of the following procedures, preferably done on patients firstly under supervision and then independently (pg.10)

3. Annual Grand Meeting

Once a year all residents enrolled for MD Pulmonology 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 MD 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: -----

Supervisor -----

Roll No. -----

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

Residents should become proficient in performing the related procedures. After observing the technique, they will be observed while performing the procedure and, when deemed competent by the supervising physician, will perform it independently. They will be responsible for obtaining informed consent, performing the procedure, reviewing the results with the pathologist and the attending physician and informing the patient and, where appropriate, the referring physician of the results.

Procedures Performed

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

Pulmonary 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				

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 degrees for successful completion of courses.

MD PULMONOLOGY EXAMINATIONS**Part-I MD Pulmonology****Total Marks: 200**

All candidates admitted in MD Pulmonology 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 paper:	Paper-I	Paper-II
1. Anatomy	(20 MCQs)	(2 SEQs)
2. Physiology	(20 MCQs)	(2 SEQs)
3. Pathology	(20 MCQs)	(2 SEQs)
4. Biochemistry	(15 MCQs)	(1 SEQ)
5. Pharmacology	(10 MCQs)	(1 SEQ)
6. Behavioural Sciences	(10 MCQs)	(1 SEQ)
7. Biostatistics & Research Methodology	(05 MCQs)	(1 SEQ)

Part-II MD Pulmonology**Total Marks: 430**

All candidates admitted in MD Pulmonology course shall appear in Part II examination at the end of 2nd 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 paper 1

Principles of internal medicine including;

1. Pulmonary Medicine	(10 MCQs)
2. Allergy and Immunology	(10 MCQs)
3. Cardiovascular Illness	(10 MCQs)
4. Endocrinology and Metabolism	(10 MCQs)
5. Ophthalmology & Otolaryngology	(05 MCQs)
6. Infectious Disease	(05 MCQs)

Topics included in paper 2

Principles of internal medicine including;

- | | |
|----------------------------------|-----------|
| 1. Nephrology | (10 MCQs) |
| 2. Neurology | (10 MCQs) |
| 3. Gastroenterology & Hepatology | (10 MCQs) |
| 4. Hematology & Oncology | (10 MCQs) |
| 5. Dermatology | (05 MCQs) |
| 6. Rheumatology | (05 MCQs) |

Components of Part II Examination**Theory:**

Paper 1:	<u>100 Marks</u>	3 Hours
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	

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

Oral & practical/clinical examination shall be held in basic clinical techniques relevant to internal medicine.

OSCE**50 Marks**

10 stations each carrying 05 marks of 10 minutes duration; each evaluating performance based assessment with five of them interactive

Clinical**100 Marks**

Four short cases (15 marks each)	60 Marks
One long case:	40 Marks

Log Book**80 Marks**

Part-III MD Pulmonology**Total Marks: 920**

All candidates admitted in MD 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.

Topics included in paper 1

- | | |
|---|-----------|
| 1. Obstructive lung diseases | (10 MCQs) |
| 2. Occupational disorders | (10 MCQs) |
| 3. Environmental disorders | (10 MCQs) |
| 4. Interstitial & inflammatory lung diseases | (10 MCQs) |
| 5. Tuberculosis (TB) and Opportunistic diseases | (10 MCQs) |
| 6. Depositional & infiltrative disorders | (10 MCQs) |
| 7. Disorders of pulmonary circulation | (10 MCQs) |
| 8. Drug induced lung disorders | (05 MCQs) |

Topics included in paper 2

- | | |
|--|-----------|
| 1. Paediatric Pulmonary medicine | (20 MCQs) |
| 2. Disorders of pleural space, mediastinum & Chest wall | (15 MCQs) |
| 3. Neoplasms of lung | (10 MCQs) |
| 4. Acute respiratory failure | (10 MCQs) |
| 5. Respiratory manifestations of extra-pulmonary disorders | (10 MCQs) |
| 6. Critical care in Pulmonology | (10 MCQs) |

Components of Part III 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

Thesis Examination

200 Marks

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

RECOMMENDED BOOKS

1. Color atlas & text of pulmonary pathology by Cagle
2. Diseases of chest imaging diagnosis based on pattern classification by Matsushima ;2007
3. Handbook of tuberculosis 3 vols-set by Kaufmann; 2008
4. Nunns applied respiratory physiology by Lumb; 2006
5. Respiratory emergencies by Fein; 2006
6. Teaching atlas of chest imaging by Parker; 2006
7. The chest x-ray differential diagnosis in conventional radiology by Burgener ;2006
8. Critical care medicine the essentials by Marini; 2006
9. Irwin & rippe's intensive care medicine by Irwin ; 2008
10. Oh's intensive care medicine by Bersten; 2007
11. The ICU book by Marino; 2007
12. The washington manual of critical care by Kollef; 2008
13. Practical pulmonary & critical care medicine: diseases management by Mosenifar; 2006
14. Pulmonary pathophysiology: the essentials by West;2008
15. Rau's respiratory care pharmacology by Gardenhire; 2008
16. Mechanical ventilation: clinical applications and pathophysiology by Papadakos; 2008