

**DHANALAKSHMI SRINIVASAN UNIVERSITY**  
**SAMAYAPURAM – 621112**



**SYLLABUS FOR BACHELOR OF SCIENCE IN OPTOMETRY**

**HEALTH FOR ALL**

# OPTOMETRY

## I YEAR

S.NO	NAME OF THE SUBJECTS	TOTAL HOURS ALLOTTED
1.	GENERAL ANATOMY, GENERAL PHYSIOLOGY	120 HOURS
2.	OCULAR ANATOMY AND OCULAR PHYSIOLOGY	120 HOURS
3.	PHYSICAL AND GEOMETRICAL OPTICS	60 HOURS
4.	BASIC BIOCHEMISTRY & NUTRITION	80 HOURS
5.	ENGLISH *	60 HOURS
6.	COMPUTER SCIENCE *	60 HOURS
7.	PRINCIPLES OF LIGHTING *	60 HOURS
8.	CLINICAL	1000 HOURS

\*INTERNAL EXAMINATION

## II YEAR

S.NO.	NAME OF THE SUBJECTS	TOTAL HOURS ALLOTTED
1.	OCULAR DISEASES	40 HOURS
2.	VISUAL OPTICS	50 HOURS
3.	OPTOMETRIC INSTRUMENTS & OPTOMETRIC OPTICS I	60 HOURS
4.	PATHOLOGY, MICROBIOLOGY AND PHARMACOLOGY	90 HOURS
5.	CLINICAL EXAMINATION OF VISUAL SYSTEM*	100 HOURS
6.	CLINIC	1000 HOURS

\*INTERNAL EXAMINATION

### **III YEAR**

<b>S.NO</b>	<b>NAME OF THE SUBJECTS</b>	<b>TOTAL HOURSALLOTTED</b>
<b>1.</b>	<b>OPTOMETRIC OPTICS II AND DISPENSING OPTICS</b>	<b>120 HOURS</b>
<b>2</b>	<b>ORTHOPTICS</b>	<b>120 HOURS</b>
<b>3.</b>	<b>LOW VISION AIDS (25 MARKS) AND CONTACT LENS(75 MARKS)</b>	<b>100 HOURS</b>
<b>4.</b>	<b>PAEDIATRIC OPTOMETRY AND GERIATRIC OPTOMETRY</b>	<b>100 HOURS</b>
<b>5.</b>	<b>EPIDEMIOLOGY AND BIOSTATISTICS *</b>	<b>20 HOURS</b>
<b>6.</b>	<b>COMMUNITY OPTOMETRY, PUBLIC HEALTH AND OCCUPATIONAL OPTOMETRY *</b>	<b>20 HOURS</b>
<b>7.</b>	<b>CLINICS AND SPECIAL CLINICS *</b>	<b>20 HOURS</b>
<b>8.</b>	<b>PROJECT AND PAPER PRESENTATION *</b>	

**\*INTERNAL EXAMINATION**

## **OPTOMETRY**

### **1.ELIGIBILITY FOR ADMISSION**

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

**i)     \*\*Physics, Chemistry and Biology Subjects taken together atthe qualifying examination after a period of 12 years of study.**

**(or)**

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

**ii)    \*\* A pass with a minimum of 35% marks in each Subjects separately includingEnglish for all Categories”**

**(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.**

### **2. AGE LIMIT FOR ADMISSION:**

**Every candidate should have completed the age of 17 years as on 31<sup>st</sup> December of the yearof admission.**

### **3. 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 .**

### **4. DURATION OF THE COURSE:**

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

### **5. COMMENCEMENT OF THE COURSE:**

**The course shall commence ordinarily from 1<sup>st</sup> August of the academic year.**

### **6. COMMENCEMENT OF THE EXAMINATIONS:**

**Regular Examinations will commence from 1<sup>st</sup> August and supplementary Examinations will commence from 1<sup>st</sup> 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.**

**7. MEDIUM OF INSTRUCTION:**

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

**8. CURRICULUM:**

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

**9. WORKING DAYS IN AN ACADEMIC YEAR:**

**Each academic year shall have a total of 240 working days.**

**10. 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.**
- (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.**

**11. 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**

**12. 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.**

**13. 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 Theory Examination.**

**50% of Marks in the Practical Examination.**

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

**14. CLASSIFICATION OF SUCCESSFUL CANDIDATES:**

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

**15. REVALUATION / RETOTALLING OF ANSWER PAPERS:**

**There is no provision for revaluation of the answer papers of failed candidates in any examination.**

**16. RE-ADMISSION AFTER BREAK OF STUDY:**

**As per the University Common Regulations for Re-admission after break of study for all courses can be done.**

**PATTERN OF QUESTION PAPER FOR UNIVERSITY EXAMINATION:**

**B. OPTOM DEGREE COURSE**

<b>Essay</b>	<b>3 x 10</b>	<b>= 30 Marks</b>
<b>Short Notes</b>	<b>8 x 5</b>	<b>= 40 Marks</b>
<b>Short Answers</b>	<b>10 x 3</b>	<b>= 30 Marks</b>
<b>Total</b>		<b>100 Marks</b>

**B. Optom Degree Course**

**17. SCHEME OF EXAMINATION****FIRST YEAR****(240 Working days)**

Paper. No.	Subject Title	IA		Theory		Practical		Viva Voce	
		Max	Min	Max	Min	Max	Min	Max	Min
	<b>General Anatomy, General Physiology</b>	<b>50</b>	<b>25</b>	<b>100</b>	<b>50</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>25</b>
	<b>Ocular Anatomy and Ocular Physiology</b>	<b>50</b>	<b>25</b>	<b>100</b>	<b>50</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>25</b>
	<b>Physical and Geometrical Optics</b>	<b>50</b>	<b>25</b>	<b>100</b>	<b>50</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>25</b>
	<b>Basic Biochemistry &amp; Nutrition</b>	<b>50</b>	<b>25</b>	<b>100</b>	<b>50</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>25</b>

**INTERNAL PAPERS:**

Paper. No.	Subject Title.	IA		Theory		Practical		Viva Voce	
		Max	Min	Max	Min	Max	Min	Max	Min
	<b>English</b>	<b>50</b>	<b>25</b>	<b>100</b>	<b>50</b>	<b>-</b>		<b>-</b>	
	<b>Computer Science</b>	<b>50</b>	<b>25</b>	<b>100</b>	<b>50</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>25</b>
	<b>Principles of Lighting</b>	<b>50</b>	<b>25</b>	<b>100</b>	<b>50</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

**SECOND YEAR**  
**(240 Working days)**

Subject Title		IA		Theory		Practical		Viva Voce		
		Max	Min	Max	Min	Max	Min	Max	Min	
<b>Ocular Diseases</b>	<b>50</b>		<b>25</b>	<b>100</b>	<b>50</b>	-	-	-		-
<b>Visual Optics</b>	<b>50</b>		<b>25</b>	<b>100</b>	<b>50</b>	<b>100</b>	<b>50</b>	<b>50</b>		<b>25</b>
<b>Optometric Instruments &amp; Optometric Optics I</b>	<b>50</b>		<b>25</b>	<b>100</b>	<b>50</b>	-	-	-		-
<b>Pathology, Microbiology and Pharmacology</b>	<b>50</b>		<b>25</b>	<b>100</b>	<b>50</b>	-	-	-		-

**INTERNAL PAPERS:**

Subject Title	IA		Theory		Practical		viva Voce	
	Max	Min	Max	Min	Max	Min	Max	Min
<b>Clinical Examination of Visual System</b>	<b>50</b>	<b>25</b>	<b>100</b>	<b>50</b>	-		-	
<b>Clinics</b>	<b>50</b>	<b>25</b>	-	-	<b>100</b>	<b>50</b>	<b>50</b>	<b>25</b>



**THIRD YEAR**

**(240 Working days)**

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

**INTERNAL PAPERS:**

<b>Subject Title</b>	<b>IA</b>		<b>Theory</b>		<b>Practical</b>		<b>Viva Voce</b>	
	<b>Max</b>	<b>Min</b>	<b>Max</b>	<b>Min</b>	<b>Max</b>	<b>Min</b>		
<b>Epidemiology and Biostatistics</b>	<b>50</b>	<b>25</b>	<b>100</b>	<b>50</b>	<b>-</b>	<b>-</b>	<b>--</b>	<b>---</b>
<b>Community Optometry, Public Health and Occupational Optometry</b>	<b>50</b>	<b>25</b>	<b>100</b>	<b>50</b>	<b>-</b>	<b>-</b>	<b>--</b>	<b>--</b>
<b>Clinics and Special Clinics</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>25</b>
<b>Project and Paper Presentation</b>	<b>100</b>	<b>50</b>	<b>50</b>	<b>25</b>	<b>-</b>	<b>-</b>	<b>--</b>	<b>--</b>

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

**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, 5<sup>th</sup> 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 Estimation of Haemoglobin**
- 3. Determination of blood group**
- 4. Determination of bleeding time and clotting time**
- 5. Determination of erythrocyte sedimentation rate**
- 6. 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, 4<sup>th</sup> Edition., Harper & Row Publishers, NY**
- 2. Parthur C. Guyton: Text book of Medical physiology, 8<sup>th</sup> 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 – 3<sup>rd</sup> , 4<sup>th</sup> , 5<sup>th</sup> and 6<sup>th</sup> 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, nerves 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**

<b>Eye lid</b>	<b>: Movements and pathways</b>
<b>Apparatus</b>	<b>: Lacrimal Tear film &amp; composition of tears Tests to assess lacrimal excretory function</b>
<b>Extra-ocular muscles</b>	<b>: Articulation of eyeball in socket Mechanics of movement Control of eye movements Diplopia-Diagnosis &amp; assessment Qualification of extraocular muscle Limitation (measurement of torsion, measurement of deviation, measurement of field of BSV, measurement of field of muscle action)</b>
<b>Cornea</b>	<b>: Biochemistry, Corneal Transparency, Innervation</b>
<b>Aqueous Humor &amp; Vitreous:</b>	<b>Aqueous secretion &amp; dynamics Maintenance of IOP, Diurnal variations Measurement of IOP Molecular structure of vitreous &amp; developmental anomalies</b>
<b>Crystalline lens &amp; Accommodation:</b>	<b>Biochemistry, glucose metabolism Changes in lens structure Depth of field &amp; depth of focus Accommodation (Changes, Amplitude, accommodation &amp; refraction, accommodation &amp; convergence) Presbyopia</b>
<b>Iris &amp; pupil</b>	<b>Pupillary reaction to light</b>



**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, 4<sup>th</sup> 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**

**Infrared 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**

**Practical's:**

- 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**

**dioptr)Prism deviation in prism**

**Combination of thin prisms**

**Dispersive power of prism-achromatic**

**prismsPlanar & spherical reflection in**

**mirrors Magnification in mirrors**

**Lens/mirror**

**systemsPracticals:**

- 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:60hours  
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.**

**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 electrophoresis 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)**

## **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, zeaxanthin, 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. Hyperlipidemias, 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 Ophthalmology (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**

**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 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**

## **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**

**Keratoconjunctivitis Sicca (KSicca) 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, 2<sup>nd</sup> Ed., 1989**

**1. Vitreous**

**Developmental abnormalities**

**Hereditary**

**hyaloidoretinopathiesJuvenile**

**retinoschisis**

**Asteroid hyalosis**

**Cholesterolosis**

**Vitreous**

**haemorrhage**

**Blunt trauma and the vitreous Inflammation and**

**the vitreousParasitic infestations**

**Pigment granules in the vitreous**

**Vitreouscomplications 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 headastrocytomas Lymphoid tumors**

**Tumors of the retinal pigment epithelium Other retinal**

**disorders Retinal inflammations**

**Metabolic diseases affecting theretina Miscellaneous disorders**

**Electromagnetic radiation effects on the**

**retina Retinal physiology and**

**psychophysicsHereditary macular**

**disorders (including albinism) Peripheral**

**retinal degenerations Retinal holes and**

**detachments**

**Intraocular foreign**

**bodiesPhotocoagulation**

**3. Glaucoma**

**Introduction to glaucoma**

**-Epidemiology**

**-Heredity**

**-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**

**GlaucomaOpen  
angle glaucoma**

- The glaucoma suspect
- Open angle glaucoma without elevated IOP
- Primary open angle glaucoma
- Secondaryopenangle

**glaucoma Angle closure**

**glaucoma**

- Primary angle closure glaucoma
- Secondary angle closure

**glaucomaMedical 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**

**Techniqueof papillary**

**examination Ocular motility**

**Checklist for**

**testingVisual**

**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  
motorsystem**



## **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**

## **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 Ophthalmology, Butterworths, 2<sup>nd</sup> 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 ophthalmometry**

**Axial and axis of the eye**

**Measurement of the optical constants of the**

**eye Corneal curvature and**

**thickness Keratometry**

**Curvature of the lens and ophthalmometry 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 objectivetests and their avoidance  
Transposition of lenses  
Spherical equivalent  
Prescribing prisms  
Binocular refraction
- 4. Effective power of spectacles; vertex distance effects Ocular refraction versus spectaclerefraction**  
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 refractorsOptical 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., simultan test Projection chartsIllumination of the consulting room Special Instruments:  
Brightness acuity test  
Vision analyzer  
Pupilometer  
Video acuity test  
Nerve fiber analyzer**
4. **Ophthalmoscopes and related devices  
  
Designofophthalmoscopes– illumination/viewing Ophthalmoscope discFilters 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 systemsScanning 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. Electrodiagnostis**  
**ERG/VEP//EOG**

**17. NFA**

**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**

**glassLens surfacing**

**Principle of surface generation and**

**glasscements Lens quality**

**Faults in lens material**

**Faults on lens surface**

**Inspecting the quality**

**oflenses 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 Frametypes 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,**

**1980T E Fannin & T Grosvenor: Clinical Optics,1996**

**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, 4<sup>th</sup> 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., 3<sup>rd</sup> ,1988**
4. **Essentials of Medical Microbiology by Rajesh Bhatia, Rattan Lal Ichhpujani-Jaypee (latest edition)**

**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 systemCholinergic**

**drugs Anticholinergic drugs**

**Sympathomimetics**

**Anti adrenergic drugs**

**Anti glaucoma drugs**

**3. Peripheral Nervous systemLocal anaesthetics**

**Different techniques of giving LA in eye**

**4. Autocoids**

**Antihistamines mast cell stabilizers, Mucolytics Non steroidal anti-inflammatorydrugs**

**5. Hormones**

**Insulin and oral hypoglycaemicdrugs**

**Corticosteroids**

**6. Central Nervous system**

**General Anaesthesia**

**Ethyl and Methyl alcohol**

**Sedatives and hypnotics**

**Antidepressants**

**7. Cardiovascular system**

**Anti hypertensive**

**Diuretics**

**Coagulants and anticoagulants**

**8. Chemotherapy**

**Antibiotics – Sulfonamides, Quinolones, Bactam 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, 4<sup>th</sup> Ed., 1999**
- 3. Goodman & Gilman's the pharmacological basis of therapeutics, 11<sup>th</sup> edition**

**Books suggested for reading**

- 1. Text book of pharmacology by Seth 2<sup>nd</sup> edition**
- 2. Basic and clinical pharmacology by Katzung 9<sup>th</sup> edition**

**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, 2<sup>nd</sup> Ed, 1989**

**CLINICS I**

**Practical: 180**

**hours**

**CLINICS II**

**Practical : 180 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, Edgecoating, 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, Professionalpress, 1979**

**1. Binocular Vision and Space perception Relative subjective visual direction. Retino motorvalue 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 Donders' 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 innervations.**

**Types of accommodation.**

**Anomalies of accommodation – a etiology 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**

**9. Confusion**

**10. Suppression Investigations management**

**11. Abnormal Retinal Correspondence Investigation and management**

**Blind spot syndrome**

**12. Eccentric Fixation**

**Investigation and management**

**13. Amblyopia**

**Classification Aetiology Investigation Management**

**14. Neuro-muscular anomalies Classification  
and etiological factors**

**15. History – recording and significance.**

**16. Convergent strabismus Accommodative convergent**

**17. Classification**

**Investigation and Management**

**Non accommodative Convergent**

**Squint Classification**

**Investigation and Management**

**Divergent Strabismus Classification**

**18. A& V phenomenon**

## **Investigation and Management**

### **19. Vertical strabismus**

#### **Classification**

#### **Investigation and Management**

### **20. Paralytic Strabismus Acquired and**

#### **Congenital Clinical Characteristics**

### **21. Distinction from comitant and restrictive squint**

### **22. Investigations**

#### **History and symptoms**

#### **Head Posture**

#### **Diplopia Charting**

#### **Hess chart**

#### **PBCT**

#### **Nine directions**

#### **Binocular field of vision**

### **23. Amblyopia and Treatment of Amblyopia**

### **24. Nystagmus**

### **25. Non-surgical Management of Squint**

### **26. Restrictive Strabismus**

- a. Features**
- b. Musculo-fascical anomalies**
- c. Duane's Retraction syndrome**
- d. Clinical features and management**
- e. Brown's Superior oblique sheath syndrome**
- f. Strabismus fixus**
- g. Congenital muscle fibrosis**
- h. 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: 60hours**  
**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. I 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**

### **Part3: Measurement of ocular dimensions**

- HVID & VVID**
- Palpebral aperture**
- Corneal curvature**
- Measurement of pupil size in normal (room light), dim and bright illumination**
- 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, 3<sup>rd</sup>Edition, 1981, Illinois, USA**
- 2. Ruben M Guillon: Contact lens practice, 994, 1<sup>st</sup> Edition**

**PAEDIATRIC OPTOMETRY**

**PART I – Examination and diagnosis**

**Ocular development in infancy -factors responsible for diseases in children- Genetic factors -Prenatal factors, Perinatal factors, Postnatal factors**

**Vision screening in childhood -assessment of visual acuity in infants and children- qualitative assessment by fixation and following, preferential looking methods - paediatric vision charts- contrast sensitivity and colour vision -electrophysiological tests**

**Pathology and structural anomalies of orbit, eye lids, lacrimal system, conjunctiva, cornea, sclera, anterior chamber, uveal tract, pupil, lens, vitreous, and fundus for children**

**Measurement of refractive errors in children :retinoscopy, subjective acceptance and correction of error in myopia, pseudomyopia, , hyperopia and astigmatism- anisometropia - amblyopia**

**Development of binocular vision in children -determining binocular status - components of binocular vision - investigation of binocular vision-Worth 4-dot test - measurement of stereoacuity**

**Convergence and accommodation -measurement of convergence and accommodation - accommodation anomalies - convergence anomalies**

**Determining sensory motor adaptability-. strabismus and nystagmus -motor testing - Hirschberg test - Krimskey test - cover and uncover testing and alternate cover testing - sensory testing - Titmus test - Bagolini glasses**

**Part II -Post examination process**

**Compensatory treatment and remedial therapy for myopia, pseudomyopia, , hyperopia and astigmatism - anisometropia and amblyopia.**

**Remedial and compensatory treatment and therapy for strabismus and nystagmus - occlusion therapy**

**Spectacle dispensing for children - paediatric contact lenses -causes of low vision in children : congenital glaucoma, optic atrophy, congenital cataract, nystagmus etc. and their management**

**- Low vision care in paediatric age group**

### **GERIATRIC OPTOMETRY**

**Structural changes in eye-physiological changes in eye-optical and refractive changes in eye-aphakia, pseudo aphakia and management**

**Ocular diseases common in the aged , with special reference to cataract, glaucoma, macular disorders, and vascular diseases of the eye**

**Management of cataract, glaucoma, ARMD, corneal degenerations, lid laxity and xanthelasma**

**Special considerations in ophthalmic dispensing to the elderly -. Contact lenses for the elderly -Management of visual problems of aging**

**Diseases responsible for low vision in old age and their management - ARMD, diabetes, optic nerve disease, RP, corneal diseases, glaucoma- low vision aids --field expanders**

**Rehabilitation of the visually handicapped - methods to enable the person carry on one's visual task overcoming the problems of aging - social, medical and educational rehabilitation**

### **Reference Books:**

- 1. Jerome Rosner: Pediatric Optometry, Butterworths, London, 1982**
- 2. Binocular Vision and Ocular Motility- Von Noorden GK Burian Von Noorden's , 2nd**
- 3. Ed. C.V. Mosby, St. Louis, 1980**
- 4. Assessing children's vision- Susan Leat- Butterworth Heinemann**
- 5. Clinical Pediatric optometry- Leonard Press, Bruce Moore- Butterworth Heinemann**

6. **Vision Problems in childhood- Terry Buckingham, Butterworth Heinemann**
7. **Hirsch M J & Wick R E: Vision of the Aging Patient, An Optometric Symposium, 1960**
8. **Vision and Aging- A.J. Rossenbloom Jr & M.W. Morgan, Butterworth Heinemann**
9. **Clinical Geriatric Eye Care- Sheree Aston, Joseph Maino- Butterworth Heinemann**

## **EPIDEMIOLOGY AND BIO-STATISTICS**

### **EPIDEMIOLOGY**

**Theory: 60 hours**

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, 2<sup>nd</sup> 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, 2<sup>nd</sup> 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**

**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**

**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

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 Rule
- 3 - Workmen's Compensation Act - ESI Act, etc  
Occupational diseases/ occupation related diseases caused by - physical agents, and biological agents. s
3. Occupational hygiene, environmental monitoring Recognition, evaluation and control of hazards Illumination - definition, measurements and standards
4. Occupational safety Causes of accidents  
Vision, lighting, colour and their role Accident analysis, Accident prevention
5. Ocular and visual problems of occupation Electromagnetic radiation Ionizing  
Non-ionizing - Infra red Ultra violet Microwave, Laser  
Injuries - Mechanical, chemical Toxicology - Metals, chemicals
6. Prevention of occupational diseases Medical examination / medical monitoring Pre-employment / pre- placement Periodic
7. Personal Protective Equipment -  
General Goggles, face shields etc  
Selection and use Testing for standards
8. Standards  
Visual standards for jobs
9. Problems of special occupational groups Drivers, Pilots and others

## **10. Field work – submission of reports**

**Visits to : Regional Labour Institute, selected industries**

## **11. Visual display units (terminals) -**

**-VDU/VDT Contact lens and work**

**Pesticides – general and visual and ocular defects**

## **12. Role of Optometrists – promotion of general and visual health and safety of people**

**at work**

## **13. Reference Books:**

- 1. R.A.F. Cox (ed.) fitness for work – the medical aspects. Oxford University Press 2000, reprinted 2003**
- 2. Indian Association of Occupational Health, Guidelines on Pre-Employment Medical Examination, Pune 1998**
- 3. Barbara A. Plog, Patricia J. Quinlan. Fundamentals of Industrial Hygiene. 5<sup>th</sup> Edition, 2002**
- 4. John Ridley & John Channing. Safety at work. 5<sup>th</sup> 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. 3<sup>rd</sup> edition, 1998**
- 9. Stephen L. Demeter, Gunnar B. J. Andersson. Disability Evaluation. 2<sup>nd</sup> edition, 2003**

- 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. Over refraction**
- 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**

## PROJECT

### B.Optomety.

#### POSTINGS FOR INTERNSHIP FOR ONE YEAR (WORK ALLOCATION)

<b>Refraction</b>	<b>3 months</b>
<b>Contact Lens &amp; Low Vision Aids</b>	<b>1 month</b>
<b>Optical Dispensing</b>	<b>2 months</b>
<b>Pediatric Ophthalmology &amp; Orthoptics</b>	<b>2 months</b>
<b>Glaucoma and Perimetry</b>	<b>15 days</b>
<b>Cataract workup</b>	<b>15 days</b>
<b>Operation Theatre &amp; Ward</b>	<b>15 days</b>
<b>FFA &amp; OCT</b>	<b>15 days</b>
<b>Retina &amp; Electro diagnostic</b>	<b>15 days</b>
<b>Cornea, Eye bank, Refractive surgery</b>	<b>15 days</b>
<b>Community Optometry</b>	<b>15 days</b>
<b>Occuloplasmy and Neuro ophthalmology</b>	<b>15 days</b>