THE TAMIL NADU Dr. M.G.R. MEDICAL UNIVERSITY, CHENNAI-600 032.

REGULATIONS FOR
BACHELOR OF OPTOMETRY DEGREE COURSE

Regulations of the University

In exercise of the powers conferred by Section 44 of The Tamil Nadu Dr. M.G.R. Medical University, Chennai , Act, 1987 (Tamil Nadu Act 37 of 1987), the Standing Academic Board of the Tamil Nadu Dr. M.G.R. Medical University, Chennai, hereby makes the following regulations.

1. SHORT TITLE AND COMMENCEMENT:

These regulations shall be called "THE REGULATIONS FOR THE Bachelor of OPTOMETRY DEGREE COURSE OF THE TAMIL NADU Dr. M.G.R. MEDICAL UNIVERSITY, CHENNAI".

They shall come into force from the academic year 2008 -2009 session.

The regulation and syllabi are subject to modifications by the Standing Academic Board from time to time.

2. ELIGIBILITY FOR ADMISSION:

(a) A candidate desiring to join the four year programme leading to the Bachelor of Optometry Degree course should have passed the HSC / CBSE / ISC or equivalent examination with

i Physics, Chemistry, Biology and Mathematics subjects taken together at the qualifying examination after a period of 12 years of study.

ii A pass in English with a minimum of 35% marks is mandatory for all categories for admission to the course.

(b) A candidate shall, at the time of admission, submit to the Head of the Institution, a Certificate of Medical Fitness from an authorized Medical Officer certifying that the candidate is physically fit to undergo the academic course and does not suffer from any disability or contagious disease.

3. AGE LIMIT FOR ADMISSION:

Every candidate should have completed the age of 17 years as on 31st December of the year of admission.

4. ELIGIBILITY CERTIFICATE:

The candidates who have passed any qualifying examination other than the Higher Secondary Course examination conducted by the Government of Tamil Nadu shall obtain an Eligibility Certificate from the University by remitting the prescribed fees along with the filled in Application Form (which can be downloaded from the University website (www.tnmmu.ac.in),

Mark Sheet, Transfer Certificate and other relevant documents required by the University before seeking admission to any one of the affiliated Institutions.

5. REGISTRATION:

A candidate admitted to the Bachelor of Optometry Degree Course in any one of the affiliated Institutions of this University shall register his / her name in the prescribed application form for registration duly filled along with the prescribed fee and a declaration in the format, (as in Annexure) to the Academic Officer of this University through the affiliated Institution within 60 days from the Cut-off date prescribed for Bachelor of Optometry Degree Course for admission.

6. DURATION OF THE COURSE:

The duration of the Bachelor of Optometry Degree course shall be three academic years and one year internship.

7. COMMENCEMENT OF THE COURSE:

The course shall commence ordinarily from 1st August of the academic year.

8. COMMENCEMENT OF THE EXAMINATIONS:

Regular Examinations will commence from 1st August and supplementary Examinations will commence from 1st February.

If the date of commencement of the examination falls on Saturday, Sunday or declared Public Holidays, the examination shall begin on the next working day.

9. CUT-OFF DATES FOR ADMISSION TO THE EXAMINATION:

The Candidates admitted upto 30th September shall be registered to take up their 1st year examination during August of the next year.

All kinds of admissions shall be completed on or before 30th September of the academic year. There shall not be any admissions after 30th September even if seats are vacant.

10. MEDIUM OF INSTRUCTION:

English shall be the medium of instruction for all subjects of study and examinations will be conducted only in English.

11. CURRICULUM:

The Curriculum and the Syllabi for the course shall be as prescribed by the University from time to time.

12. WORKING DAYS IN AN ACADEMIC YEAR:

Each academic year shall have a total of 200 working days.

13. ATTENDANCE REQUIRED FOR ADMISSION TO EXAMINATIONS:

(a) No candidate shall be permitted to appear for the University examinations, unless he/she attends the course for the prescribed period and produces the necessary certificate of attendance and satisfactory conduct from the Head of the Institution.

(b) Every candidate is required to put in a minimum of 75% of attendance both in theory and practical separately in each subject for admission to the examination.

(c) A candidate lacking in the prescribed attendance in any subject in theory and /or practical shall not be admitted to the entire examination.

14. CONDONATION OF LACK OF ATTENDANCE;

There shall be not condonation of lack of attendance.

15. INTERNAL ASSESSMENT:

(a) A minimum of two written internal assessment examinations shall be conducted in each subject during a semester and the average marks of two examinations shall be taken into consideration for the award of internal marks.

(b) A minimum of two practical examinations shall be conducted in each subject (wherever practical have been included in the curriculum) and the average marks of these two examinations shall be taken into consideration for award of internal marks in practicals.

(c) A candidate failed in any subject in the University examination shall be provided an opportunity to improve his/her internal assessment marks by conducting a minimum of two examinations in theory and two practicals separately.

16. SUBMISSION OF LABORATORY RECORD NOTE BOOKS:

At the time of practical examination, each candidate shall submit to the examiners his / her laboratory note books duly certified by the Head of the Department as a bonafide record of the work done by the candidate.

In practical record shall be evaluated by the concerned Head of the Department (Internal Evaluator) and the practical record marks shall be submitted to the University 15 days prior to the commencement of the theory Examinations.

In respect of failed candidates the marks awarded for record at previous examination will be carried over for the subsequent examination. The candidates shall have the option to improve his performance by submission of fresh records.

17. CARRY-OVER OF FAILED SUBJECTS:

(a) Candidates shall be permitted to undergo study in the second year carrying not more than two University Examination subjects in the first year.

(b) Candidates shall be permitted to undergo study in the third year only after passing all the prescribed subjects of the first year.

However, the candidates are permitted to carry not more than two University Examinations and two internal subjects of the second year.

(c) Candidates shall be permitted to undergo internship only after passing all the subjects.

18. MARKS QUALIFYING FOR A PASS:

A candidate shall be declared to have passed the examination if he/she obtains the following minimum qualifying marks:-

50% of Marks in the University Theory Examination.

50% of Marks in the University Practical Examination.

50% of Marks in aggregate in Theory, Practical, I.A. & Oral.

19. CLASSIFICATION OF SUCCESSFUL CANDIDATES:

The candidate should have appeared for Theory Practical and Oral Examinations for securing a pass in a subject.

The names of first ten University Rank Holders will be published in the University Website.

20. REVALUATION / RETOTALLING OF ANSWER PAPERS:

There is no provision for revaluation of the answer papers of failed candidates in any examination. However, the failed candidates can apply for retotalling / revaluation.

21. MIGRATION / TRANSFER OF CANDIDATES:

Migration / Transfer of Candidates from one recognized institution to another recognized institution of this University shall be granted on the following conditions:-

a) All migrations / transfers are subject to the approval of the Vice-Chancellor.

b) Transfer shall be effected only at the beginning of the academic year.

c) The transfer application should be sent through proper channel to the Academic Officer within three months of publications of the results or admission to the course.

d) Transfers shall be effected during any year of study after fulfillment of the regulations of this University.

e) The Vice-Chancellor has been empowered to decide and issue transfer from one college to another college, subject to verification of the vacancy position available in the college

without contravention to the statutory rules of the Central Council and such transfers permitted by the University be placed in the Governing Council for information.

f) The provision of combination of attendance shall be granted to the transfers for admission to the examination of the University on satisfactory fulfillment of the regulations of this University.

22. RE-ADMISSION AFTER BREAK OF STUDY:

As per the University common Regulations for Re-admission after break of study for all courses (As approved by the Standing Academic Board in its XXVI Meeting on 16.12.2003).

23. VACATION:

Six Weeks in an academic year.

24. PATTERN OF QUESTION PAPER FOR UNIVERSITY EXAMINATION:

Theory:

2 Essays (20 Marks each)	2 x 20 Marks	= 40 Marks
10 Short Notes (6 Marks each)	10 x 6 Marks	= 60 Marks
	Total	100 Marks

Bachelor of Optometry

25. SCHEME OF EXAMINATION

FIRST YEAR
(200 Working days)*

S. No.	Subject Title	I A	University Exam	Practical/ Viva Voce	Total
1.	Mathematics I & II	20	80	-	100
2.	Physical and Geometrical Optics (I & II)	20	80	50	150
3.	General Anatomy and General Physiology	20	80	50	150
4.	Ocular Anatomy and Ocular Physiology	20	80	50	150
5.	Basic Biochemistry (I & II)	20	80	-	100
6.	Computing and Computer Applications	20	80	50	150
7.	Nutrition	20	80	50	150
8.	Principles of Lighting	20	80	-	100

Internal Papers:

9. Functional English and Communication
10. Management Principles and Basic Accountancy
11. Hospital Procedures

SECOND YEAR

(200 Working days)*

S. No.	Subject Title	I A	University Exam	Practical / Viva Voce	Total
1.	Optometric Optics (I & II)	20	80	-	100
2.	Ocular Diseases (I & II)	20	80	-	100
3.	Visual Optics I	20	80	50	150
4.	Pharmacology	20	80	-	100
5.	Pathology and Microbiology	20	80	-	100

Internal Papers:

6. Marketing and Consumer Behaviour
7. Optometric Instruments
8. Clinical Examination of Visual System
9. Clinical Psychology
10. Clinics (I & II)

THIRD YEAR

(200 Working days)*

S. No.	Subject Title	I A	University Exam	Practical/ Viva Voce	Total
1.	Binocular vision	20	80	-	100
2.	Glaucoma	20	80	-	100
3.	Low Vision Aids	20	80	50	150
4.	Dispensing Optics	20	80	50	150
5.	Paediatric Optometry and Geriatric Optometry	20	80	-	100
6.	Contact Lens	20	80	-	100
7.	Law & Optometry and Occupational Optometry	20	80	-	100

Internal Papers:

8. Systemic Diseases
9. Epidemiology and Bio Statistics
10. Public Health and Community Optometry
11. Clinics and Special Clinics (I & II)
12. Project

FOURTH YEAR – INTERNSHIP

Course objectives:

This programme will enable those passing out to become Optometrists who can undertake

1. Correction of refractive errors of the eye and prescription of glasses.
2. Detection of ocular and related systemic and neurological diseases.
3. Designing and fitting of contact lenses, aniseikonic lenses and low vision aids.
4. Diagnosis and orthopotic treatment of oculomotor malfunctions such as heterophoria and strabismus.
5. Public Health Optometry in Schools, Colleges, Urban slums, Rural areas and Occupational Optometry in Industries.
6. Optometric counseling of patients with partial sight, colour blindness and hereditary vision defects.
7. Evaluation of the health status of the eye and visual system and referral of patient to specialists at the appropriate stage.
8. Detection at an early stage of pathological conditions and immediate referral of the patients to specialists.
9. Vision rehabilitation and follow-up work of discharged patients.
10. Public education on ovular hygiene and related nutritional and environmental counseling.

They will however not be permitted to undertake any surgery or application of medicines other than those absolutely required for the discharge of their optometric functions.

The entire course to be conducted under the Senior Instructor or Lecturer with qualification of M.Sc., / M.Phil (Biometric) (4 years experience), Ph.D., as added qualification in Optometric. Junior Instructor should have B.Sc.(Optometric) (4-8 years experience).

These faculties should work directly under the supervision and guidance of Professor of Opthalmology in the Department of Opthalmology of the concerned University. These faculties are suggested with only an input of 20 students. For 20 students, one Senior Instructor with qualification of M.Sc., (Optometry) / M.Phil., (Optometry) with added qualification Ph.D., (Optional) with minimum of 4 years experience(Senior Instructor).

Junior Instructor – B.Sc.,(Optometry) – 8 years experience.
Senior Instructor – M.Sc.,(Optometry) / MPhil., - 3 years experience.

SYLLABUS

FIRST YEAR

PHYSICAL OPTICS

Theory: 60 hours
Practical: 40 hours

1. **Light**

   Nature of light-Newton's Corpuscular theory-Huygens's wave theory-Maxwell's electromagnetic theory-Einstein's quantum theory-Dual Nature theory

   Properties of light - Spectrum of light

   Visible light and the eye- Fechner's Law-Weber's law

   Measurement of light-Radiometry-Photometry

2. **Interference**

   Interference phenomena in optics-Constructive interference-Destructive interference

   Coherence-Spatial coherence-Temporal coherence

   Applications of interference

   Thomas Young's experiment

   Interference in thin films -Lloyd's single mirror-interference due to reflected and transmitted light

   Wedge shaped thin films- testing of planeness of surface

   Newton's rings experiment-refractive index of liquid

   Non-reflecting films

   Interferometer-Michelson interferometer-Fabry-Perot interferometer

3. **Diffraction**

   Phenomenon of Rectilinear Propagation

   Frenel's diffraction

   Fraunhofer diffraction

   Applied aspects of diffraction

   Single slit, qualitative and quantitative

   Zone plate

   Circular aperture

4. **Polarisation**

   Polarization of transverse waves-light as transverse waves

   Double refraction

   Nicol prism - Nicol prism as an analyser

   Elliptically & Circulary polarized light

   Optical activity- Frenal's experiment

   Biquartz

   Applications of polarized light

5. **Spectrum**
   Sources of spectrum: Bunsen-carbon-mercury-sodium
   Emission and absorption spectra
   Classification of emission spectra
   Solar spectrum
   Ultraviolet Spectrum
   Infra red spectrum
   Electromagnetic spectrum
6. **Scattering**
   Applied aspects-Glare effect-light reduction effect
   Photo electric effect
   Raman Effect
   LASER
7. **Optical instruments**
   Spectrometer
   Simple and compound microscope
   Telescope
   Resolving power of optical instruments
   Resolving power of the eye
   Magnifying power of simple and compound microscope, telescope

Practicals:

1. Newton's Ring's-radius of curvature-refractive index of lens
2. Newton's Ring's-refractive index of a liquid
3. Air wedge-thickness of a wire (hair)
4. Grating-wavelength determination
5. Dispersive power of a grating
6. Grating – minimum deviation & Wavelength determination
7. Reflection grating
8. Diffraction at a straight wire
9. Resolving power of a telescope
10. Polarimeter
11. Fresnel's biprism experiment
12. Thickness of thin glass plate

Reference Books:

1. Optics-Hecht (International Edition 4)
2. The principles of Physical optics-Ernst mach
3. Physical optics-S.A. Akhmanov & S.Yu.Nikitin

4. Radiation & Optics – Stone Mc.Graw Hill
5. The eye & visual optical Instruments-George Smith & David Atchison
6. Fundamentals of Optics-Jenkins & White, Mc Graw Hill
7. Principles of Optics-Born & wolf

GEOMETRIC OPTICS I

Theory: 60 hours

Stimulus of vision

Laws of reflection and refraction

Total internal reflection

The Ray model

Fermat's principle

Refraction through spherical surfaces

Introduction: Lenses-Spherical lens-Cylindrical lens-Contact lens -Divergence and convergence of wave fronts by spherical surfaces - Definition of diaptre -Vergence

Working of spherical lenses – primary and secondary focal points

Prism diopter: Prentice's law – deviations- Opthalmic prisms – thin and thick

Refraction at single Spherical or plane surfaces: convex – concave – Curvature & Sagitta-Vergence & dioptric power-Nodal points & nodal ray-lateral magnification and angular magnicifaciton-Snell's law of refraction

Thin lenses: lenses in contact-lenses separated by a distance. Two lens systems- dioptric & vergence power-(Object-image) relationships

Application: calculation of image points - dioptric powers in reduced systems using vergence techniques

Thick lenses –- cardinal points - front and back vertex powers reduced system - dioptric power of equivalent lenses.

Application – to calculate to the equivalent dioptric power of thick meniscus lens-plano convex vertex powers- position of principal planes- Dioptric powers using reduced systems. (Matrix theory and lens matrices)

Cylindrical and spherocylindrical lenses: location of foci-image planes-principle meridians-refraction by a cylindrical lens -calculation of power in different meridians -spherocylindrical lenses- circle of least confusion- refraction through a sphro cylindrical lens- writing Rx in different forms (+cyl., -cyl., meridional)- additional sphro-cylinders-oblique-cylinders

Stops, Pupils and Ports:

Entrance pupil & exit pupil (size & location)

Field stop

Entrance port & exit port, field of view, vignetting

Depth of field and depth of focus

4. Aberrations:

Spherical
Coma
Oblique astigmatism
Curvature of field
Distortion
Chromatic

5. Thin prisms and Mirrors

Unit of measurement (prism diopter)
Prism deviation in prism
Combination of thin prisms
Dispersive power of prism-achromatic prisms
Planar & spherical reflection in mirrors
Magnification in mirrors
Lens/mirror systems

Practicals:

1. Refraction through a slab
2. Caustic curve for a glass slab
3. Refraction at a curved surface
4. I-d curve for a prism – pin method
5. Spherometer and lens gauge
6. Single optic lever
7. Double optic lever
8. Spherical mirrors
9. Spherical lenses
10. Critical angle – glass and water
11. magnifying power of a simple and a compound microscope
12. Magnifying power of a telescope

Reference Books:

Mirrors, Prisms & Lenses-southall, Dover
Geometric, Physical & Visual Optics-Michael P.Kealing
Aberrations of Optical systems-W.T.Welford
Introduction to Geometrical optics-Milton Katz
N.Subramanyam & Brij Lal: A text book of Optics, S.Chand & Co.

GEOMETRIC OPTICS II

Theory: 60 hours
Practical: 40 hours

INTRODUCTION:

1. Vergence and vergence techniques revised. Lens power, prism power, cylindrical lenses
2. Gull strand's schematic eyes, visual acuity, Stile Crawford experiment

Errors of refraction:

3. Emmetropia and ammetropia
4. Correction of ammetropia with lenses
5. Myopia
6. Hypermetropia
7. Astigmatism-Causes of Astigmatism-Types of Astigmatism-Application-for eg., to calculate dioptric power - angular magnification of spectacles in aphakic-presbyopic patients
8. Aphakia
9. Presbyopia
10. Thin lens model of the eye – angular magnification – magnification of microscope, telescope, Spectacle and relative spectacle magnification. Applications – To calculate the angular magnification, dioptric power of spectacles, spectacle magnification, entrance and exit pupils, vertex distances

Laser Optics:

11. Laser optics – basic laser principles – spontaneous and stimulated emission. Coherence – spatial, temporal, laser pumping- population inversion optical feedback

    Gas lasers, solid lasers, helium-neon laser- Argon-ion laser-ruby laser

    Monocular laser-carbon dioxide, eximer laser - Semiconductor lasers. Lasers in medicine ophthalmic applications

Practicals:

1. Spectrometer – minimum deviation
2. Spectrometer – I-d curve
3. Spectrometer – I-I' curve
4. Spectrometer – narrow angled prism
5. Refractive index by microscope
6. Focimeter
7. Dispersive power of a prism
8. Toric lens and meniscus lens
9. Nodal slide
10. Boy's method – radius of curvature
11. Liquid lens

12. Refractive index of lenses
13. Powers of concave and convex mirrors

Reference Books:

Lasers –Milonni & Eberly, John wiley & sons
N.Subramanyam & Brij Lal: A text book of Optics, S.Chand & Co.

GENERAL ANATOMY

Theory: 40 hours
Practical: 40 hours

Introduction:

Subdivisions of Anatomy: Regional and Systemic Anatomy
Planes of the Body
Terminology

Systemic Anatomy

Skeletal System-Bones of the body
Joints – Classification, Joints of the body
Muscular system
Cardiovascular System- Heart, Arteries & Veins of the Body
Lymphatic system – Lymphoid organs, Lymphatics & Lymphatic drainage of the body
Respiratory system – Upper and lower Respiratory tract, Lungs, Pluera & Muscles of Respiration
Digestive system
Reproductive system
Endocrine system
Special senses – Ear, Tongue and Nose

Histology

Ephithelial Tissue
Connective Tissue
Cartilage
Bone
Muscular Tissue
Cardiovascular Tissue
Lymphoid organs
Nervous System
Skin & Appendages
Exocrine glands – Salivary, Lacrimal, Mammary & Pancreas
Endocrine glands – Thyroid, Parathyroid, Pituitary & Adrenal
Eye – Cornea & Retina

Practical:

1. Skeletal System and Joints
2. Muscular system
3. Cardiovascular System
4. Lymphatic system
5. Respiratory system
6. Digestive system
7. Reproductive system
8. Endocrine system
9. Special senses
10. Epithelial Tissue
11. Connective Tissue
12. Cartilage
13. Bone
14. Muscular Tissue
15. Cardiovascular Tissue
16. Lymphoid organs
17. Nervous System
18. Exocrine glands
19. Endocrine glands
20. Eye

Reference Books:

1. Mariano S.H.Difiore: Atlas of Human Histology, 5th Edn., 1981, Lea & Feliger
2. G.J.Tortora & N.P.Anagnostakos: Principles of Anatomy and Physiology
3. Ross & Wilson, Text Book of Anatomy and Physiology

GENERAL PHYSIOLOGY

Theory: 60 hours
Practical: 40 hours

1. **Introduction to Physiology**

   Cell structure, Body fluid compartments, Transport across cell membrane, Homeostasis, Skeletal muscle structure and properties, neuromuscular junction and muscle contraction

2. **Blood**

   Composition and function of Blood, Red blood cells, erythropoisis, anaemia, White blood cells structure and functions, Platelets and blood coagulation, plasma proteins, blood groups

3. **Cardiovascular system**

Properties of cardiac muscle, origin and conduction of heart beat, cardiac cycle, ECG, cardiac output, arterial blood pressure measurement, factors affecting and factor regulating it, heart rate and its regulation

4. **Respiration**

Mechanics of respiration, lung volume and capacities, transport of oxygen and carbondioxide, regulation of respiration, hypoxia and artificial respiration

5. **Digestive system**

Movements of GI tract, Secretions and functions of salivary glands, gastric glands, pancreas, small intestine, function of liver, absorption in the intestine

6. **Excretion**

Structure of Nephron, Renal circulation, formation of urine, micturition, diuretics, normal and abnormal constituents of urine, structure and function of skin

7. **Endocrine system**

All major endocrine glands, their secretion, action and regualtaion with hyper and hypo secretion of the glands.

8. **Reproductive system**

Spermatogenesis, male sex harmones, menstrual cycle, pregnancy and lactation, principles of contraceptive methods

9. **Nervous system**

Structure of neuron, properties of nerve, nerve impulse conduction, synapse, receptor, spinal cord, reflex action, ascending and descending tracts, structure and function of cerebral cortex, basal ganglia, thalamus, hypothalamus, brain stem, sleep and reticular formation, autonomic nervous system

10. **Special tissues**

Olfaction, gustation, Hearing and Vision-Structure, Physiology, pathways and applied aspect

Practicals:

1. Enumeration of RBC and WBC count
2. Differential count
3. Estimation of Haemoglobin
4. Determination of blood group
5. Determination of bleeding time and clotting time
6. Determination of erythrocyte sedimentation rate
7. Measurement of blood pressure
8. Effect of posture and exercise on blood pressure

9. Radial pulse tracing
10. Clinical examination of cardiovascular and respiratory system
11. Examination of Motor and sensory system
12. Examination of cranial nerves

Reference Books:

1. G.J.Tortora & N.P.Anagnostakos: Principles of Anatomy and Physiology, 4th Edition., Harper & Row Publishers, NY
2. Parthur C. Guyton: Text book of Medical physiology, 8th Ed., Saunder

OCULAR ANATOMY

Theory: 40 hours
Practical: 40 hours

1. Surface anatomy of the orbit – Nerve supply & blood supply of Extra-ocular muscles- Neural basis of eye movements – 3rd , 4th , 5th and 6th Cranial nerves – Anatomy of papillary pathway
2. Eye:

   Sclera - Anatomy, Anterior &Posterior scleral foramen, Emisaria

   Cornea – Structure, transparency, nerves, Limbal transition zone

   Iris – Structure, Sphincter pupillae, Dilator Pupillae, blood vessels movement of fluid across iris

   Ciliary body – Pars plana, pars plicata, blood supply & Nerve supply, Blood supply, accommodation, presbyopia, Aqueous secretion

   Retina – anatomy, photoreceptors, general architecture
3. Refractive media: Anterior chamber relation, Anterior chamber outflow apparatus, Lens structure, Vitreous gross & microscopic anatomy
4. Eyelids: Orbicularis oculli & levator palpebrae superioris, Anatomy blood supply , nerve supply
5. Adnexa: Lacrimal apparatus, Embryology and development of eye

Practicals:

Orbit : Orbital structure demonstration

Eye : Cardaveric enucleation of eye

Reference Books:

1. Inderbir Singh (I.B.S): A Text book of Human Neuro-Anatomy, Vikas Publishing House, 1985
2. A.K.Dutta: Essentials of Human Anatomy, Current books International Calcutta, Bombay, Chennai, 1989
3. Richard S Snell & M A Lemp, Ocular Anatomy of the eye, 1998

OCULAR PHYSIOLOGY

Theory: 40 hours
Practical: 40 hours

Eye lid	:	Movements and pathways
Lacrimal Apparatus	:	Tear film & composition of tears

		Tests to assess lacrimal excretory function
Extra-ocular muscles	:	articulation of eyeball in socket
		Mechanics of movement
		Control of eye movements
		Diplopia-Diagnosis & assessment
		Qualification of extraocular muscle
		Limitation (measurement of torsion, measurement of deviation, measurement of field of BSV, measurement of field of muscle action)
Cornea	:	Biochemistry, Corneal Transparency, Innervation
Aqueous Humor & Vitreous:		Aqueous secretion & dynamics
		Maintenance of IOP, Diuranal variations
		Measurement of IOP
		Molecular structure of vitreous & developmental anomalies
Crystalline lens & Accommodation:		
		Biochemistry, glucose metabolism
		Changes in lens structure
		Depth of field & depth of focus
		Accommodation (Changes, Amplitude, accomadation & refraction, accomadation & convergence)
		Presbyopia
Iris & pupil		Pupillary reaction to light
		Measurement of afferent papillary defect
		Pharmacology of pupil
		Horner's syndrome & evaluation
		Analyzing anisocoria
Retina	:	Photichemistry of Retina
		Wald's visual cycle
		Entopic phenomenon
Acuity of vision	:	Vernier acuity, minimum angle of resolution, Principle of measurement, factors affecting visual acuity
Visual pathway	:	Optic nerve, chiasm & optic tract
		Visual deprivation, lesions of pathway
Visual Perception	:	Binocular vision, development, theories of fusion, Stereoscopic acuity, tests for stereopsis, anaomalies of stereopsis, Dark adaption
Colour Vision	:	Theories of colour vision,
		Defective colour vision
		Testing for congenital & acquired colour vision defects
Electrophysiology	:	Electro retinogram, Electro oculogram

Practicals:

Eye and Vision

1. Lid movements
2. Tests for lacrimal secretion
3. BUT
4. Extraocular movements, anterior segment examination – Slit lamp examination
5. Pupillary reflexes
6. Digital tonometry
7. Schiotz tonometry
8. Measurement of accommodation
9. Visual acuity measurement
10. Opthalmoscopy and retinoscopy
11. Opthalmoscopy and retinoscopy
12. Opthalmoscopy and retinoscopy
13. Light and dark adaptation
14. Binocular vision
15. Colour vision

Reference Books:

1. Davson H: Physiology of the eye, 4th edition., 1980
2. Sir Steward Duke Elders, System of Ophthalmology, Vol.4

BASIC BIOCHEMISTRY I

Theory: 60 hours

Carbohydrates

Properties of monosaccharide, disaccharides, polysaccharides and their biological importance

Proteins

Classification and properties of Amino acids, physiological important peptides, Classification and properties of proteins, plasma proteins, structure of protein, immunoglobulins, chromatography and electrophoresis

Lipids

Classification and properties of fatty acids, triglycerides, phospholipids, other compound lipids, cholesterol its derivatives and their biological significance

Enzymes

Definition, classification, co-enzymes, factors affecting their action, enzyme inhibition, enzymes of clinical importance

Vitamins

Classification, functions, source, deficiency manifestations and hypervitaminoses.

Minerals

Calcium, Phosphorus, Sodium, Potassium, iron, selenium, iodine, copper

Reference Books:

1. Dr.S.Ramakrishnan: Essentials of Biochemistry & Ocular Biochemistry 1992, Publications Division, Annamalai University. (EBO)
2. G.Rajagopal & Dr.S.Ramakrishnan: Practical Biochemistry for Medical students, M/s. Orient Longman, Calcutta, 1985 (For Practical)

BASIC BIOCHEMISTRY II

Theory: 60 hours
Practical: 40 hours

1. Hormones basic concepts in metabolic regulation with examples, with respect to insulin
2. **Metabolism:**

   Metabolism of carbohydrates, proteins and lipids
3. **Ocular Biochemistry:**

   Various aspects of the eye, viz., tears, cornea, lens, aqueous, vitreous, retina and pigment rhodopsin.

   Importance of the biochemical constituents in ocular tissues
4. **Technique:**

   Colloidal state, sol. Gel, emulsion, dialysis, electrophoresis, Ph buffers mode of buffer action, molar and percentage solutions, photometer, colorimetry and spectrophotometry

   Radio isotopes: application in medicine and basic research
5. **Clinical Biochemistry**

   Blood sugar, urea, creatinine and bilirubin significance of their estimation

Practicals:

Qualitative Experiment

1. Analysis of biochemical substance-Reactions of carbohydrates, proteins, non protein nitrogenous substance
2. Analysis of abnormal urine

Demonstration

Quantitative Experiment

Principle, working and use of

pH meter

Colorimeter-estimation of glucose, urea, cholesterol

Electrophoresis

Semi automated analyzer

Charts on serum protein electrophoretic pattern, cardiac, renal & lever profile

Reference Books:

1. Dr.S.Ramakrishnan: Essentials of Biochemistry & Ocular Biochemistry 1992, Publications Division, Annamalai University. (EBO)
2. G.Rajagopal & Dr.S.Ramakrishnan: Practical Biochemistry for Medical students, M/s. Orient Longman, Calcutta, 1985 (For Practical)

COMPUTING AND COMPUTER APPLICATIONS

Theory: 60 hours
Practical: 80 hours

1. **Computers:** History of computers, Definition of computers, input devices, output devices, storage devices, types of memory, and units of measurement, range of computers, generations of computers, characteristics of computers,.
2. **System:** Hardware, Software, system definition, Fundamentals of Networking, Internet, performing searches and working with search engines, types of software and its applications
3. **Office application suite –** Word processor, spreadsheet, presentations, other utility tools, Fundamentals of Linux / Windows operating system, functions, interfaces, basic commands, working with the shell and other standard utilities.

Language - Comparison chart of conventional language, programming languages, generations of programming languages, Compilers and interpreters, Universal programming constructs based on SDLC, Variable, constant, identifiers, functions, procedures, if while, do – while, for and other Structures. Programming in C language, Data types, identifiers, functions and its types, arrays, union, structures and pointers

Introduction to object oriented programming with c++: classes, objects, inheritance polymorphism, and encapsulation. Introduction to databases, and query languages, Introduction to Bioinformatics

Practicals:

1. Various browsers, search engines, email
2. Text document with mages with multiple formatting options using a specified office package
3. Spreadsheet using a specified office package
4. Presentation on a specified topic using the specified locations
5. Shell programming-parameters
6. Shell program- regular expressions
7. C program- functions
8. C program – file handling
9. C program demonstrating the usage of user defined variables
10. Databases

11. Applications in Optometry

Reference Books:

1. C Programming Tutorial (K & R version 4) Author(s): Mark Burgess
2. An introduction to GCC by Brain J.Gough, foreword by Richard M.Stallman
3. Red Hat Linux 9 bible by Christopher Negus May 2003
4. Microsoft office 2003 by Jennifer Ackerman Kettell, Guy Hart-Davis

NUTRITION

Theory: 40 hours
Practical: 40 hours

1. **Introduction**

   History of nutrition, Nutrition as science

2. **Foods**

   Food groups, RDA, Food guides, Food Pyramid, Balanced diet, Limitations of daily food guide, Menu planning

3. **Carbohydrates**

   Function, sources, RDA, Dietary fiber

4. **Proteins**

   Sources and functions, Essential and non-essential amino acids, Incomplete and complete proteins, Supplementary food, PEM and the eye, Nitrogen balance, Changes in the protein requirement

5. **Fats**

   Functions and sources, Essential fatty acids, Excess and deficiency, Lipids and the eye

6. **Energy**

   Units of energy, Measurement and energy value of food, Energy expenditure, Total energy/calorie requirement for different age groups and diseases, Energy imbalance – obesity, starvation

7. **Minerals**

   General functions and sources, Macro and micro minerals associated with the eye, Deficiencies and excess – ophthalmic complications (e.g) Iron, calcium, Iodine, etc

8. **Vitamins**

   General functions, food sources, Vitamin deficiencies and associated eye disorders with particular emphasis on vitamin ‘A’

9. **Antioxidant**

   Lutein, xeamanthin, lycopene, Monosodium Glutamate, aspartame and their role in vision

Practicals:

Test 1: Applied Nutrition

1. **Assessment of nutritional status**

   A – anthropometry- height weight measurements, BMI calculation & interpretation, MAC, TSF measurements

   B – Biochemical Interpretation

   C – 24 hour recall

   Bedside exposure

2. **Life cycle**

   Nutrition in: pregnancy, lactation, low birth weight, infancy, childhood, adolescence

3. Nutrition in elderly

Test 2: Clinical Nutrition

4. Diabetes Mellitus – Glaucoma, retinopathy – role of diet
5. Hyuperlipidemias, Atherosclerosis, Xanthomas
6. Measles and associated eye disorders

Test 3: Miscellaneous

7. Epidemiologic studies of nutrition and cataract
8. Recent advances of nutrition in vision

Reference Books:

1. Nutritional Opthalmology (Nutrition, Basic and Applied Science) by Donald Stewart MC Lenon, 2nd Ed. (1980)
2. Nutritional and environmental influences on the Eye, Allen Taylor (1999)
3. Nutritional Aspects and Clinical Management of Chronic Disorders and Disease (2002)
4. Normal and Therapeutic Nutrition, Orinne H. Robinson & Narilyn R. Lawler, 1986
5. Food & Nutrition, Dr. M.Swaminathan, Vol. I & II

PRINCIPLES OF LIGHTING

Theory: 60 hours

1. Modern theory on light and colour: synthesis of light
2. Colour theory: Additive and subtractive synthesis of colour- Goethe's theory 7 reasoning – colour temperature-colour rendering
3. Visual task: factors affecting visual tasks
4. Light and vision : Discomfort glare - Visual ability- relationship among lighting- visibility and task performance
5. Light sources: Sunlight-Modern light sources – spectral energy distribution – luminous efficiency – colour temperature – colour rendering.
6. Illumination : Luminous flux, candela, solid angle, illumination, utilization factor, depreciation factor, Illumination laws
7. Lighting System Design : Design approach, Design process, concept of lighting design, Physical consideration and psychological consideration and types of lighting
8. Photometry : Photometric quantities - photometers and filters

9. Fibre optics: Optical description-optical fiber communication -optical fibre cables.

Reference Books:

Colour: An introduction to practice and principles

Applied Illumination Engineering-Lindsey

Illuminating Engineering Society of North America Introductory Lighting, 1985

MATHEMATICS I

Theory: 60 hours

1. **Algebra**

   Introduction to binomial theorem –Permutation and combination-Mathematical induction-Partial fractions-Types of partial fractions-Boolean Algebra- Boolean Algebraic structure-Principle of duality-Conditional and Biconditional statements-Arguments and their validity

2. **Trignometry**

   Introduction to Trignometrical ratios and identities –Signs of T-ratios-Compound angles A+B, A-B –multiple angles 2A, 3A –sub multiple angle A/2 – Transformation of product into sum or differences – Conditional identities – Trigonometrical equations – properties of triangles-Solution of triangles-Inverse trigonometric functions-Hyperbolic functions

3. **Differential calculus**

   Introduction-Concept of differentiation and derivation-Slope of a curve-Differentiability-Differentiation Techniques-Derivative of elementary functions from first principle-Product and Quotient rule-Derivative of trigonometric functions- Derivative of function of function-Logarithmic differentiation-method of substitution-Differentiation of implicit function-Higher order derivatives

4. **Application of Differential Calculus**

   Tangents and normal to curve-Angle of intersection of two curves-Rate of change-Increasing and decreasing functions-Maxima & Minima-Centre and radius of curvature-Partial differentiation

5. **Co-ordinate Geometry**

   Introduction to conic-Parabola, Ellipse, Hyperbola –Introduction to 3 dimensional geometry - Spheres

Reference Books:

1. Algebra and Trigonometry Problem Solver by James R Ogden, Jerry R Shipman, 2003
2. Linear Algebra and Geometry by Yu I Manin, Alexei I Kostrikin, Mathematics, 1989
3. Trigonometry by Israel M Gelfrand, Mark E Saul, I M Gel'fand – Mathematics, 2001
4. The Calculus problem solver by James R Ogden, The Staff of Rea, 2002
5. Calculus and Analytical Geometry by Sherman K Stein, Anthony Barcellos,2003-Amazon Publications

MATHEMATICS II

Theory: 60 hours

Integral calculus

Introduction to integration and formulas-Integrals of function with linear functions-Methods of Integration –Decomposition Method-Method of substitution-Integration by parts- definite integrals.

Application of Integral calculus

Area under plane curve-Area between two curves-Volume of solid revolution-length of arc-Surface of revolution.

Differential Equation

Introduction to first and second order differential equations-Solutions of first order but first degree equations-Homogeneous differential equations-Linear differential equations-Second order Linear equations with constant co-efficient.

Application of Matrix and Vector Algebra

Inverse of matrix-Determinants-properties of determinants-Solving simultaneous equations by matrix method-Solving equations by determinant method-Crammer's rule-application to solving on lens matrices- Dot product and cross products of two vectors-Scalar triple product - vectors-dot and cross product of four vectors.

Mechanics

Equivalent systems of Forces, moments, couples-Equilibrium of Rigid bodies in 2-D and 3-D – Centroids and Centers of Gravity – Forces in Beams-Friction-Kinematics of Particles-Plane Motion of Rigid Bodies: Energy and Momentum – Methods Navier stokes equation –Vector and Tensors symmetries and conservation-Linear and Nonlinear Oscillations Hamilton and Lagrangian Mechanics-Central Force Motion-Rigid Body dynamics-Coupled systems-Newtonian Mechanics-Laws of Thermodynamics.

Reference Books:

1. Differential and Integral Calculus by R.Courant (1998)
2. Theory of matrices with Applications by Peter Lancaster, Miron Tismenetsky (1985)
3. About vectors by Banesh Hoffmann (1975)
4. Vector methods applied to mechanics and Potential Theory by D E Ruther Ford (2004)
5. New foundation for Classical Mechanics by David Hestenes (1999)
6. Primer of Quantum Mechanics by Marvin Chester (2003)
7. Introduction to Differential Equation by John W Dettman (1976)
8. Introduction to Matrices and Vectors by Jacob T Schwartz (2001)-Pub-Amazon

FUNCTIONAL ENGLISH AND COMMUNICATION

Theory: 40 hours

FUNCTIONAL ENGLISH

1. **Grammar**
   - Components of a sentence
   - Positive and Negative statements
   - Interrogative Statement
   - Parts of speech in brief
   - Transformation and synthesis of sentences
   - Verb and Tense forms
   - Voice
   - Reported Speech
   - Common errors and how to avoid them
2. **Vocabulary**
   - Medical Terminology
   - Words often confused or misused
   - Words and expression in British and American English
   - Idioms and Phrases
3. **Oral communication**
   - Importance of speaking efficiently
   - Voice culture
   - Preparation of Speech
   - Secrets of good delivery
   - Audience Psychology
   - Presentation Skills
   - Using non-verbal communication
   - Interview technique
   - Skill in arguing
4. **Spoken English**
   - The phonetic symbols
   - Stress
   - Intonation
   - Rhythm
   - Transcription
   - Using dictionaries for learning to pronounce
5. **Written communication**
   - **(a) Art of writing**
     - Rules for effective writing
     - Expansion of proverbs & Ideas
     - Précis writing
   - **(b) Letter writing**
     - Private letters & Social letters
     - Business letters

Letter to a Bank
Letter to a Newspaper
Letter to Application

Curriculum Vitae (Different models)
Placing an order

(c) Report writing
Guidelines to prepare a good report
Usage of impersonal language
Preparing lab reports

(d) Note making and Note taking
Note making and note taking strategies
Organizing notes
Exercise and note making / taking

(e) Comprehension
Listening and reading comprehension
(Exercise of prescribed short answers)

6. Reading
(a) What is efficient and fast reading?
(b) Awareness of existing reading habits
(c) Tested techniques for improving speed
(d) Improving concentration and comprehension through systematic study

Reference Books:
1. English for Competitive Examinations by R.P.Bhatnagar, Rajiel Bhargava
2. English for college and competitive exams by Dyvadatham
3. Written Communication in English by Sarah Freeman
4. Writing with a purpose by Tickoo & Sasikumar
5. English phonetics for Beginners by P.Iyadurai
6. English through reading by W.Bhaskar and N.S.Prabhu
7. Empowerment through verbs & idioms by Padmini devkumar
8. High School English Grammer and Composition by Wren & Martin
9. Communication techniques for your success everywhere by Muralidharan

Method of Evaluation:
Oral presentations, Reading Comprehension exercise, Writing letters, summaries and essays, MCQ's in grammar and vocabulary.

MANAGEMENT PRINCIPLES AND BASIC ACCOUNTANCY

Theory: 40 hours

1. Definition of Management - Concepts of management - Role and importance of Management - Levels of management - Skills of management - Principles of management
2. Planning – Meaning – Nature - Importance kinds of planning - Planning process - Strategic Planning vs. Operational planning - types of plans – Budgets – Meaning – Importance - Types

of Budgets -Functional Budget - Master Budget - Fixed Budget - Flexible budget - Long term budget-Short term budget

3. Organizing - Principles of organizing – Organizing process – staffing - Elements of staffing – Manpower planning – Process – Direction - Principles of Directing – Supervision – Motivation –Leadership - Leadership skills - Qualities of a good leader - Leadership styles
4. Basic Accountancy - Need for accountancy - Principles of Accounting - Journal- Ledger-Trial Balance - Final accounts - Balance Sheet - Profit and loss account

Reference Books:

Advanced accountancy, R L Gupta & M Radhasamy
Advanced Accountancy, T.S. Grewell
Management Principles for Health Professionals, 2nd edition (1992)- Joan Gratto Lieblev, Ruth Eller Louvine, Jeffrey Rothman, Aspex publication, Gaithersburg, Marylad
Principles of Management- G.Venkatesan (1994), J.J.Publishers , Madurai
Management in Health Care. A Theoretical and Experiential Approach, (1997)- Elaine Lynne la Monica and Philip Ian Morgan, Macmillan Publishers
Essentials of Management – Harold Koontz and Heinz Weihrich – Tata McGraw Hill, 5th edition
Financial Management I.M.Pandey,, Vikas Publishing House Pvt. Ltd
Financial Management, Prasanna Chandra
Financial Management, Eugene West
Financial Management, S.N.Maheswari

HOSPITAL PROCEDURES

Practical: 40 hours

Practicals:

1. Accounts Department
2. Laboratory
3. Bio-Medical Engineering department
4. Medical records Department
5. Correspondence
6. Stores
7. House Keeping
8. Reception
9. Computer Department
10. Fundus Fluorescein Angiography and Medical Photography
11. Human Resources Department
12. Medical Social Work Department
13. Message Centre
14. Patients Relation Department
15. Biometry Department

SECOND YEAR

OPTOMETRIC OPTICS I

Theory: 60 hours

Part I

1. **Spectacle lenses:**
   Introduction to spectacle lenses
   Forms of lenses
   Cylindrical and spherocylindrical lenses
   Properties of crossed cylinders
   Toric lenses
   Toric transportation
   Astigmatic lenses
   Axis direction of astigmatic lenses
   Obliquely crossed cylinders
   Sag formula
   Miscellaneous spectacle lenses
   Vertex distance and vertex power
   Tilt induced power
   Aberrations in ophthalmic lenses
   Fresnel prisms, lenses and magnifiers

Part II

2. **Spectacle lenses:**
   Manufacture of glass
   Lens surfacing
   Principle of surface generation and glass cements
   Lens quality
   Faults in lens material
   Faults on lens surface
   Inspecting the quality of lenses
   Toughened lenses
3. **Ophthalmic lenses**
   Definition of prisms; units of prism power
   Thickness difference and base – apex notation
   Dividing, compounding and resolving prisms
   Rotary prisms and effective prism power in near vision

Prismatic effect, decentration, Prentice's rule
Prismatic effect of spherocylinders and plano cylinders
Differential prismatic effects

4. **Spectacle frames**
   Frame types and parts
   Classification of spectacle frames – material, weight, temple position, coloration
   Frame construction, frame measurements and markings

Reference Books:

M.Jalie: Principles of Ophthalmic Lenses, Edition 3, 1980
T E Fannin & T Grosvenor: Clinical Optics,1996

OPTOMETRIC OPTICS II

Theory: 80 hours

1. Tinted and protective lenses
2. Characteristics of tinted lenses
3. Absorptive glasses
4. Polarizing filters
5. Photochromic filters
6. Reflecting filters
7. Bifocal lenses
8. Trifocal lenses
9. Progressive addition lenses
10. Lenticular lenses
11. Reflections from spectacle lenses, ghost images, reflections in bifocals at the dividing line
12. Anti-reflection coating, Anti-scratch coating, Anti-fog coating, Mirror coating, Edge coating, hard multi coating (HMC)
13. Field of view of lenses
14. Size, shape and mounting of ophthalmic lenses
15. Aspherical lenses

Reference Books:

1. M.Jalie: Principles of Ophthalmic Lenses, Edition 3, 1980
2. T E Fannin & T Grosvenor: Clinical Optics,1996

OCULAR DISEASES I

Theory: 60 hours

1. **Eyelids:**
   Eyelid anatomy

Congenital and developmental anomalies of the eyelids
Blepharospasm
Ectropion
Entropion
Trichiasis and symblepharon
Eyelid inflammations
Eyelid tumours
Ptosis
Eyelid retraction
Eyelid trauma

2. **Lacrimal system**
   Lacrimal system
   Lacrimal pump
   Methods of lacrimal evaluation
   Congenitial and development anomalies of the lacrimal system
   Lacrimal obstruction
   Lacrimal sac tumors
   Lacrimal trauma
3. **Sclera, Episclera**
   Ectasia and staphyloma
   Scleritis, episcleritis
4. **Orbit**
   Orbital anatomy
   Incidence of orbital abnormalities
   Methods of orbital examination
   Congenital and developmental anomalies of theorbit
   Orbital tumours
   Orbital inflammations
   Sinus disorders affecting the orbit
   Orbital trauma
5. **Conjunctiva and Cornea**
   Inflammation
      Therapeutic principles
      Specific inflammatory diseases
   Tumours
      Tumours of epithelial origina
      Glandular and adnexal tumours
      Tumours of neuroectodermal origin
      Vascular tumours

Xanthomatuos lesions
Inflammatory lesions
Metastatic tumours

Degenerations and dystrophies
Definitions
Degenerations
Dynstrophies

Miscellaneous conditions
Keratoconjuctivitis Sicca (K Sicca)
Tear function tests
Stevens – Johnson syndrome
Ocular Rosacea
Atopic eye disorders
Benign mucosal pemphigoid (BMP) – ocular pemphigoid
Vitamin A deficiency
Metabolic diseases associated with corneal charges

6. **Iris, Ciliary body and Pupil**
Congenital anomalies
Primary and secondary disease of iris and ciliary body
Tumors
Anomalies of papillary reactions
7. **Choroid**
Congential anomalies of the choroids
Diseases of the choriod
Tumours

Reference Books:

Jack J. Kanski: Clinical Opthalmology, Butterworths, 2nd Ed., 1989

OCULAR DISEASES II

Theory: 80 hours

1. **Vitreous**
Developmental abnormalities
Hereditary hyaloidoretinopathies
Juvenile retinoschisis
Asteroid hyalosis
Cholesterolosis
Vitreous haemorrhage

Blunt trauma and the vitreous
Inflammation and the vitreous
Parasitic infestations
Pigment granules in the vitreous
Vitreous complications in cataract surgery

2. **Retina**

Retinal vascular diseases
Diseases of the choroidal vasculature, Bruch's membrane and retinal pigment epithelium (RPE)
Retinal tumors
Retinoblastoma
Phakomatoses
Retinal vascular anomalies
Retinal and optic nerve head astocytomas
Lymphoid tumors
Tumors of the retinal pigment epithelium
Other retinal disorders
Retinal inflammations
Metabolic diseases affecting the retina
Miscellaneous disorders
Electromagnetic radiation effects on the retina
Retinal physiology and psychophysics
Hereditary macular disorders (including albinism)
Peripheral retinal degenerations
Retinal holes and detachments
Intraocular foreign bodies
Photocoagulation

3. **Neuro-ophthalmology**

Neuro-ophthalmic examination
History
Visual function testing
Technique of papillary examination
Ocular motility
Checklist for testing
Visual sensory system
The retina
The optic disc
The optic nerve
The optic chiasm
The optic tracts

The lateral geneculate body
The optic radiations
The visual cortex
The visual field
The blood supply of the anterior and posterior visual systems
Disorders of visual integration
Ocular motor system
Supranuclear control of eye movements

- Saccadic system
- Clinical disorders of the saccadic system
- Gaze palsies
- Progressive supranuclear palsy
- Parkinson's disease
- Ocular motor apraxia
- Ocular oscillation

Smooth pursuit system and disorders
Vergence system
Cerebella system
Non-visual reflex system
Position maintenance system
Nystagmus
Ocular motor nerves and medial longitudinal fascicules
The facial nerve
Pain and sensation from the eye
Autonomic nervous system
Selected systemic disorders with neuro-ophthalmologic signs

4. **Lens**

Anatomy and pathophysiology
Normal anatomy and aging process
Developmental defects
Acquired lenticular defects

5. **Trauma**

Anterior segment trauma
Posterior segment trauma

6. **Blindness**

Blindness – definitions
Causes 6.1.2 Social implications 6.1.3 Rationale in therapy
Drug induced ocular diseases

Reference Books:

1. Jack J. Kanski: Clinical Opthalmology, Butterworths, 2nd Ed., 1989

VISUAL OPTICS I

Theory: 60 hours
Practical: 40 hours

1. **Review of Geometric Optics**
   Vergence and power
   Conjugacy, object space and image space
   Sign convention
   Spherical refracting surface
   Spherical mirror; catoptric power
   Cardinal points
   Magnification
   Optics of Ocular Structures
   Cornea and aqueous
   Crystalline lens
   Vitreous
   Curvature of the lens and opthalmophakometry
   Axial and axis of the eye
   Measurement of the optical constants of the eye
   Corneal curvature and thickness
   Keratometry
   Curvature of the lens and ophthalmophakometry
   Axial and axis of the eye
2. **Refractive anomalies and their causes**
   Aeitology of refractive anomalies
   Contributing variabilities and their ranges
   Populating distributions of anomalies
   Optical component measurements
   Growth of the eye in relation to refractive errors

Practical:

1. Study of Purkinje images I and II
2. Study of Purkinje images III and IV
3. Measurement of corneal curvature
4. Measurement of Corneal thickness
5. Mathematical models of the eye –emmetropia
6. Mathematical models of Hypermetropia

7. Mathematical models of myopia
8. Conjugate points – demonstration – worked examples
9. Axial and refractive hyperopia – worked examples
10. Axial and refractive myopia – worked examples
11. Visual acuity charts
12. Effect of lenses in front of the eye
13. Effect of prisms in front of the eye
14. Vision through pinhole, slit, filters, etc.

Reference Books:

1. Bennett & Rabbetts: Clinical visual Optics
2. David O Michaels: Visual Optics & Refraction (DOM)

VISUAL OPTICS II

Theory: 60 hours
Practical: 80 hours

1. **Refractive conditions**
   Emmetropia
   Myopia
   Hyperopia
   Astigmatism
   Anisometropia and Anisekonia
   Presbyopia
   Aphakia and Pseudo aphakia
   Correction and Management of Ambiopia
2. Far and near points of accommodation
   Correction of spherical ametropis
   Axial versus refractive ametropia
   Relationship between accommodation and convergence; A/c ratio
3. Retinoscopy – principles and methods
   Retinoscopy – speed of reflex and optimum condition
   Retinoscopy – dynamic/static
   Review of objective refractive methods
   Review o f subjective refractive methods
   Cross cylinder method for astigmatism, Astigmatic Fan test
   Difficulties in objective tests and their avoidance
   Transposition of lenses
   Spherical equivalent
   Prescribing prisms

Binocular refraction

4. Effective power of spectacles; vertex distance effects
   Ocular refraction versus spectacle refraction
   Ocular accommodation versus spectacle accommodation
   Spectacle magnification and relative spectacle magnification
   Retinal image blur; depth of focus and depth of field

Practicals:

1. Phorometry
2. Visual acuity, stereo acuity in emmetropis
3. Myopia and pseudomyopia, myopia and visual acuity
4. Myopic correction – subjective verification – monocular and binocular
5. Hypermetropia – determination of manifest error subjectively
6. Hypermetropic correction: subjective verification
7. Demonstration of astigmatism. Use of slit and Kertometry to find the principal meridians
8. Astigmatism: fan – subjective verification tests
9. Astigmatism: Cross-Cyl. – Subjective verification test
10. Measurement of accommodation: near and far points and range
11. Presbyopic correction and methods: accommodative reserve, balancing the relative accommodation and cross grid test
12. Methods of differentiating axial and refractive ametropia
13. Practice of Retinoscopy – Emmetropia
14. Practice of Retinoscopy – Spherical ametropia
15. Practice of Retinoscopy – Simple astigmatism
16. Practice of Retinoscopy – Compound hyperopia
17. Practice of Retinoscopy – Compound myopia
18. Practice of Retinoscopy – Oblique astigmatism
19. Practice of Retinoscopy – in media apacities
20. Practice of Retinoscopy – in irregular astigmatism
21. Practice of Retinoscopy – in strabismus and eccentric fixation
22. Interpretation of cycloplegic retinoscopic findings
23. Prescription writing
24. Binocular refraction
25. Photo refraction
26. Vision therapy
27. Exercises for vergence

Reference Books:

1. Abrams D: Duke elders Practice of Refraction, Edition 9, 1998

PHARMACOLOGY

Theory: 60 hours

1. **General Pharmacology**
   Introduction, sources of drugs, drug formulations in ophthalmic use
   General routes of drug administrations, ocular routes
   Pharmacokinetics - absorption, distribution, Bio-transformation, excretion of drugs
   Pharmacokinetics - Factors modifying drug action
   Adverse drug effects
2. **Autonomic Nervous system**
   Cholinergic drugs
   Anticholinergic drugs
   Sympathomimetics
   Anti adrenetgic drugs
   Anti glaucoma drugs
3. **Peripheral Nervous system**
   Local anaesthetics
   Different techniques of giving LA in eye
4. **Autocoids**
   Antihistamines mast cell stabilizers, Mucolytics
   Non steroidal anti-inflammatory drugs
5. **Hormones**
   Insulin and oral hypoglycaemic drugs
   Corticosteroids
6. **Central Nervous system**
   General Anaesthesia
   Ethyl and Methyl alcohol
   Sedatives and hypnotics
   Antidepressants
7. **Cardiovascular system**
   Anti hypertensives
   Diuretics
   Coagulants and anticoagulants
8. **Chemotherapy**
   Antibiotics – Sulfonamides, Quinolones, Blactam antibiotics, Tetra cyclones, Chloram phenicol, amino glycosides, macrolides
   Anti tubercular drugs

Anti leprotic drugs
Anti fungal drugs
Anti viral drugs

9. **Miscellaneous**
   Anticancer drugs for ophthalmic use
   Immunosuppressants
   Drugs acting on skin and mucous membranes
   Antiseptics and disinfectants
   Vitamins
   Drugs causing ocular toxicity
   Drugs and Biological agents used in Opthalmic surgery
   Agents used to assist in ocular diagnosis
   Wetting agents/ Tear substitutes/ Osmotic drugs in ocular use

Reference Books:

1. S P Rang, M M Dale, Ritter- Pharmacology Edition 3, Churchill 1995
2. K D Tripathi: Essentials of Medical Pharmacology, 4th Ed., 1999
3. Goodman & Gilman's the pharmacological basis of therapeutics, 11th edition

Books suggested for reading

1. Text book of pharmacology by Seth 2nd edition
2. Basic and clinical pharmacology by Katzung 9th edition

PATHOLOGY AND MICROBIOLOGY

Theory: 60 hours

PATHOLOGY

1. General Introduction
2. Inflammation and repair
3. Ophthalmic wound healing
4. Infections (tuberculosis, leprosy, syphilis, fungus, virus, Chlamydia)
5. Intraocular tumours (retinoblastoma, choroidal melanoma)
6. Optic nerve (normal and tumors)
7. Hematology (anemia, Leukemia and bleeding disorders)
8. Clinical pathology (examination of urine and blood smears)
9. Eyelid (normal and pathology including inflammations and tumors)
10. Cornea (normal and pathology in degeneration and dystrophies)
11. Lens (normal and pathology of cataract)
12. Retina (normal and pathology in inflammatory disease, infections)
13. Orbit (inflammation and neoplasia)

MICROBIOLOGY

1. Morphology of the bacterial cell
2. Growth and nutrition of bacteria; cultivation methods
3. Identification of Bacteria
4. Sterilization
5. Disinfection
6. Antibacterial agents and antibiotic sensitivity testing
7. Basic Immunology
8. Bacterial infections of the eye
9. Viral infections of the eye
10. Parasitic infections of the eye
11. Fungal infections of the eye

Reference Books:

1. Corton Kumar and Robins: Pathological Basis of the Disease, 4th edition, 1994
2. Harsh Mohan: Text Book of Pathology
3. Burton G R W: Microbiology for the Health Sciences, St.Louis, J P Lippincott Co., 3rd ., 1988
4. Essentials of Medical Microbiology by Rajesh Bhatia, Rattan Lal Ichhpujani- Jaypee (latest edition)

MARKETING AND CONSUMER BEHAVIOUR

Theory: 40 hours

Market-Classification of markets- Marketing –Features of marketing-Scope of marketing-Importance of marketing- Marketing and Selling-Role of marketing in Economic Development

Marketing mix-Product-Features-Classification-Product mix-Product Differentiation-Branding and packaging-Price-Importance of pricing-Pricing objectives-Factors affecting pricing decisions-Procedure for price determination-Kinds of pricing-Sales promotion-Purpose-Kinds of sales promotion-Consumer promotion-Dealer promotion-Advertising.

Marketing Finance-Finance-Business Finance-Fixed and working capital-Factors determining working capital-Types and sources working capital –Trade credit-Consumer credit

Consumer Behaviour-Introduction-Buying motives-Buying decision Process-factors influencing buying behaviour-Customer retention-Need-Importance-Advantages-Customer Relationship Management (CRM)

Reference Books:

1. Marketing Management-analysis, planning and control – Philip Kotler, (1987), 11th edition, Prentice hall of India, New Delhi
2. Principles of Marketing-Philip Kotler & Gary Armstrong (1996), Prentice Hall of India, New Delhi 14th Indian reprint
3. The essence of Marketing- Simon Majoro, (1996), 3rd Indian Reprint, Prentice Hall of India, New Delhi
4. Fundamentals of Marketing – William J.Stanton and Charles Futrell

5. Marketing Management – Rajan Saxena
6. Consumer Behaviour, Leon G.Schiffman, Leslie Lazar Kanuk, 6th Edition Prentice Hall of India, New Delhi

OPTOMETRIC INSTRUMENTS

Theory: 40 hours
Practical: 40 hours

1. Binocular vision
2. Simple and compound microscope **–** oil immersion eyepiece
3. **Refractive instruments:**
   Test chart standards
   Choice of test charts
   Trial case lenses – best forms
   Refractor (phoropter) head units –Auto refractors
   Optical considerations of refractor units
   Trial frame design
   Near vision difficulties with units and trail frame
   Retinoscope – types available
   Adjustment of retinoscopes – special features
   Cylinder retinoscopy
   The interpretation of objective findings
   Special subjective test – polarizing and displacement – etc., simultan test
   Projection charts
   Illumination of the consulting room
   Special Instruments:
   Brightness acuity test
   Vision analyzer
   Pupilometer
   Video acuity test
   Nerve fiber analyzer
4. **Opthalmoscopes and related devices**
   Design of opthalmoscopes – illumination/viewing
   Opthalmoscope disc
   Filters for opthalmoscopy
   Indirect opthalmloscopes
   The use of the opthalmoscope in special cases
5. Lensometer, lens gauge or clock
6. Slit lamp
   Slit lamp systems
   Viewing microscope systems

Scanning laser devices
Slit lamp accessories
Mechanical design in instruments

7. **Tonometer**
   Tonometer principles
   Types of tonometers and standardization
   Use and interpretation of tonometers
8. **Fundus camera**
   The fundus camera - principles
   The fundus camera – techniques
   External eye photography – apparatus
9. Keratometer and corneal topography
10. Refractionometer
11. **Orthoptic Instruments**
    Orthoptic Instruments - haploscopes
    Orthoptic Instruments – home devices
    Orthoptic Instruments – pleoptics
    Historical instruments
12. **Colour vision testing devices**
    Colour confusion/Hue discrimination/Colour matching
    FM-100 hue test
13. **Fields of vision and screening devices**
    Perimeter and the visual field
    Illumination of field testing instruments
    Projection perimeters
    Screening devices for field defects
    Results of field examination
    Vision screeners – principles
    Vision screeners – details
    Analysis of screener results
    Bowl perimeters
    Goldmann and Humphery Vision Analyzer
14. Optical devices and electronic (Low vision) aids
15. **Ophthalmic Ultrasonography**
    Biometry/Ultrasound/'A' Scan/'B' Scan/UBM
16. **Electrodiagnostics**

    ERG/VEP//EOG

17. NFA

Practicals:

1. Simple and compound microscope – oil immersion eyepiece
2. Refractive instruments:
   Test chart standards
   Trial case lenses – best forms
   Refractor (phoropter) head units –Auto refractors
   Retinoscope – types available
   Nerve fiber analyzer
3. Opthalmoscopes and related devices
   Design of opthalmoscopes – illumination/viewing
   Opthalmoscope disc
   Filters for opthalmoscopy
   Indirect opthalmloscopes
   The use of the opthalmoscope in special cases
4. Lensometer, lens gauge or clock
5. Slit lamp
   Slit lamp systems
   Viewing microscope systems
   Scanning laser devices
   Slit lamp accessories
6. Tonometer
   Tonometer principles
7. Fundus camera
8. Keratometer and corneal topography
9. Orthoptic Instruments
10. Colour vision testing devices
11. Fields of vision and screening devices
12. Ophthalmic Ultrasonography
13. Electrodiagnostics

Reference Books:

1. David B Henson: Optometric Instrumentation. (DBH)

CLINICAL EXAMINATION OF VISUAL SYSTEM

Theory: 40 hours

1. History of the Ophthalmic subject
   Ocular symptoms

The past prescription – its influence

2. Visual acuity testing – distance and near and colour vision
3. Examination of muscle balance
4. Slit lamp examination
   Examination of eye lids, conjunctiva and sclera
   Examination of cornea
   Examination of iris, ciliary body and pupil
   Examination of lens
5. Examination of intraocular pressure and examination of angle of anterior chamber
6. Ophthalmoscopy – Direct and Indirect
7. Examination of fundus (vitreous and disc), (choroids and retina)
8. Examination of lacrimal system
9. Examination of the orbit
10. Macular function test
11. Visual field charting (central), (peripheral).
12. Neuro – ophthalmological examination

Reference Books:

1. Jack J. Kanski: Clinical Opthalmology, Butterworths, 2nd Ed, 1989

CLINICAL PSYCHOLOGY

Theory: 40 hours

1. Introduction to Psychology
   A – Definition, History, Branches, Scope and Current Status
   B – Methods, Concepts of Normality and abnormality
2. Sensation, Attention and Perception
   Primary senses
   Types of attention and determinants
   Principles of perception and determinants
3. A – Intelligence, B - Learning, C - Memory, D - Personality, E – Motivation and F – Body image and personality integration
4. Helper – Helpee relationship and Ophthalmic counseling
   Characteristics of therapist, Relationship between the therapist and client
   Counseling patient with partial sight, colour blindness and hereditary vision defects
5. Psychological Reaction
   A – Illness, loss and Grief
   B - Adapting changes in Vision (age, diseases, etc….)
6. Tests for people with disability
   WAIS – R, WISC –R (for visually handicapped)

Blind learning aptitude tests

7. Disability and Rehabilitation

Reference Books:

1. Introduction to Psychology, Morgon C.T., King R.A., Robinson N.M., Tata Mc Graw Hill Publishing Co.
2. Introduction to Psychology, Hilgard and Atkinson, Tata Mc Graw Hill Publishing Co.
3. Psychology 5th Ed. Dworetsky J.P.
4. Child Development Hurlock, EB, VIED, Mc Graw Hill International Book Co. (1981)

CLINICS I

Practical: 180 hours

CLINICS II

Practical : 180 hours

THIRD YEAR

BINOCULAR VISION

Theory: 60 hours

1. Spatial sense
2. Evolution of Binocular vision
3. Binocular fusion, suppression, revalry and summation
4. Visual direction, local sign and corresponding points
5. Visual distance, empirical cues
6. Panum's space
7. Stereopsis
8. Development of Binocular vision
9. The longitudinal horopter
10. Neural aspects of Binocular vision
11. Visually guided behaviour and aniselkonia
12. ARC
13. Qualitative and quantitative diagnosis of strabismus
14. Esodeviations
15. Exodeviations
16. A-V phenomena

17. Cyclovertical squint
18. Pseudo strabismus
19. Amblyopia and eccentric fixation
20. Treatment of amblyopia
21. Special forms of strabismus
22. Nystagmus
23. Non-surgical management of strabismus
24. Review of orthoptic procedures

Reference Books:

1. R W Reading: Binocular Vision- Foundations and Applications
2. Basic Science, A.A.O (section-6) Pediatric Ophthalmology and Strabismus 1992-1993

GLAUCOMA

Theory: 60 hours

1. Introduction to glaucoma
   a. Epidemiology
   b. Heridity
   c. Definition & classification of Glaucoma
2. Intra Ocular pressure and Aqueous humor dynamics
3. Clinical Evaluation
   a. History and General examination
   b. Gonioscopy
   c. Optic nerve head analysis
   d. Visual fields
4. Childhood Glaucoma
5. Open angle glaucoma
   a. The glaucoma suspect
   b. Open angle glaucoma without elevated IOP
   c. primary open angle glaucoma
   d. Secondary open angle glaucoma
6. Angle closure glaucoma
   a. Primary angle closure glaucoma
   b. Secondary angle closure glaucoma
7. Medical management of glaucoma
8. Surgery therapy f or glaucoma
9. Newer advances in the management of glaucoma

Reference Books:

1. M Bruce Shields (MBS): Text Book of Glaucoma, Williams & Wilkins, London

2. Marc Leiberman: Simplified Guide to Computerized Perimetry

LOW VISION AIDS

Theory: 60 hours
Practical: 40 hours

1. Identifying the low vision patient
2. History
3. Diagnostic procedures in low vision case management
4. Optics of low vision aids
5. Refraction, special charts.l Radical retinoscopy
6. Evaluating near vision: Amsier grid and field defects, prismatic scanning
7. Demonstrating aids – optical, Non-optical, Electronic
8. Teaching the patient to use aids including eccentric viewing training when necessary
9. Guidelines to determining magnification and selecting low vision aids for distance, intermediate and near
10. Spectacle mounted telescopes and microscopes
11. Children with low vision
12. Choice of tests, aids in different pathological conditions
13. Light, glare and contrast in low vision care and rehabilitation
14. Bioptic telescopes
15. Optical devices to help people with field defects
16. Contact lens combined system
17. Rehabilitation of the Visually handicapped

Practicals:

1. Refraction, special charts.l Radical retinoscopy
2. Evaluating near vision: Amsier grid and field defects, prismatic scanning
3. Demonstrating aids – optical, Non-optical, Electronic
4. Guidelines to determining magnification and selecting low vision aids for distance, intermediate and near
5. Spectacle mounted telescopes and microscopes
6. Choice of tests, aids in different pathological conditions
7. Contact lens combined system
8. Rehabilitation of the Visually handicapped

Reference Books:

1. C.Dickinson : Principles and Practice of Low Vision, Butterworth- Heinemann Publication, 1998

DISPENSING OPTICS

Theory: 60 hours
Practical: 40 hours

1. Clinical experiences in verification and dispensing of ophthalmic materials outlined in Ophthalmic Optics.(Optometric Optics)Course and Dispensing Optics
2. Special practical instructions in centering, marking and mounting the lenses of all designs, types, shapes and sizes in accordance with frame and facial measurements
3. Visit to lens manufacturing workshops
4. Video session on fitting of progressive lenses
5. ANSI standards
6. Dispensing Instrumentation
   Pupillometer
   Pliers
   PCD
   Air blower
   Distometer
7. Abbe's value, specific gravity, optical density, Pantoscopic flit
8. Patients selection, fitting Ms of PALs, Selection of designs
9. case study : problems, orientated dispensing optics
10. Recent developments
11. Special purpose frames
12. Safety wear

Practicals:

1. Optic center marking
2. PD Measurement – for far and near
3. Pupilliometer
4. Tints and filters to be shown – indications
5. Different types of Bifocals to be shown
6. PALs fitting

Reference Books:

1. Clifford W Brooks & Irvin M Borish: System of Ophthalmic Dispensing, Professional press, 1979

PAEDIATRIC OPTOMETRY AND GERIATRIC OPTOMETRY

Theory: 100 hours

PAEDIATRIC OPTOMETRY

PART I – Examination and Diagnosis

1. **History**
   Genetic factors - Perinatal factors- Prenatal factors - Postnatal factors
   Measurement of visual acuity
2. **Normal appearance, Pathology and structural anomalies of :**
   Orbit
   Eyelids
   Lacrimal system
   Conjunctiva
   Cornea
   Sclera
   Anterior chamber, uveal tract, pupils
   Lens, vitreous, fundus
   Oculomotor system
3. Measurement of refractive status
4. Determining binocular status
5. Determining sensory motor adaptability

PART II – Post-Examination process

6. Compensatory treatment and remedial therapy for:
   Myopia
   Pseudo myopis
   Hyperopia
   Astigmatism
   Anisometropis
   Amblyopia
7. Remedial and compensatory treatment for strabismus and nystagmus
8. Vergence and accommodation

GERIATRIC OPTOMETRY

1. Structural changes in eye
2. Physiological changes in eye
3. Optical and refractive changes in eye

4. Aphakia, Pseudo aphakia – its correction
5. Ocular diseases common in old eye, with special reference to cataract, glaucoma, macular disorders, vascular diseases of the eye
6. Special considerations in ophthalmic dispensing to the elderly
7. Management of visual problems of aging
8. How to carry on one's visual task overcoming the problems of aging?

Reference Books:

1. Jerome Rosner: Pediatric Optometry, Butterworths, London, 1982
2. Hirsch M J & Wick R E: Vision of the Aging Patient, An Optometric Symposium, 1960

CONTACT LENS

Theory: 100 hours

1. History of contact lens
2. Corneal Anatomy and Physiology
3. Corneal Physiology and Contact Lens
4. Preliminary Measurements and Investigations
5. Slit lamp Biomicroscopy
6. Contact lens materials
7. Optics of Contact lenses
8. Glossary of Terms: Contact Lenses
9. Indications and Contra Indications of CL
10. Rigid gas permeable contact lens design
11. Soft contact lens design
12. Keratometry, Placido's disc, Topography
13. Fitting philosophies (Introduction to Contact lens fitting)
14. Handling of contact lenses
15. Fitting of spherical Soft CL and effects of parameter changes
16. Astigmatism; Correction options
17. Fitting spherical RGP CL. Low DK High DK
18. Effects of RGP CL parameter changes on lens fitting
19. Fitting in Astigmatism
20. Fitting in Keratoconus
21. Fitting in Aphakia, Pseudophakia
22. Lens care & Hygiene Instructions Compliance
23. Follow up post fitting examination
24. Follow up slit lamp examinations
25. Cosmetic Contact lenses
26. Fitting contact lens in children

27. Toric Contact lenses
28. Bifocal contact lenses
29. Continuous wear and extended wear lenses
30. Therapeutic lenses / bandage lenses
31. Contact lens following ocular surgeries
32. Disposable contact lenses, Frequent replacement and lenses
33. Use of Specular Microscopy and Tachymetry in CL
34. Care of contact lenses, Contact lens solutions
35. Complications of Contact lenses
36. Contact lens modification of finished lenses
37. Instrumentation in contact lens practice
38. Checking finished lens parameters
39. Contact lens – Special purposes – Swimming, Sports, Occupational etc.,
40. recent developments in Contact lenses
41. Review of lenses available in India
42. Current contact lens research

Reference Books:

1. Robber B Mandell: Contact lens Practice, hard and flexible lenses, Charles C. Thomas, 3rd Edition, 1981, Illinois, USA
2. Ruben M Guillon: Contact lens practice, 994, 1st Edition

LAW & OPTOMETRY AND OCCUPATIONAL OPTOMETRY

Theory: 80 hours

LAW & OPTOMETRY

1. Legal environment and techniques – history – law and equity
2. History and theory of licensure
3. Licensure as a means of internal and external discipline – unprofessional conduct – incompetence – gross immorality
4. International Optometry – important foreign optometry law
5. The Optometrist in court
6. Malpractice – Theory of Liability – damages – minimizing malpractice claims
7. Insurance
8. Negligence
9. Ethics – professional ethics
10. Laws governing practice of medical profession and para-medical profession In India
11. Registered medical practitioner – laws against practice of medicine of those unregistered – Medical Council of India – Dental Council – Nursing council
12. Present rules and regulations – Laws regarding optical product manufacturers – dispensing in India

13. Opticians – Are they registered? Dispensing Opticians – rules in U.K

OCCUPATIONAL OPTOMETRY

1. Introduction to occupational health, hygiene and safety International Bodies like ILO, WHO, National bodies like labour Institutes, National Institutes of Occupational Health, National Safety Council, etc.
2. Acts and Rules: Factories Act and Rules- Workmen's Compensation Act – ESI Act, etc
3. Occupational diseases/ occupation related diseases caused by – physical agents, chemical agents and biological agents
4. Occupational hygiene, environmental monitoring
   Recognition, evaluation and control of hazards
   Illumination – definition, measurements and standards
5. Occupational safety
   Causes of accidents
   Vision, lighting, colour and their role
   Accident analysis
   Accident prevention
6. Ocular and visual problems of occupation
   Electromagnetic radiation
   Ionizing
   Non-ionizing – Infra red
   Ultra violet
   Microwave, Laser
   Injuries – Mechanical, chemical
   Toxicology – Metals, chemicals
7. Prevention of occupational diseases
   Medical examination / medical monitoring
   Pre-employment / pre-placement
   Periodic
8. Personal protective equipment
   General
   Goggles, face shields, etc
   Selection and use
   Testing for standards
9. Standards
   Visual standards for jobs
10. Problems of special occupational groups
    Drivers, Pilots and others
11. Field work – submission of reports

Visits to : Regional Labour Institute, selected industries

12. Visual display units (terminals) - -VDU/VDT
    Contact lens and work
    Pesticides – general and visual and ocular defects
13. Role of Optometrists – promotion of general and visual health and safety of people at work

Reference Books:

1. Seymour L Coblens: ptometry and the Law, American Optometric Association, St.Louis,1976
2. R.A.F. Cox (ed.) fitness for work – the medical aspects. Oxford University Press 2000, reprinted 2003
3. Indian Association of Occupation Health, Guidelines on Pre-Employment Medical Examination, Pune 1998
4. Barbara A.Plog, Patrica J. Quinlan. Fundamentals of Industrial Hygiene. 5th Edition, 2002
5. John Ridley & John Channing. Safety at work. 5th Edition 1999, reprinted 2000,2001
6. Stephen Konz, Steven Johnson. Work Design-Industrial Ergonomics 2000
7. Salvatore R. Dinardi. The Occupational Environment – Its Evaluation and Control 1997
8. Linda Rosenstock & Mark R.Cullen. Textbook of Clinical Occupational and Environmental Medicine, 1994
9. William N. Rom. Environmental and Occupational Medicine. 3rd edition, 1998
10. Stephen L.Demeter, Gunnar B. J.Andersson. Disability Evaluation. 2nd edition, 2003

SYSTEMIC DISEASES

Theory: 40 hours
Practical: 40 hours

1. **Arterial Hypertension**
   Pathophysiology, classification, clinical examination, diagnosis, complications, management
   Hypertension and the eye
2. **Diabetes Mellitus**
   Pathology, classification, clinical features, diagnosis, complications and management
   Diabetes mellitus and the eye
3. **Acquired Heart Disease – Embolism**
   Rheumatic fever- Pathophysiology**,** classifications, diagnosis, complications, management
   Embolism
   Subacute bacterial endocarditis
4. **Cancer – Introduction**
   Definitions, nomenclature, characteristics of Benign and malignant neoplasms
   Grading of staging of cancer, diagnosis, principles of treatment
   Neoplasia and the eye
5. **Connective Tissue disease**
   Anatomy and Pathophysiology : Arthritis

Eye and connective tissue disease

6. **Thyroid Disease**

   Anatomy and physiology of the thyroid gland

   Classification of thyroid disease

   Diagnosis, complications, clinical features, management, thyroid disease and the eye

7. **Tuberculosis**

   Aetiology, pathology, clinical features, pulmonary tuberculosis, diagnosis, complications, treatment, tuberculosis and the eye

8. **Helminthiasis**

   Classification of helminthic diseases, Schistosomiasis, principles of diagnosis and management

9. **Common tropical medical ailments (Malaria, Leprosy, etc.)**

   Introduction to tropical diseases; Malaria

   Tropical diseases and the eye – leprosy, toxoplasmosis, syphillis trachoma

10. **Malnutrition**

    Aetiology, protein energy malnutrition, water electrolytes, minerals, vitamins, nutritional disorders and the eye

11. **Introduction to Immunology**

    Introduction, components of the Immune system, principle of Immunity in health, Immunology in disease, Immunology and the eye

12. **Neurological disorders – Stroke/CVA**

    Disseminated sclerosis and subacute combined degeneration

    Anatomy eith pathophysiology Disseminated sclerosis and subacute combined degeneration

    Eye and connective tissue disease

13. **General Medical Emergencies – first aid**

    Ocular/general

14. **Genetics**

    Introduction to genetics

    Organization of the cell

    Chromosome structure and cell division

    Gene structure and basic principle of genetics

    Genetic disorders and their diagnosis

    Genes and the eye

    Genetic counseling and genetic engineering

Practical:

Ward visits

Reference Books:

1. Davidson's principles and Practice of Medicine, Ed. John Macleod, 14th Ed., ELBS/Churchill Livingstone (PPM)

EPIDEMIOLOGY AND BIO-STATISTICS

Theory: 60 hours

EPIDEMIOLOGY

1. Introduction to Epidemiology
2. Measures of Disease Frequency
3. Descriptive Epidemiology
4. Cross sectional studies
5. Case control studies
6. Cohort studies
7. Randomized controlled trial
8. Association and Causation
9. Bias and Confounding
10. Screening for disease
11. History of Public Health
12. Organization of Health services
13. Health Care Delivery system
14. Health Economics
15. Health Planning

BIO-STATISTICS

1. Introduction to Statistics
2. Scales of Measurement
3. Collection and Presentation of data
4. Measures of Central tendency
5. Measures of Variation
6. Probability
7. Binomial and Normal distribution
8. Sampling Methods
9. Sample size determination
10. Correlation and Regression
11. Statistical Significance
12. Non-Parametric tests
13. Health Statistics including hospital statistics

Reference Books:

1. Mausne & Bahn: Epidemiology- An Introductory text, 2nd Ed

2. Community Health Nursing by K.Park, Latest Edition, Banarsidas
3. Basic Epidemiology by R.Beaglehole R.Bonita and T.Kjellstrom. Orient Longman WHO Geneva
4. Biostatistics, 2nd edition University park Press, Baltimore
5. Methods in Biostatistics by Mahajan, B.K.Jaypee publishers
6. An introduction to Biostatistics III Edition by P.S.S.Sundar Rao & J.Richard, Prentice-Hall of India, New Delhi

PUBLIC HEALTH AND COMMUNITY OPTOMETRY

Theory: 80 hours

1. **Philosophy of Public Health**

   History of public health medicine

   History of public health optometry (including epidemiology, man power, projections, community reimbursement mechanisms)

2. **Health care systems**

   Organization of health services (principles of primary, secondary and tertiary care)

   Determinants of health care delivery system

   Planning of health services (including relevant legislation and implications to optometric practice)

   Health economics

   Health manpower protection and in the practice of ophthalmology

   Third party involvement in financing health care services (including both governmental and non-governmental programmes)

   Quality assurance in patient care services

3. **Modes of health and vision care delivery**

   Solo and group practice modes

   Multidisciplinary, interdisciplinary and institutional practice modes

   Optometry's role as a primary care profession

Reference Books:

1. Oxford Text Book of Public Health & Preventive Medicine, (Vol I to I)

CLINICS AND SPECIAL CLINICS I

Practical: 240 hours

1. Case sheet
2. History taking
3. Lensometry
4. Visual acuity
5. Tests for phorias and tropias

6. External examination
7. Slit lamp examination
8. Drugs and method of application
9. Do's and don'ts – papillary dilatation
10. Direct Opthalmoscopy
11. Indirect Opthalmoscopy
12. Instrumentation
13. Patients selection
14. Keratometry reading
15. Refraction
16. Fluorescent pattern
17. Overrefraction
18. Fitting of hard lenses
19. Rigid gas permeable lenses and soft lenses in refractive errors and in specialized condition

    The students are made to observe the internees initially, then gradually they are encouraged to work up a patient, and perform various examination techniques

NOTE: The portion for clinics I and II are the same

CLINICS AND SPECIAL CLINICS II

Practical: 240 hours

1. Case sheet
2. History taking
3. Lensometry
4. Visual acuity
5. Tests for phorias and tropias
6. External examination
7. Slit lamp examination
8. Drugs and method of application
9. Do's and don'ts – papillary dilatation
10. Direct Opthalmoscopy
11. Indirect Opthalmoscopy
12. Instrumentation
13. Patients selection
14. Keratometry reading
15. Refraction
16. Flourescein pattern
17. Overrefraction
18. Fitting of hard lenses
19. Rigid gas permeable lenses and soft lenses in refractive errors and in specialized condition

The students are made to observe the internees initially, then gradually they are encouraged to work up a patient, and perform various examination techniques

NOTE: The portion for clinics I and II are the same

PROJECT