
**CURRICULUM / STATUTES & REGULATIONS
FOR
5 YEARS DEGREE PROGRAMME
IN
OPHTHALMOLOGY
(MS Ophthalmology)**



**UNIVERSITY OF HEALTH SCIENCES,
LAHORE**

STATUTES

1. Nomenclature of the Proposed Course

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

2. Course Title:

MS Ophthalmology

3. Training Centers

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

4. Duration of Course

The duration of MS Ophthalmology 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 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 Ophthalmology shall start from 3rd year onwards in the in recognized institutions.

Part III is structured for 3rd, 4th and 5th calendar years in MS Ophthalmology. It has two components; Clinical and Research. The candidate shall undergo clinical training to achieve educational objectives of MS Ophthalmology (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 Ophthalmology course, the candidate shall be required to have:
 - MBBS degree
 - Completed one year House Job
 - One year experience in Ophthalmology/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 Ophthalmology 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 Ophthalmology 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 Ophthalmology 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 ophthalmic 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 eye and related structures and differentiate those amenable to surgical treatment
- Effectively manage the care of patients with ophthalmological 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 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

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 Ophthalmology
- Facilitate the learning of others.

7. Appreciate ethical issues associated with Ophthalmology:

- 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 Ophthalmology
- 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, Ophthalmology 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 Ophthalmology at secondary and tertiary care level with proficiency in the Basic and applied clinical sciences, intensive care, Emergency (A&E) medicine and Complementary surgical disciplines

1. Describe embryology, applied anatomy, physiology, pathology, clinical features, diagnostic procedures and the therapeutics including preventive methods, (medical/surgical) pertaining to Ophthalmology surgery
2. Develop clinical skills in the medical interview and physical examination

Specialized training in:

Basic Sciences & Optics

- Anatomy & embryology of the eye
- Anatomy of orbit
- Anatomy of ocular adnexae
- Ocular circulation
- Ciliary epithelia & aqueous humour
- Intraocular pressure
- Visual Neuroanatomy
- Accommodation & Presbyopia
- Pupil
- Color vision
- Central visual pathways
- Binocular vision
- Physiology of vision

Optics & Refraction

- Visual Field Testing
- Physical optics
- Geometric optics & clinical refraction
- Contact lenses
- Low vision

Diseases of the Eye

- Anterior Segment Diseases.
- Infection of the ocular adnexa
- Corneal diseases

- Eye banking & keratoplasty
- Lens, cataract & its management.
- Intraocular lenses.
- Glaucoma.

Posterior Segment Diseases

- Hereditary retinal & choroidal diseases
- Acquired macular diseases
- Retinoblastoma & leukokoria
- Diabetic retinopathy
- Retinal Vascular Diseases
- Peripheral retinal neovascularization
- Vitreal diseases
- Uveitis, congenital anomalies & tumour

Diseases of the Orbit

- Orbital & adnexa tumours & treatment
- Tumours & related lesion of the eyelid & conjunctiva
- Lacrimal System Disorders

Oculoplastics

- Basic oculoplastic surgery
- Enucleation & evisceration
- Craniofacial anomalies

Ocular Anaesthesia & Surgeries

- Surface, infiltration, regional anesthesia
- Premedication, sedation for local anesthesia
- Premedication for general anesthesia
- Akinesia & intraocular tension during anesthesia
- Cardio pulmonary complication with anesthesia
- Cardiac arrest & local anaesthetic emergency
- Operative Surgeries

Ocular Diagnostic & Operative Instrument

- Radiology in ophthalmologic diagnosis
- Ultrasonography – A scan & B scan
- Fluorescein angiography.
- Pachymeter
- Autoperimeter
- Autorefractometer
- Applanation tonometry
- Indirect ophthalmoscope
- Recent trends / advances in ophthalmology

Ocular Manifestations of Systemic Diseases:

- Diabetes mellitus
- Hypertension
- Infectious diseases like: - Aids, tuberculosis, sarcoidosis, leprosy, etc.

- Haematological diseases
- Connective tissue disorders
- Hyperlipoproteinemias, amyloidosis
- Inborn metabolic disorders & the eye.
- Genetics & eye diseases.
- Retinal vascular occlusions.

Neuro-ophthalmology

- Ophthalmic manifestation of brain tumours
- Ophthalmic manifestation of vascular diseases of brain.
- Optic nerve disease.
- Migraine

- **Ocular Therapeutics & Toxicity**
- **Ocular Emergency & Trauma**
- **Pediatric Ophthalmology**
- **Community Ophthalmology**

Surgical management of common eye disorders:

- Injuries of eye
- Foreign body in eye
- Malignancy of eye
- Diabetic and Hypertensive retinopathy
- Sty
- Chalazion
- Blepharitis
- Cellulitis
- Corneal Ulcer
- Keratomalacia
- Scleritis, and Episcleritis
- Choroiditis
- Iridocyclitis
- Cataract
- Glaucoma
- Trachoma
- Vitreous Haemorrhage
- Optic Neuritis
- Retinal Detachment
- Myopia
- Hypermetropia
- Astigmatism
- Presbyopia
- Diplopia
- Squint
- Proptosis
- Epiphora
- Dacryocystitis
- Dacryoadenitis
- Comitant Deviations
- Noncomitant Deviations

- Strabismus Surgery
- Ocular hazards in Agriculture and Industry

Recent advances in surgical management of eye disorders

- Manual small incision cataract surgery.
- Phacoemulsification
- Newer intraocular lens implant
- Recent advances in diagnostic procedures, surgical management of glaucoma
- Recent advances in lasers in ophthalmology
- Recent advances in vitreous substitutes & perfluorocarbons
- Recent advances in retinal detachment surgery
- Recent advances in ultrasonography
- Recent advances in indocyanine green angiography
- Recent advances in optical coherence tomography
- Newer antibiotics, antifungals & antivirals
- Refractive surgery
- Retinal detachment & its managements
- Vitreo-retinal surgery
- Phacomatosis
- Corneal ulcers & its management
- Allergic conjunctivitis
- Keratoplasty & eye banking
- Lasers in ophthalmology
- Congenital cataract & its management
- Proptosis & its management
- Radiology in ophthalmology diagnosis
- Fluorescein angiography
- Use of various dyes in ophthalmology.

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.

REGULATIONS

1. Scheme of the Course

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

Course Structure	Components	Examination
Part I	<p>Basic Medical Sciences Anatomy, Physiology, Biochemistry, Pathology, Pharmacology, Behavioural Sciences and Biostatistics & Research Methodology</p>	<p>Part-I examination at the end of 1st year of MS Ophthalmology programme</p> <ul style="list-style-type: none"> • Written: Paper I: MCQs Paper II: SEQs
Part-II	<ul style="list-style-type: none"> • Fundamental Concepts in Surgery : Training in basic clinical techniques of Surgery with compulsory rotations for two years starting from first day of enrollment 	<p>Part-II examination at the end of 2nd year of MS Ophthalmology 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 Ophthalmology : Training in Ophthalmology during 3rd, 4th & 5th year of MS Ophthalmology programme Three years of training with compulsory & optional rotations in relevant fields <p style="text-align: center;"><u>Research component of Part III</u> 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 Ophthalmology at the end of 5th year of MS Ophthalmology 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 Ophthalmology programme.</p>

2. Examinations

Part-I Examination

1. All candidates admitted in MS Ophthalmology course 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 Ophthalmology (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 MS Ophthalmology course 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 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 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 Ophthalmology 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	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 MS Ophthalmology 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 Ophthalmology Degree

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

CONTENT OUTLINE

Part I MS Ophthalmology

Basic Sciences:

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

1. Anatomy

- *Clinical and functional anatomy with pathological and operative relevance*
- *Surgical approaches to the orbital cavity and related cranial structures*
- *Histology and embryology of eye, orbit and other related 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.

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, neck, trunk and limbs. Common developmental anomalies associated with this.

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. Concept of critical periods

Organs of Special Senses

- Development of special sense organs and common developmental anomalies of the eye
- Basic mechanisms of vision

The Eye / Orbit

- Walls, bony constituents and salient morphological features.
- Disposition of the contents of the orbit including muscles, nerves and vessels. Structure and function of eyelids.
- Conjunctival sac, lacrimal gland and lacrimal apparatus, structure and functions
- Orbicularis oculi muscle, attachments, nerve supply and functions.

Eyeball

- Tunics of the eyeball and their anatomical constituents.
- Microscopic anatomy of cornea and lens, layers of retina.
- Chambers of the eye, boundaries and contents.
- Formation, circulation and functions of aqueous humour, sinus venous sclerae (canal of Schlemm), filtration angle.
- General morphological and structural features of refracting media.
- Blood supply of retina.
- The visual pathway and effect of lesions at different levels.
- Pupillary light reflex and its pathway.
- Accommodation, its mechanism and pathway.
- Colour vision and colour blindness.
- Photopic, scotopic and binocular vision.
- Field of vision and stereoscopic vision.

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
- Histological picture of
 - Conjunctiva
 - Cornea
 - Sclera
 - Limbus and aqueous outflow pathways

- Iris and pupil
- Lens and zonular apparatus
- Ciliary body
- Choroid
- Retina and retinal pigment epithelium and associated structures
- Vitreous
- Optic nerve

Surface and Imaging Anatomy

- Embryology of the eye
- Anatomy of the skull
- The orbital cavity
- The nasal sinus and its relation with the orbit and eye ball
- The eye ball
- Internal structure of the eye ball
- Movements of eye ball and extra ocular muscles
- The blood supply of the orbit
- The blood supply of the eye ball
- The optic nerve and its connection with the brain
- The motor and sensory nerves of the orbit and eye ball
- The Autonomic nervous system
- The visual pathways
- The association areas of the brain
- Cranial nerves
- Pituitary gland and sella turcica
- Cavernous sinus
- Carotid vessel and circle of Willis
- Higher centers

2. Physiology

- Physiology of eyelids
- Lacrimal apparatus
- Cornea
- Somatosensory features of the eye
- Extra ocular muscles
- Ocular circulation
- The ciliary epithelia and aqueous humour
- Intra ocular pressure
- Visual acuity
- Accommodation
- Pupillary reflexes
- Light detection and dark adaptation
- Colour vision
- Visual fields and visual pathways (including retinotopic organization)
- Processing of light stimuli
- Contrast sensitivity
- Eye movements
- Stereopsis
- Motion detection
- Visual perception

- Electrophysiology of the visual system
- The physiology of vitreous
- The physiology of lens
- The papillary reaction
- The physiology of vision
- Visual acuity
- Colour vision
- Retinal physiology
- Optic nerve
- The visual pathways
- The binocular vision
- Higher visual functions
- Visual cortex
- Ocular movements controls in the brain

3. Pharmacology

- The Evolution of Medical Drugs
- British Pharmacopoeia
- Receptors
- Mechanisms of Drug Action
- 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
- Pharmacology of common ophthalmological drugs
 - Cholinergic and adrenergic systems
 - Drug control of intraocular pressure
 - Serotonin
 - Histamine
 - Anti-inflammatory agents
 - Anti-infective agents
 - Immunosuppressants
 - Local anaesthetics
 - Analgesics
 - Mechanisms of drug toxicity and drugs which specifically cause ocular toxicity

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
- Molecular and Cell Biology
 - Cell organelles, receptors and receptor signaling
 - Plasma membrane
 - Cytoskeleton and its relation to cell motility and contractility
 - Nucleus
 - Cell-cell communication
 - Protein synthesis – pre – and post-transcriptional and translational control
 - Molecular biology of protein synthesis
 - Receptor Biochemistry
 - Secondary messengers and intracellular signaling
 - Understanding of molecular biological techniques (also in relation to genetics) including: Polymerase chain reaction
 - Northern and Southern Blotting
 - In situ hybridization
 - Extracellular matrix (particularly with respect to ocular structures)
 - Collagen synthesis – types and function
 - Proteoglycans, glycoproteins, fibronectin, laminin and glycosaminoglycans
 - Retinal neurochemistry

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.
- Pigment Metabolism
- Causes of pigmentation and depigmentation.
- Disorders of pigment metabolism, inherited disorders, acquired disorders from deficiency or excess of vitamins, minerals, fats, carbohydrates, proteins etc.
- 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 organ systems related to the practice of ophthalmology

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

Genetics

- Oncogenes, and genetics of malignancy (including retinoblastoma)
- Inherited ocular disease : including for example retinitis pigmentosa, aniridia, choroidaemia, stationary night blindness, Norrie's disease
- Genetics of ocular disorders and of general conditions which contain an ocular component
- Principles of gene therapy

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
- Normal and abnormal microbiology of bacterial, viral & parasitical infections
- 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 and interpret the results
- Swab collection/transfer and inoculation
- Gram staining
- Biopsy-collection and transfer
- Basics in allergy and immunology

Special Pathology

- Infections of the ocular tissues
- Bacterial
- Viral
- Fungal infection of
 - Conjunctiva
 - Corneal
 - Eye coats
 - Orbit
 - Cavernous sinus
 - Meninges
 - Metastatic infections
 - Para nasal sinus infection
- Sympathetic ophthalmitis
- Conjunctival/corneal and scleral pathology

- Lid pathology
- Pathology of the lens
- Pathology of Glaucoma
- Retinal pathologies and Retinopathies
- Pathology of the optic nerve
- Congenital anomalies and abnormalities
- AIDs
- Specific viral pathologies
- Tumours of the lids and adnexa
- Ocular tumours
- Orbital tumours
- Metastatic tumours of the eye and orbits
- Tumours directly invading orbits
- Drug reactions and eye
- Ocular involvement in systemic diseases
 - Diabetes Mellitus
 - Hypertension
 - Leukemias
 - Anaemia
 - Connective tissue disorders
 - Endocrine disorders
 - Ocular involvement in CNS disease process
 - Brain and pituitary tumours, Rathke's pouch
 - Demyelinating disease
 - Aneurysm
 - Raised intra cranial pressure
 - Ordering relevant investigation

Immunology

- Eye transplantation and pathophysiology of allograft rejection

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
- 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 Ophthalmology

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
- Management of Head Trauma and injury
- Coma and Glasgow coma scale
- Nutrition and metabolism
- Principles of burn management
- Principles of surgical oncology
- 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
- Referral to appropriate surgical subspecialties

Technical Skills

- Central venous line insertion
- Chest drain insertion
- Bleeding diathesis & corrective measures, e.g. warming, packing
- Clotting mechanism; Effect of surgery and trauma on coagulation
- Tests for thrombophilia and other disorders of coagulation
- Methods of investigation for suspected thromboembolic disease
- Anticoagulation, heparin and warfarin
- Role of V/Q scanning, CT angiography and thrombolysis
- Awareness of symptoms and signs associated with pulmonary embolism and DVT
- Role of duplex scanning, venography and d-dimer measurement
- Initiate and monitor treatment

Diagnosis and Management of Common Surgical Conditions:

- Child with head or eye related pain
- Vomiting child
- Trauma
- 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*

Part III MS Ophthalmology

Clinical Component

Students should be familiar with typical clinical presentation, key physical findings, radiological findings and differential diagnosis, initial treatment, and referral indications in ophthalmology.

Optics and Refraction

- Physical optics
- Geometric optics
- Clinical optics
- Properties of Light and its application to human eye
- Prisms
- Spherical and astigmatic eye
- Aberration of the optical system
- Accommodation and its disorders
- Aphakia and Pseudophakia
- Presbyopia
- Reduced eye
- Instruments
- Autorefractometer
- Retinoscope
- Ophthalmoscope
- Microscopes
- Lasers
- Keratorefractive surgery principle
- Contact Lenses

Trauma and Emergency Ophthalmology

- Superficial ocular trauma: including assessment and treatment of foreign bodies, abrasions and minor lid lacerations
- Severe blunt ocular injury: management of hyphaema - recognition and initial management of more severe injury.
- Severe orbital injury: recognition and initial care of corneal and scleral wounds; recognition of aqueous leakage and tissue prolapse.
- Retained intraocular foreign body; anticipation from history, confirmation of X-ray and CT scan.
- Sudden painless loss of vision; recognition of retinal arterial occlusion, central retinal vein occlusion, acute ischaemic optic neuropathy, optic neuritis, urgency of treatment.
- Severe intraocular infection; recognition and initial investigation and management of hypopyon.
- Acute angle closure glaucoma; recognition and acute reduction of intraocular pressure.
- Liaisons with Radiological department, Microbiologist, ENT and Faciomaxillary surgeons.

Disorders of the lids, lacrimal drainage apparatus, orbit and oculoplasty

- Abnormal lid position; including assessment of ectropion, entropion, ptosis, trichiasis, lagophthalmos and exposure.
- Abnormal lid swelling, including chalazion, sty, retention cysts, papilloma and basal cell carcinoma.
- The watering eye, including the distinction between excessive lacrimation and epiphora, blepharitis, recognition and investigation of nasolacrimal obstruction.
- Orbital swelling, including dysthyroid eye disease, distinguishing intraconal from extraconal space occupying lesions, orbital cellulitis, recognition of compressive optic neuropathy.
- Sebaceous carcinoma of lid and squamous cell carcinoma
- Cicatricial malposition of the lids
- Management of ptosis and blepharospasm
- Canaliculus repair
- Dacryocystorhinostomy
- Orbital and lacrimal tumours and their treatment
- Inflammatory orbital and lacrimal diseases and their treatment
- Paranasal sinus disease
- Use of radiographs, MRI, CT scan
- Enucleation, evisceration and fitting of prosthesis
- Exenteration
- Liaison with Neurosurgeons, ENT, Endocrinologists and orbit reconstruction Services.

External eye disease, sclera, cornea and anterior segment

- External disease, including viral, bacterial and chlamydial conjunctivitis.
- The dry eye, including symptoms, assessment of reduced tear production and tear film stability and treatment.
- Allergic and atopic eye disease recognition and management.
- Corneal ulceration from viral and bacterial disease, marginal keratitis.
- Complications of contact lens wear.
- Corneal oedema, opacity and ectasia, indications for corneal transplantation, standards of care in donor eye procurement, signs of corneal graft rejection and other complications.
- Episcleritis, recognition and management.
- Anterior uveitis, including classification, differential diagnosis, systemic associations, investigations and treatment.
- Liaison with microbiology, immunology
- Acanthamoeba keratitis and fungal keratitis
- Cicatricial conjunctival disease.
- Punctal occlusion
- Corneal topography and specular microscopy
- Corneal stromal dystrophies, interstitial keratitis.
- Corneal biopsy, indications.
- Chemical injury of the cornea and conjunctiva.
- Therapeutic contact lenses and their complications.
- Corneal transplantation, immunology of rejection.
- Limbal stem cell transplantation.

- Autoimmune corneal and scleral disease including peripheral ulcerative keratitis.
- Use of immunosuppressive therapies.
- Management of pterygium.
- Conjunctival and uveal tumours.
- Aniridia and other dysgenesis.
- Fuch's heterochromic cyclitis.

Optics and refraction, contact lens and low vision aids

- Ametropia, including hypermetropia, myopia, astigmatism and their complications.
- Accommodation problems, including spasm and presbyopia.
- Knowledge of contact lens fitting, indications, management and complications.
- Low vision aids services and rehabilitation of a low vision patient.
- Basis of spectacle intolerance from poor dispensing or defective prescription.
- Use of log MAR charts in assessment of acuity.
- Alternatives to capsular IOL fixation.
- Combined cataract and glaucoma/corneal transplantation surgery.
- Ectopia lentis and Marfan's syndrome.
- Contact lenses and refractive surgery.
- Therapeutic contact lenses.
- Fluidics and ultrasonics.
- Intraocular lens design and biomaterials.

Disorders of lens and glaucoma

- Lens opacifications, including types of cataract, relationship of opacity to symptoms, contribution to visual loss in co-morbidities, systemic associations, cataract surgery and its complications.
- Pseudoexfoliation of the lens capsule, including its recognition and significance.
- Calculation of intraocular lens power, according to the patient's needs.
- Glaucomatous optic neuropathy, recognition and investigation.
- Glaucoma suspects, including ocular hypertension.
- Rubeotic glaucoma recognition, differential diagnosis and management.
- Hypotensive agents, topical and systemic drugs affecting intraocular pressure and their complications.
- Glaucoma drainage surgery, indications, complications and their treatment.
- Hypotony, including its causes and consequences.
- Risk factors for primary open-angle and normal-tension glaucoma
- Other secondary glaucomas, including phacolytic, pigmentary, erythroclastic, pseudo-exfoliative and silicone-oil glaucomas.
- Posner Schlossman syndrome.
- Chronic closed angle glaucoma.
- Malignant glaucoma
- Tonopen, Perkins and non-contact tonometry.
- Scanning laser ophthalmoscopy and nerve fibre layer analysis
- Argon laser trabeculoplasty
- Prevention of glaucoma bleb failure e.g. using anti-metabolites
- Drainage tubes and stents.

- Cycloablation.

Vitreoretinal disorders

- Diagnosis and management of anterior, intermediate and posterior uveitis
- Flashes and floaters, complications of posterior vitreous detachment and recognition of retinal tears.
- Vitreous haemorrhage, from retinal tears or neovascularization - initial management.
- Retinal detachment, classification, predisposition, recognition and urgency of treatment, recognition of proliferative vitreoretinopathy.
- Diabetic retinopathy, classification, screening strategies, management.
- Hypertensive and arteriosclerotic retinopathy, including macroaneurysms and branch retinal vein occlusion.
- Retinal vascular occlusions, recognition of ischaemic and exudative responses, rubeosis.
- Macular diseases, including recognition of age related maculopathy, subretinal neovascularization, cystoid macular oedema, macular hole, related symptomatology and urgency of treatment.
- Fluorescein angiography, indications, complications and interpretation.
- Fundus imaging including scanning laser ophthalmoscopy.
- Indocyanine green angiography.
- Electro diagnostic tests and dark adaptation.
- Genetic retinal disease, retinal dystrophies, retinoblastoma
- Differential diagnosis and treatment of malignant melanoma.
- Macular laser photocoagulation, principles and laser safety.
- Toxic maculopathy and central serous retinopathy.
- Intraocular lymphoma.
- Intermediate and posterior uveitis, toxoplasmosis, toxocara and sympathetic ophthalmia, retinal vasculitides.
- Coats' disease, other telangiectasis and the retinal phakomatoses.
- AIDS-related opportunistic infections and anti-AIDS treatment
- B-Scan ultrasound for opaque media.
- Vitreoretinal surgery, including closed intraocular microsurgery, scleral buckling and internal tamponade.
- Intraocular foreign body, complications and management.
- Other vasoproliferative vitreoretinopathies including sickle cell retinopathy, retinopathy of prematurity, Eales' disease.
- Genetic vitreoretinal disease-Stickler syndrome, X-linked retinoschisis.
- Asteroid hyalosis
- Choroido-retinal coloboma

Disorders of the optic nerve and visual pathways- Neurophthalmology

- Swollen optic disc, differential diagnosis, recognition and evaluation of papilloedema, ischaemic optic neuropathy (arteritic and non-arteritic), acute optic neuritis and congenital optic disc anomalies.
- The atrophic optic disc, recognition and differential diagnosis, clinical evaluation of optic nerve function.
- Visual pathway disorders, identification of site and nature of lesion from history, examination and investigations, transient ischaemic attacks.

- Examination of cranial nerve palsies particularly III, IV, VI, VII and V nerve
- Benign intracranial hypertension
- Compressive optic neuropathy
- Optic nerve glioma
- Chiasmal lesions
- Visual evoked responses
- Neuro-imaging including CT, MRI and carotid Doppler
- Carotid endarterectomy
- Multiple sclerosis and its ophthalmic manifestations
- Higher cortical dysfunction, including the visual agnosias.

Strabismus and paediatric Ophthalmology

- Concomitant strabismus, screening strategies, epicanthus, accommodative aspects, interpretations of orthoptic report, indications for surgery.
- Amblyopia, anisometropic, stimulus-deprivation, strabismic prevention and treatment using occlusions.
- Incomitant strabismus, cranial nerve palsies including diabetic mononeuropathies, significance of painful third nerve palsy and of pupil sparing, prediction of post operative diplopia.
- Approach to infants, children and their parents.
- Ophthalmia neonatorum, diagnosis and management.
- Congenital nasolacrimal obstruction; recognition and management
- Ametropia in children, significance and treatment
- The apparently blind infant, normal and delayed visual maturation
- Paediatric cataract surgery and paediatric glaucoma.
- Nystagmus
- Ocular motility syndromes (duane's, brown's)
- Use of botulinum toxin
- Ocular myopathies and the neuromuscular junction
- Supranuclear eye movement disorders
- Fresnel prisms
- Oblique muscle, vertical muscle and adjustable suture surgery
- Electromyography.
- Assessment of vision in children, fixation, preferential looking, single and linear optotype tests.
- Cycloplegic refraction and prescribing for children.
- Fundoscopy in children.
- Ocular albinism Congenital nystagmus
- Congenital glaucoma, diagnosis and management.
- Congenital cataract, diagnosis and management including prevention of amblyopia.
- Leucocoria, differential diagnosis including retinoblastoma.
- Retinopathy of prematurity, screening and treatment.
- Paediatric neurological diseases.
- Ophthalmic signs of child abuse
- Orbital Cellulitis presenting in children.
- Orbital tumours in children, including rhabdomyosarcoma.

Diagnostic Ophthalmology

- Ultra sound A and B scan
- Visual fields examination
 - Manual
 - Automated
- Orthoptics and use of amblyoscope
- Lees and Hess charting
- Maddox wing and rod testing
- Prisms use
- Fundus angiography
- Low vision aids and tool

Neurology

- Assessment of neurological patient for level of consciousness
- Higher cerebral function
- Cranial nerve assessment
- Posture and gait
- The Unconsciousness
- Headache and allied disorders
- Raised intra cranial pressure
- Benign intra cranial hypertension
- Transient loss of vision
- Pupillary disorders
- Facial Pain
- Head injury
- Intra cranial tumours
- Hydrocephalus
- Nystagmus
- Cerebellar disorders

Radiology

- Interpretation of a radiograph
- Radiography of Orbit
- Radiography of the skull
- Radiography of the Lacrimal passages
- Limbs and spine
- Ultra sound of the eye ball and orbits, both A and B scan
- Orbital and brain CT
- MRI
- Other imaging techniques

Common Ophthalmic Skills and Procedures

- On completion of the initial training in Part I, the trainees will be competent in all aspects of the basic, operative and non operative care of surgical patients
- During Part II training, they will understand the importance of ophthalmic care and management with particular reference to common ophthalmological presentations recognizing and preventing secondary disorders. They will be capable of resuscitating, assessing and initiating the surgical management of patients deteriorating as a result of local and systemic complications. They will

demonstrate sound judgment when seeking more senior support, prioritizing medical interventions and escalating the level of medical care.

General surgical care:

- Administration of antibiotics in the surgical patient
- Use of blood and its products
- The role/complications of diathermy
- Pain relief in surgery
- Thrombo-embolic episodes
- Prevention and management
- Wound care and nosocomial infection
- Suture techniques and materials
- Initial assessment and management

Specialized Surgical Skills

- Anesthesia and Akinesia for ophthalmic procedure
- The eyelids and reconstructive eye surgery
- Surgery of Lacrimal apparatus
- The extra ocular muscles and strabismus surgery
- Surgical procedure on conjunctiva, sclera and cornea
- Surgery of Iris, ciliary body and choroid
- Lens surgery and cataract
- Surgical management of glaucoma's
- Vitreoretinal surgery
- Management of ocular trauma and orbital surgery

Following clinical skills should be taught to the students

- Clinical approach
- Ophthalmic examination
- Ocular movements
- Pupillary reflexes
- Cover Tests
- Corneal sensations
- Regurgitation test and syringing
- Confrontation perimetry
- Digital and other methods of tonometry
- Measurement of corneal diameters
- Biometry
- Instrument for diagnosis

Should be able to use the instruments with expertise

- Slit Lamp
- Anterior segment and fundus camera
- Direct and Indirect Ophthalmoscope
- Colour vision testing equipment
- Bjerrum's screen/perimeter
- Automated field analyzer
 - A scan
 - B scan
- Gonioscope

Part-III Thesis Component (Fifth year of MS Ophthalmology 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 Ophthalmology 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 Ophthalmology 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 Ophthalmology 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 related essential cases and observe and participate in each of the following procedures, preferably done on patients under supervision initially and then independently. (pg. 38)

3. Annual Grand Meeting

Once a year all residents enrolled for MS Ophthalmology 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 Ophthalmology Examinations

Part I MS Ophthalmology

Total Marks: 200

All candidates admitted in MS Ophthalmology 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	(15 MCQs)	(1 SEQs)
5. Pharmacology	(15 MCQs)	(1 SEQ)
6. Behavioural Sciences	(05 MCQs)	(1 SEQ)
7. Biostatistics & Research Methodology	(05 MCQs)	(1 SEQ)

Part II - MS Ophthalmology

Total Marks: 430

All candidates admitted in MS Ophthalmology 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
10 SEQs (No Choice; 05 marks each)	50 Marks	
50 MCQs	50 Marks	

Paper 2:

10 SEQs (No Choice; 05 marks each)
50 MCQs

100 Marks**3 Hours**

50 Marks

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.

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 (each 15 marks)
One long case:

60 Marks

40 Marks

Log Book**80 Marks**

Part III MS Ophthalmology**Total Marks: 920**

All candidates admitted in MS Ophthalmology 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 Ophthalmology**Clinical Examination****Total Marks: 720****Topics included in paper 1**

- | | |
|--|-----------|
| 1. External eye disease, sclera, cornea and anterior segment | (15 MCQs) |
| 2. Disorders of the lids, lacrimal drainage apparatus, orbit and oculoplasty | (15 MCQs) |
| 3. Trauma and emergency ophthalmology | (15 MCQs) |
| 4. Optics and refraction | (15 MCQs) |
| 5. Diagnostic ophthalmology | (15 MCQs) |

Topics included in paper 2

- | | |
|---|-----------|
| 1. Disorders of the optic nerve and visual pathways and neurophthalmology | (15 MCQs) |
| 2. Vitreoretinal disorders | (15 MCQs) |
| 3. Disorders of lens and glaucoma | (15 MCQs) |
| 4. Optics, refraction, contact lens and low vision aids | (15 MCQs) |
| 5. Strabismus and paediatric ophthalmology | (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	

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

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)
One long case:

100 Marks
100 Marks

Log Book

120 Marks

Part III MS Ophthalmology
Thesis Examination
Total Marks: 200

All candidates admitted in MS Ophthalmology 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

Anatomy

1. Snell R. S., Lemp M. A. *Clinical Anatomy of Eye.*
2. *Wolf's Anatomy of the Eye*
3. Newell F. W. *Ophthalmology Principles and Concepts.*

Optics and Refraction

1. Elkington A. R., Frank H. J., Greaney M. J. *Clinical Optics.*
2. Duke-Elder. **Practice of Refraction.**

Physiology

1. Guyton. *Textbook of Medical Physiology.*
2. Newell F. *Ophthalmology Principles and Concepts.*
3. *Adler's Physiology of the Eye.* (For reference)

Pathology

1. Apple D. J., Rabb M. F. *Ocular Pathology.*
2. Gree. *Ocular Pathology.*
3. Kanski J. J. *Clinical Ophthalmology.*

Ophthalmic Surgery

Newell F. W. *Ophthalmology Principles and Concepts*

Ophthalmic Surgery

Willshaw H. *Practical Ophthalmic Surgery.*
Bailey and Love. *Short Practice of Surgery.*

Rana M. H., Ali S. Mustafa M. *A Handbook of Behavioural Sciences for Medical and Dental Students.* Lahore: University of Health Science; 2007.

Fathalla M. F. and Fathalla M. M. F. *A Practical Guide for Health Researcher.* Cairo: World Health Organization; 2004.

Journals

1. Archives of Ophthalmology (AMA USA)
2. British Journal Of Ophthalmology (UK)
3. Journal Of Oculoplastics and Reconstructive Surgery (USA)
4. Retina (USA)
5. Eye RC Ophth (UK)