

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.

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 2015 -2016 onwards.

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

1. ELIGIBILITY FOR ADMISSION

1. A Candidate 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 Botony and Zoology 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.

** (Approved in 43rd SAB dt.19.12.11).

2. AGE LIMIT FOR ADMISSION:

Every candidate should have completed the age of 17 years at the time of admission or would complete the said age on or before 31st December of the year of admission. No upper Age limit.

3. ELIGIBILITY CERTIFICATE:

The candidates who have passed any qualifying examination other than the Higher Secondary Course examination conducted by the Government of Tamilnadu, before seeking admission to any one of the affiliated Institutions shall obtain an Eligibility Certificate from this University by remitting the prescribed fees along with the filled in Application Form (which shall be downloaded from the University website (web.tnmgrmu.ac.in))

4. REGISTRATION:

A candidate admitted to the B. Optom 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 to the University through the affiliated Institution within 30 days from the Cut-off date prescribed for B. Optom Degree Course for admission. The applications should have the date of admission of the course.

5. MIGRATION/TRANSFER OF CANDIDATE:

(a) A student studying in B. Optom Degree Course can be allowed to migrate/transfer to another institution of Allied Health Science under the same or another University.

(b) All migration/transfer are subject to the approval of the Vice-chancellor.

6. COMMENCEMENT OF THE COURSE:

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

7. MEDIUM OF INSTRUCTION:

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

8. CURRICULUM:

The Curriculum and the Syllabus for the course shall be as prescribed in these regulations are subject to modifications by the Standing Academic Board from time to time.

9. DURATION OF THE COURSE:

The duration of the B. Optom Degree course shall be 4 Years (Three Academic Years and One year Internship)

10. RE-ADMISSION AFTER BREAK OF STUDY:

The Regulations for Re-admission are as per the University common Regulation for Re-admission after break of study.

11. WORKING DAYS IN AN ACADEMIC YEAR:

Each academic year shall consist of not less than 240 working days.

12. ATTENDANCE REQUIRED FOR ADMISSION TO EXAMINATIONS:

A candidate is required to put in a minimum of 85% of attendance out of 240 working days. The academic year should consist of not less than 240 working days.

13. CONDONATION OF LACK OF ATTENDANCE;

There shall be no condonation of lack of attendance.

14. VACATION:

There is no vacation.

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

I) 30th September of the academic year concerned.

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

iii) 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.

16. COMMENCEMENT OF THE EXAMINATIONS:

1st August / 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.

17. MARKS QUALIFYING FOR PASS:

50% of marks in the University Theory Examinations

50% of marks in the University Practical
Examinations

50% of marks in aggregate in Theory, Practical I.A. & Oral taken
together

18. EXAMINATION

1. A candidate has to pass in theory and practical examinations separately in each of the paper
2. If the candidate fails either in theory or practical examinations, he/she has to reappear for both (theory and practical)
3. The candidate has to successfully complete the course within double the duration of the course from the date of joining (i.e. 6 years from the date of joining)

Maximum number of candidates for practical examination should not exceed 20 per day.

An examiner should be a lecturer or above in any of the affiliated institutions of Allied Health Sciences.

19. NUMBER OF EXAMINERS

One internal and one external examiner should jointly conduct practical/ oral examination for each student

20. REVALUATION/RETOTALLING OF ANSWER PAPERS:

Revaluation/ Retotalling of answer paper is not permitted.

B. Optom Degree Course

25. 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 and	50	25	100	50	100	50	50	25

	Basic Biochemistry								
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	Principles of Lighting	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	English	50	25	100	50	-		-	
VI	Computer Science	50	25	100	50	100	50	50	25

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 – I & II	50	25	100	50	-	-	-	-
II	Visual Optics - I & II	50	25	100	50	100	50	50	25
III	Optometric Instruments	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 I & II and Dispensing Optics	50	25	100	50	100	50	50	25
II	Orthoptics	50	25	100	50	-	-	-	-
III	Low Vision Aids (25 marks) and Contact Lens (75 marks)	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
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	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 ocular 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**

PAPER - I

**GENERAL ANATOMY, GENERAL PHYSIOLOGY AND
BASIC BIOCHEMISTRY**

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

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 & liver 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)

PAPER – II

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 : Cadaveric 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. Schiottz tonometry
8. Measurement of accommodation
9. Visual acuity measurement
10. Ophthalmoscopy 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

PAPER – III – PHYSICAL AND GEOMETRICAL OPTICS (I & II)

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- Dioptic 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.

PAPER - IV**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 & 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

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 Grammar 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 images 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 Brian 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

SECOND YEAR
PAPER – 1 – OCULAR DISEASES – I & II

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

- Keratoconjunctivitis 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 changes

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. **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 fasciculus

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 Ophthalmology, Butterworths, 2nd Ed., 1989

PAPER – II – VISUAL OPTICS I & II

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 ophthalmophakometry

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

Aetiology 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 of 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

PAPER - III

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 trial frame
Retinoscope – types available
Adjustment of retinoscopes – special features
Cylinder retinoscopy
The interpretation of objective findings
Special subjective test – polarizing and displacement – etc., simultaneous test
Projection charts
Illumination of the consulting room
Special Instruments:
Brightness acuity test
Vision analyzer
Pupilometer
Video acuity test
Nerve fiber analyzer

4. **Ophthalmoscopes and related devices**

Design of ophthalmoscopes – illumination/viewing
Ophthalmoscope disc
Filters for ophthalmoscopy
Indirect ophthalmoscopes
The use of the ophthalmoscope 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

PAPER – IV

PATHOLOGY, MICROBIOLOGY AND PHARMACOLOGY

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 adrenergic 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, Chloramphenicol, 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 Ophthalmic 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 Ophthalmology, Butterworths, 2nd Ed, 1989

CLINICS I

Practical: 180 hours

CLINICS II

Practical : 180 hours

THIRD YEAR

PAPER – I - OPTOMETRIC OPTICS I & II & DISPENSING OPTICS

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

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. Pupillometer
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

PAPER – II ORTHOPTICS

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

PAPER - II - LOW VISION AIDS AND CONTACT LENS

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. Radical retinoscopy
6. Evaluating near vision: Amsler 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. I Radical retinoscopy
2. Evaluating near vision: Amsler 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

PAPER – IV

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

2. Introduction to Statistics
3. Scales of Measurement
4. Collection and Presentation of data
5. Measures of Central tendency
6. Measures of Variation
7. Probability
8. Binomial and Normal distribution
9. Sampling Methods
10. Sample size determination
11. Correlation and Regression
12. Statistical Significance
13. Non-Parametric tests
14. 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

PAPER – V

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

PAPER – VI

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 Ophthalmoscopy
 11. Indirect Ophthalmoscopy
 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 interneers 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

PAPER – VII

Paper presentation