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 B. OPTOM DEGREE COURSE OF THE TAMIL NADU Dr. M.G.R. MEDICAL UNIVERSITY, CHENNAI".

They shall come into force from the academic year 2018 -2019 onwards.

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

2. ELIGIBILITY FOR ADMISSION

(a) A Candidates desiring to join the four year programmes leading to the B.Optom. Degree Course should have passed the HSC/CBSE/ISC or equivalent examination with

i) **Physics, Chemistry and Biology Subjects taken together at the qualifying examination after a period of 12 years of study. (or)

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

ii) ** A pass with a minimum of 35% marks in each Subjects separately including English for all Categories"

****(It is approved by 43rd SAB dt.19.12.11).**

(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 Controller of Examination 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 B.Optom. Degree course shall be 4 Years (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 up to 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 240 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 90% 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. 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 practical.**

(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 practical separately.**

15. 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.

16. 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.

17. 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.

18. 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 retotaling.

19. 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: All migrations / transfers are subject to the approval of the Vice-Chancellor.

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

b) 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.

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

d) 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.

e) 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.

20. 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).

21. PATTERN OF QUESTION PAPER FOR UNIVERSITY EXAMINATION:

EXAMINATION QUESTION PAPER PATTERN

B.Optom. DEGREE COURSE

Essay	**3 x 10 = 30 Marks**
Short Notes	**8 x 5 = 40 Marks**
Short Answers	**10 x 3 = 30 Marks**
Total	**100 Marks**

B. Optom Degree Course

22. SCHEME OF EXAMINATION

FIRST YEAR
(240 Working days)

Paper. No.	Subject Title	I A		Theory		Practical		Viva Voce	
		Max	Min	Max	Min	Max	Min	Max	Min
I	General Anatomy, General Physiology	50	25	100	50	100	50	50	25
II	Ocular Anatomy and Ocular Physiology	50	25	100	50	100	50	50	25
III	Physical and Geometrical Optics	50	25	100	50	100	50	50	25
IV	Basic Biochemistry & Nutrition	50	25	100	50	100	50	50	25

Internal Papers:

Paper. No.	Subject Title	I A		Theory		Practical		Viva Voce	
		Max	Min	Max	Min	Max	Min	Max	Min
V	English	50	25	100	50	-		-	
VI	Computer Science	50	25	100	50	100	50	50	25
VII	Principles of Lighting	50	25	100	50	-	-	-	-

SECOND YEAR

(240 Working days)

Paper. No.	Subject Title	I A		Theory		Practical		Viva Voce	
		Max	Min	Max	Min	Max	Min	Max	Min
I	Ocular Diseases	50	25	100	50	-	-	-	-
II	Visual Optics	50	25	100	50	100	50	50	25
III	Optometric Instruments & Optometric Optics I	50	25	100	50	-	-	-	-
IV	Pathology, Microbiology and Pharmacology	50	25	100	50	-	-	-	-

Internal Papers:

Paper. No.	Subject Title	I A		Theory		Practical		Viva Voce	
		Max	Min	Max	Min	Max	Min	Max	Min
V	Clinical Examination of Visual System	50	25	100	50	-		-	
VI	Clinics	50	25	-	-	100	50	50	25

THIRD YEAR

(240 Working days)

Paper. No.	Subject Title	I A		Theory		Practical		Viva Voce	
		Max	Min	Max	Min	Max	Min	Max	Min
I	Optometric Optics II and Dispensing Optics	50	25	100	50	100	50	50	25
II	Orthoptics	50	25	100	50	100	50	50	25
III	Low Vision Aids (25 marks) and Contact Lens (75 marks)	50	25	100	50	100	50	50	25
IV	Paediatric Optometry and Geriatric Optometry	50	25	100	50	-	-	-	-

Internal Papers:

Paper. No.	Subject Title	I A		Theory		Practical		Viva Voce	
		Max	Min	Max	Min	Max	Min	Max	Min
IV	Epidemiology and Biostatistics	50	25	100	50	-	-	-	-
V	Community Optometry, Public Health and Occupational Optometry	50	25	100	50	-	-	-	-
VI	Clinics and Special Clinics	-	-	-	-	100	50	50	25
VII	Project and Paper Presentation	100	50	50	25	-	-	-	-

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 orthoptic 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. (Optometry) (4 years experience), Ph.D., as added qualification in Optometric. Junior Instructor should have B.Sc.(Optometry) (4-8 years experience).

These faculties should work directly under the supervision and guidance of Professor of Ophthalmology in the Department of Ophthalmology 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
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, Pleura & Muscles of Respiration**
- **Digestive system**
- **Reproductive system**
- **Endocrine system**
- **Special senses – Ear, Tongue and Nose**

Histology

- **Epithelial 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, erythropoiesis, 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 carbon dioxide, 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 regulation with hyper and hypo secretion of the glands.

8. **Reproductive system**

   Spermatogenesis, male sex hormones, 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 oculi & 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, Diurnal 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, accommodation & refraction, accommodation & convergence)
		Presbyopia
Iris & pupil		**Pupillary reaction to light**
		Measurement of afferent papillary defect
		Pharmacology of pupil
		Horner's syndrome & evaluation
		Analyzing anisocoria
Retina	:	**Photochemistry 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, anomalies 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. **Light and dark adaptation**
12. **Binocular vision**
13. **Colour vision**

Reference Books:

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

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 Fresnel's diffraction

Fraunhofer diffraction

Applied aspects of diffraction

Single slit, qualitative and quantitative Zone plate

Circular aperture

4. **Polarization**

Polarization of transverse waves-light as transverse waves Double refraction

Nicol prism - Nicol prism as an analyzer Elliptically & Circularly polarized light Optical activity-

Fresnel'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 diopter -Vergence

Working of spherical lenses – primary and secondary focal points

Prism diopter: Prentice's law – deviations- Ophthalmic 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 magnification-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 spherocylindrical lens- writing Rx in different forms (+cyl., -cyl., meridional)- additional sphero-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 ametropia
4. Correction of ametropia 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, excimer 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.

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)**

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**

ENGLISH

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.

COMPUTER SCIENCE

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**

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

SECOND YEAR
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

Congenital 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 the orbit 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 origin

Glandular and adnexal tumours
Tumours of neuroectodermal
origin Vascular tumours
Xanthomatous lesions
Inflammatory lesions Metastatic
tumours Degenerations and
dystrophies
Definitions
Degenerations
Dystrophies
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
Congenital anomalies of the
choroids Diseases of the choroid
Tumours

Reference Books:

Jack J. Kanski: Clinical Ophthalmology, 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 astrocytomas 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. Glaucoma

Introduction to glaucoma

-Epidemiology

-Heridity

-Definition & classification of Glaucoma

Intra Ocular pressure and Aqueous humor dynamics Clinical Evaluation

- History and General examination
- Gonioscopy
- Optic nerve head analysis
- Visual fields

Childhood Glaucoma

Open angle glaucoma

- The glaucoma suspect
- Open angle glaucoma without elevated IOP
- Primary open angle glaucoma
- Secondary open angle glaucoma Angle closure glaucoma
- Primary angle closure glaucoma
- Secondary angle closure glaucoma

Medical management of glaucoma

Surgery therapy f or glaucoma

Newer advances in the management of glaucoma

4. 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 geniculate 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

5. **Lens**

Anatomy and pathophysiology

Normal anatomy and aging

process Developmental defects

Acquired lenticular defects

6. **Trauma**

Anterior segment trauma

Posterior segment trauma

7. **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**
2. **M Bruce Shields (MBS): Text Book of Glaucoma, Williams & Wilkins, London**
3. **Marc Leiberman: Simplified Guide to Computerized Perimetry**

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 Aniseikonia Presbyopia**
   - **Aphakia and Pseudo aphakia**
   - **Correction and Management of Amblyopia**
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 emmetropia**
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 Keratometry 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 opacities**
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

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 <u>Special Instruments:</u>

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**

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

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)

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

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

CLINICS I

Practical: 180 hours

CLINICS II

Practical : 180 hours

THIRD YEAR

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**

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**

ORTHOPTICS

Theory: 60 hours

1. Binocular Vision and Space perception

Relative subjective visual
direction. Retino motor value
Grades of BSV
SMP and Cyclopean
Eye Correspondence,
Fusion, Diplopia, Retinal
rivalry Horopter
Physiological Diplopia and Suppression
Stereopsis, Panum's area, BSV.
Stereopsis and monocular clues - significance.
Egocentric location, clinical applications.
Theories of Binocular vision.

2. Anatomy of Extra Ocular Muscles.

Rectii and Obliques, LPS.
Innervation & Blood Supply.

3. Physiology of Ocular movements.

Center of rotation, Axes of Fick.
Action of individual muscle.

4. Laws of ocular motility

Donder's and Listing's law

- Sherrington's law
- Hering's law

5. Uniocular& Binocular movements - fixation, saccadic & pursuits.
   - Version &Vergence.
   - Fixation & field of fixation
6. Near Vision Complex Accommodation
   - Definition and mechanism (process).
   - Methods of measurement.
   - Stimulus and innervation.
   - Types of accommodation.
   - Anomalies of accommodation – aetiology and management.
7. Convergence
   - Definition and mechanism.
   - Methods of measurement.
   - Types and components of convergence - Tonic, accommodative, fusional, proximal. Anomalies of Convergence – aetiology and management.
8. Sensory adaptations
   - Confusion
9. Suppression
   - Investigations
   - Management
   - Blind spot syndrome
10. Abnormal Retinal Correspondence
    - Investigation and management
    - Blind spot syndrome
11. Eccentric Fixation
    - Investigation and management
12. Amblyopia
    - Classsification
    - Aeitiology
    - Investigation
    - Management
13. Neuro-muscular anomalies
    - Classification and etiological factors
14. History – recording and significance.
15. Convergent strabismus
    - Accommodative convergent squint Classification
      - Investigation and Management
    - Non accommodative Convergent squint
      - Classification
      - Investigation and Management
16. Divergent Strabismus
    - Classification

- A& V phenomenon
- Investigation and Management

17. Vertical strabismus
    - Classification
    - Investigation and Management
18. Paralytic Strabismus
    - Acquired and Congenital
    - Clinical Characteristics
19. Distinction from comitant and restrictive squint
20. Investigations
    - History and symptoms
    - Head Posture
    - Diplopia Charting
    - Hess chart
    - PBCT
    - Nine directions
    - Binocular field of vision
21. Amblyopia and Treatment of Amblyopia
22. Nystagmus
23. Non-surgical Management of Squint
24. Restrictive Strabismus
    - Features
    - Musculo-fascical anomalies
    - Duane's Retraction syndrome
    - Clinical features and management
    - Brown's Superior oblique sheath syndrome
    - Strabismus fixus
    - Congenital muscle fibrosis
    - Surgical management

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

PRACTICAL

1. History taking & general observation
2. Ocular motility
3. NPA measurement (all techniques)
4. Amplitude of accommodation calculation
5. Relative accommodation (NRA/PRA)
6. Accommodative facility

7. **Dynamic retinoscopy (Nott & MEM methods)**
8. **NPC measurement (Subjective & Objective) -All techniques**
9. **Hirschberg Test (Distance & Near)**
10. **Cover tests (Distance & Near)**
11. **Maddox rod test (Distance & Near)**
12. **Prism bar cover test**
13. **Step vergence ranges (Distance & Near)**
14. **Vergence facility**
15. **AC/A ratio**
16. **Stereoacuity**
17. **Tests for diplopia**
18. **Tests for suppression**
19. **Tests for ARC**
20. **Diplopia charting**
21. **Vision therapy procedures for accommodation, vergence problems and amblyopia**
22. **Horopter**
23. **Physiological diplopia**

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**

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**

Practicals:

A. Preliminary examination of CL candidate:

Part 1: Anterior segment evaluation

a. Slit lamp examination of anterior segment

b. Assessment of corneal sensitivity

c. Lid tonus

e. Blink rate and type

Part 2: Assessment of tears a. Schirmer's test I & II b. TBUT

c. Tear prism height

Part 3: Measurement of ocular dimensions a. HVID & VVID

b. Palpebral aperture

c. Corneal curvature

d. Measurement of pupil size in normal (room light), dim and bright illumination

e. Selection of trial contact lens parameters (from HVID, keratometry reading, and subjective acceptance). Writing trial lens parameters.

B. Identification of type of contact lens – soft, RGP, soft toric, scleral, cosmetic, prosthetic, lenses for keratoconus (Rose-K, kerasoft, hybrid, etc)

C. Contact lens verification – CL power, total diameter, blends (in RGP), base curve, type, quality

D. Insertion & Removal of contact lenses
a. Identification of correct side of soft contact lens (Taco test)
b. Insertion & Removal of soft contact lenses
c. Insertion & Removal of RGP contact lenses
d. Cleaning procedure for soft & RGP contact lenses

E. Soft CL Fit assessment, over-refraction & final lens parameters

F. Fitting principle in toric soft contact lenses

G. Fit assessment of RGP contact lenses – observation of static & dynamic fitting characteristics in steep, flat and optimum fitting RGP lenses.

H. Examination of old contact lens patient
a. CL examination for deposits, tear, scratches, type of lens
b. Vision, comfort, ocular changes, old CL fit assessment & over-refraction

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

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)

OCCUPATIONAL OPTOMETRY

Theory: 80 hours

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

CLINICS AND SPECIAL CLINICS I & 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. **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

PROJECT

B.Optom.
POSTINGS FOR INTERNSHIP FOR ONE YEAR (WORK ALLOCATION)

Refraction	3 months
Contact Lens & Low Vision Aids	1 month
Optical Dispensing	2 months
Pediatric Ophthalmology & Orthoptics	2 months
Glaucoma & Perimetry	15 days
Cataract workup	15 days
Operation Theatre & Ward	15 days
FFA & OCT	15 days
Retina & Electrodiagnostic	15 days
Cornea, Eye bank, Refractive surgery	15 days
Community Optometry	15 days
Oculoplasty & Neuro ophthalmology	**15 days**