

BHARATHIAR UNIVERSITY,COIMBATORE-641 046

## **B.Sc –Optometry (4 Years Degree Course with One year Compulsory Internship)** (For the CPOP students admitted during the academic year 2010-11 & onwards)

### SCHEME OF EXAMINATION – CBCS Pattern

Part	Course Title	Ins. hrs / week	Examinations				Credits
			Dur. Hrs	CIA	Mar_k	Tot al	
	<b>SEMESTER – I</b>						
I	Language-I	5	3	25	75	100	4
II	English-I	5	3	25	75	100	4
III	Core- I : General Anatomy & Physiology	4	3	25	75	100	4
III	Core-II : Physical Optics	3	3	25	75	100	4
III	Major Practical-I	3	-	-	-	-	-
III	Allied Paper-I : Biochemistry	3	3	25	75	100	4
IV	<b>Environmental Studies #</b>	2	3	-	50	50	2
	<b>SEMESTER – II</b>						
I	Language-II	5	3	25	75	100	4
II	English-II	5	3	25	75	100	4
III	Core- III : Ocular Anatomy & Physiology	3	3	25	75	100	4
III	Core-IV : Geometrical Optics	3	3	25	75	100	4
III	Major Practical-I : Physical & Geometric Optics	3	3	40	60	100	4
III	Allied II – Microbiology	3	3	25	75	100	4
IV	<b>Value Education – Human Rights #</b>	2	3	-	50	50	2
	<b>SEMESTER – III</b>						
III	Core-V : Optometric Optics	3	3	25	75	100	4
III	Core-VI : Visual Optics-I	3	3	25	75	100	4
III	Core-VII :Optometric Instruments & Examination of Visual System	3	3	25	75	100	4
III	Major Practical-II	2	-	-	-	-	-
III	Allied Paper III : Pharmacology	4	3	25	75	100	4
IV	<b>Tamil @ / Advanced Tamil # (or)Non-major elective–I : Yoga for Human Excellence # / Women’s Rights #</b>	2	3	50		50	2
	<b>SEMESTER – IV</b>						
III	Core-VIII : Visual Optics-II	3	3	25	75	100	4
III	Core-IX : Dispensing Optics	3	3	25	75	100	4
III	Core X : Systemic Disease	3	3	25	75	100	4
III	Major Practical-II : Examinations of Visual System	3	3	40	60	100	4
III	Allied IV – Pathology	3	3	25	75	100	4
IV	<b>Tamil @ /Advanced Tamil # (or) Non-major elective - II : General Awareness #</b>	2	3	50		50	2

<b>SEMESTER – V</b>							
III	Core XI – Contact Lens-I	4	3	25	75	100	4
III	Core XII –Ocular Diseases-I	4	3	25	75	100	4
III	Core XIII –Binocular Vision-I	4	3	25	75	100	4
III	Core XIV – Low Vision Aid	4	3	25	75	100	4
III	Core XV –Occupational Optometry	4	3	25	75	100	4
III	Major Practical-III	3	-	-	-	-	-
III	Elective-I	3	3	20	55	75	3
<b>SEMESTER – VI</b>							
III	Core XVI – Contact Lens-II	4	3	25	75	100	4
III	Core XVII – Ocular Disease-II	4	3	25	75	100	4
III	Core XVIII –Binocular Vision-II	3	3	25	75	100	4
III	Core XIX – Geriatric & Pediatric Optometry	4	3	25	75	100	4
III	Major Practical-III: Contact Lens & Low Vision Aid	4	3	40	60	100	4
III	Elective-II	4	3	20	55	75	3
IV	Project Work & Viva-Voce* (Project-120 mks. & Viva-30 mks)	10	-	-	-	150	6
V	Extension Activities @	-	-	-	-	50	2
<b>SEMESTER-VII - Compulsory Rotating Clinical Internship</b>							
VI	Special Clinic-I* (Report-200 mks.& Viva-50 mks)	-	-	-	-	250	10
VI	Special Clinic-II* (Report-200 mks.& Viva-50 mks)	-	-	-	-	250	10
<b>SEMESTER-VIII - Compulsory Rotating Clinical Internship</b>							
VI	Special Clinic-III*(Report-200 mks.& Viva-50 mks)	-	-	-	-	250	10
VI	Special Clinic-IV* (Report-200 mks.& Viva-50 mks)	-	-	-	-	250	10
<b>TOTAL</b>						<b>4550</b>	<b>182</b>

@ No University Examinations. Only Continuous Internal Assessment (CIA)

# No Continuous Internal Assessment (CIA). Only University Examinations.

\* Project Report : 80% and Viva-Voce Examinations: 20% .

<b>List of Elective Papers (Colleges can choose any one of the paper as Electives)</b>		
<b>Elective – I</b>	A	Nutrition
	B	Low & Optometry
	C	Clinical Psychology
<b>Elective – II</b>	A	Community Optometry
	B	Operation Theatre Techniques
	C	Nursing Procedure

**List of Special Clinic for Internship (Candidate can choose any one of special clinic)**

- Contact Lens Clinic
- General Ophthalmology Clinic
- Glaucoma Clinic
- Ophthalmic Ultra Sound Clinic
- Low Vision Aid Clinic
- Ophthalmic Imaging Clinic
- Refractive Surgery Clinic
- Retina Clinic
- Cornea Clinic
- Paediatric Ophthalmology
- Squint Clinic
- Oculoplasty Clinic

**Note:** The Total Marks and total credits are corrected as 4550 and 182 instead of 4500 and 180.

There is no classification for Part VI (on par with Part IV and V in the UG Regulations).

However, these parts shall be awarded with grades and marks in the statement of marks and in the consolidated statement of marks.

## SEMESTER 1

### CORE PAPER I - GENERAL ANATOMY & PHYSIOLOGY

**Course Description:** General anatomy deals with the entire human anatomy with emphasis on different tissues, blood vessels, glands, nerves and the entire central nervous system in particular. General physiology deals with the entire human anatomy with emphasis on different organ systems, their physiological functions with special emphasis on blood and neuro physiology.

**Objectives:** At the end of the course, the student should be able to:

- Comprehend the normal disposition, inter-relationships, gross, functional and applied anatomy of various structures in the human body.
- Comprehend the basic structure and connections between the various parts of the central nervous system so as to analyze the integrative and regulative functions on the organs and systems.
- Explain the normal functioning of various organ systems of the body and their interactions.
- Know the physiological principles underlying pathogenesis of disease

#### Unit: I

##### General Anatomy:

Introduction to Human Anatomy: Anatomy: Definition and its relevance in medicine and optometry - Planes of the body, relationship of structures, organ system, Skeleton System

##### Tissues of the Body:

Epithelium, connective tissue, bone and cartilage, Embryology, histology, different types of each of them, types of cells, cellular differentiation and arrangements in different tissues

##### Muscles:

Different types of muscles, their functional differentiation, their relationship with different structures, and their neural supply

##### Blood vessels:

Differentiation between arteries and veins, embryology, histology of both arteries and veins, Functional differences between the two, anatomical differences at different locations

#### Unit: II

##### Skin and appendages:

Embryology, anatomical differences in different areas, functional and protective variations, innervations, relationship with muscles and nerves

##### Lymphatic system:

Embryology, functions, relationship with blood vessels and organs

##### Glands:

Embryology, different types of glands (exocrine and endocrine), functional differences, neural control of glands

**Nervous system:**

Parts of Nervous system, cell types of nervous system, Blood-brain barrier, Reflex arc, Peripheral Nerves, Spinal nerves, Nerve fibers, Autonomic Nervous system

**Brain and Cranial nerves:**

Major parts of Brain, Protective coverings of the Brain, Cerebrospinal Fluid, Brain stem, Cerebellum, Diencephalon, Cerebrum, Cranial nerves

**Unit: III**

General Physiology

Cell structure & organization, Tissue organization, Epithelium

Connective tissue – Collagen fibers – Elastic fibers – Areolar fibers

Cartilage – Bone, Contractile tissue – striated – skeletal – cardiac – non striated – plain – myoepithelial - General principles of cell physiology, Physiology of skeletal muscle

**BLOOD:**

Composition, Volume measurement & variations, Plasma proteins – classification & functions

Red blood cells – development, morphology & measurements – functions & dysfunctions.

White blood cells – development – classification, morphology – functions & dysfunctions

Platelets – morphology – development, functions & dysfunctions, Clotting – factors – mechanism – anti- coagulants dysfunctions, Blood grouping – classification – importance in transfusion, Rh factor & incompatibility, Suspension stability

**DIGESTION:**

**General arrangement :** Salivary digestion – functions & regulations, Gastric digestion – functions & regulations, Pancreatic digestion – functions & regulations, Intestinal digestion – functions & regulations, Liver & bile, Absorption, Motility, Deglutition, Vomiting, Defecation, Functions of large intestine, Neurohumoral regulations of alimentary functions, summary

**Unit: IV**

**EXCRETION:**

Body fluids – distribution, measurement & exchange, Kidney – structure of nephron – mechanism of urine formation – composition of the urine and abnormal constituents – urinary bladder & micturition

**ENDOCRINES:**

Hormone mechanism – negative feed backs – tropic action – permissive action – cellular action, hypothalamic regulation

Thyroid - hormones, actions, regulations

Adrenal cortex - hormones, actions, regulations

Adrenal medulla – hormones, actions, regulations

Parathyroid - hormones, actions, regulations

Islets of pancreas – hormones, actions, regulations

Miscellaneous \_ hormones, actions, regulations

Common clinical disorders

**Unit: V**

**REPRODUCTION:**

Male reproductive system – control & regulation , Female reproductive system – uterus – ovaries – menstrual cycle – regulation – pregnancy & delivery – breast – family planning

**Respiration:**

Mechanics of respiration – pulmonary function tests – transport of respiratory gases- neural and chemical regulation of respiration – hypoxia, cyanosis, dyspnoea – asphyxia.

**Circulation:**

General principles

Heart: myocardium – innervations – transmission of cardiac impulse- Events during cardiac cycle – cardiac output. Peripheral circulation: peripheral resistances – arterial blood pressure – measurements – factors regulation variations – capillary circulation – venous circulation. Special circulation: coronary cerebral – miscellaneous - Environmental Physiology, Body temperature regulation (including skin Physiology). Exposure to low and high atmospheric pressure

**Nervous System:**

Neuron – Conduction of impulse – synapse – receptor.

Sensory organization – pathways and perception - Reflexes – cerebral cortex – functions. Thalamus – Basal ganglia, Cerebellum., Hypothalamus. - Autonomic nervous system – motor control of movements, posture and equilibrium – conditioned reflex, eye hand co-ordination, Special senses – (Elementary) Olfaction – Taste – Hearing

**Texts Books:**

1. B D Chaurasia: Handbook of general Anatomy, Third edition, CBS Publishers, New Delhi, 1996
2. GJ Tortora, B Derrickson: Principles of Anatomy and Physiology, 11<sup>th</sup> edition, John Wiley & Sons Inc, 2007
3. John Wiley & Sons Inc, New Jersey, 2007

**Reference Books:**

1. AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006
2. A C Guyton: Text book of Medical Physiology, 6<sup>th</sup> edition, saunders company, Japan, 1981

## SEMESTER I

### CORE PAPER II – PHYSICAL OPTICS

**Course Description:** This course will be taught in one semester. Physical Optics is the study of light, its properties and its interaction with matter. Specifically, the phenomena of interference, diffraction, polarization and scattering will be dealt with in detail.

**Objectives:** The objective of this course is to equip the students with a thorough knowledge of properties of light. At the end of this course, students will be able to predict the distribution of light under various conditions.

#### Unit: I

Nature of light – light as electromagnetic oscillation – wave equation; ideas of sinusoidal oscillations – simple harmonic oscillation; transverse nature of oscillation; concepts of frequency, wavelength, amplitude and phase.

Sources of light; Electromagnetic Spectrum.

#### Unit: II

Polarized light; linearly polarized light; and circularly polarized light.

Intensity of polarized light; Malus' Law; polarizers and analyzers; Methods of producing polarized light; Brewster's angle., Birefringence; ordinary and extraordinary rays.

Relationship between amplitude and intensity. Coherence; interference; constructive interference, destructive interference; fringes; fringe width

#### Unit: III

Double slits, multiple slits, gratings.

Diffraction; diffraction by a circular aperture; Airy's disc

#### Unit: IV

Resolution of an instrument (telescope, for example); Raleigh's criterion

Scattering; Raleigh's scattering; Tyndall effect.

Fluorescence and Phosphorescence

#### Unit: V

Basics of Lasers – coherence; population inversion; spontaneous emission; Einstein's theory of lasers.

Radiometry; solid angle; radiometric units; photopic and scotopic luminous efficiency and efficacy curves; photometric units

Inverse square law of photometry; Lambert's law.

Other units of light measurement; retinal illumination; Trolands

**Text Book:**

- Subrahmanyam N, Brij Lal, *A text book of Optics*, S. Chand Co Ltd, New Delhi, India, 2003.

**Reference Books:**

1. Pedrotti L. S, Pedrotti Sr. F. L, *Optics and Vision*, Prentice Hall, New Jersey, USA, 1998.
2. Keating NM. P, *Geometric, Physical and Visual Optics*, Butterworth- Heinemann, Massachusetts, USA, 2002.

## SEMESTER I

### ALLIED PAPER I – BIOCHEMISTRY

**Course Description:** This course deals with the biochemical nature of carbohydrates, proteins, minerals, vitamins, lipids etc. A detailed study of these, emphasizing on their chemical composition and their role in metabolism is the required aim of this course.

**Objectives:** At the end of the course, the student should be able to: demonstrate his knowledge and understanding on

- Structure, function and interrelationship of biomolecules and consequences of deviation from normal.
- Integration of the various aspects of metabolism, and their regulatory pathways.
- Principles of various conventional and specialized laboratory investigations and instrumentation, analysis and interpretation of a given data.

#### **Unit: I**

Carbohydrates:

Glucose; fructose; galactose; lactose; sucrose; starch and glycogen (properties and tests, Structure and function)

Proteins:

Amino acids, peptides, and proteins (general properties & tests with a few examples like glycine, tryptophan, glutathione, albumin, hemoglobin, collagen)

#### **Unit: II**

Lipids:

Fatty acids, saturated and unsaturated, cholesterol and triacylglycerol, phospholipids and plasma membrane

Vitamins:

General with emphasis on A,B2, C, E and inositol (requirements, assimilation and properties)

#### **Unit: III**

Minerals:

Na, K, Ca, P, Fe, Cu and Se.(requirements, availability and properties)

Hormones and their receptors basic concepts in metabolic regulation with examples, insulin, glucagons and thyroxine

**Unit: IV**

Metabolism: General whole body metabolism (carbohydrates, proteins, lipids)

**Unit: V**

Ocular Biochemistry

Various aspects of the eye, viz. tears, cornea, lens, aqueous, vitreous, retina and pigment epithelium rhodopsin. (The important chemicals in each and their roles).

Clinical Biochemistry

Blood sugar, urea, creatinine and Bilirubin, cholesterol etc and significance of their estimation.

**Text book:**

1. Ramakrishnan: Essentials of biochemistry and ocular biochemistry, Annamalai University Publications, Chidambaram, India, 1992

**Reference Books:**

1. S. Ramakrishnan, K G Prasanna and R Rajan: Text book of Medical Biochemistry, Orient Longman, Madras, 1990
2. D.R. Whikehart: Biochemistry of the Eye, 2<sup>nd</sup> edition, Butterworth Heineman

## SEMESTER II

### CORE PAPER III – OCULAR ANATOMY & PHYSIOLOGY

**Course Description:** This course deals with detailed anatomy of the orbit, eyeball and cranial nerves associated with ocular functions. Ocular physiology deals with the physiological functions of each part of the eye.

**Course Objectives:** At the end of the course, the student should be able to:

- Comprehend the normal disposition, inter-relationships, gross, functional and applied anatomy of various structures in the eye and adnexa and understand the basic principles of ocular embryology
- Comprehend the basic structure and connections between the various parts of the central nervous system and the eye so as to understand the neural connections and distribution.
- Elucidate the physiological aspects of normal growth and development of the eye.
- List the physiological principles underlying pathogenesis and treatment of disease of the eye.

**Unit: I**

Anatomy:

Cornea: Anatomy of all the layers, cellular structure, nerve supply, reason for transparency, refractive properties

Coats of eyeball:

Sclera (episclera & sclera), Choroid (Iris, ciliary body, choroid), Retina

Detailed anatomy, cellular structure, vasculature, nerve supply for all the above coats, pupils, nerve supply for pupillary actions, pupillary pathway. Crystalline lens, Aqueous, anterior chamber, vitreous body

**Unit: II**

Ocular Embryology

Detailed study of orbit

Ocular Adnexa and Lacrimal system

Extra ocular muscles (anatomy, innervations, action)

Orbital Blood supply

**Unit: III**

CRANIAL NERVES:

Detailed study of each of the following nerves in terms of their nuclei, course, relationship within brain, effects of compression etc at different regions

Optic nerve

Oculomotor nerve

Trochlear nerve

Trigeminal nerve

Abducent nerve

Facial nerve

Visual Pathway, Autonomic Innervations of Ocular structures

**Unit: IV**

Physiology:

Protective mechanisms in the eye

Precorneal tear film, eyelids and lacrimation

Extrinsic Ocular muscles, their actions and control of their movements

Saccadic, smooth pursuit and Nystagmic eye movements

Coats of the eye ball

Corneal Physiology

Aqueous humor and vitreous: Intra ocular pressure

Iris and pupil

**Unit: V**

Crystalline lens and accommodation – presbyopia

Retina – structure and functions, dark and Light Adaptations

Vision – general aspects of sensation

Pigments of the eye and photochemistry, electrophysiology

The visual stimulus, refractive errors

Visual acuity, vernier acuity and principle of measurement

Visual perception – Binocular vision, stereoscopic vision, optical illusions

Visual pathway, central and cerebral connections, lesions of pathway and effects  
Colour vision and colour defects. Theories and diagnostic tests

**Text Book:**

1. A Remington: Clinical Anatomy of the Visual System, Second edition, Elsevier Butterworth Heinemann, Missouri, USA, 2005.
2. AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006

**Reference Books:**

1. AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006
2. RD Ravindran: Physiology of the eye, Arvind eye hospitals, Pondicherry, 2001
3. PL Kaufman, A Alm: Adler's Physiology of the eye clinical application, 10<sup>th</sup> edition, Mosby, 2002

**SEMESTER II**

**CORE PAPER IV – GEOMETRIC OPTICS**

**Course Description:** Geometric Optics is the study of light and its behavior as it propagates in a variety of media. Specifically, the phenomena of reflection and refraction of light at boundaries between media and subsequent image formation will be dealt with in detail. Reflections at plane and spherical surfaces and refractions at plane, spherical, cylindrical and toric surfaces will be studied in this course. Attention will be given to the system of surfaces and/or lenses and their imaging properties. The effect of aperture stops on the quality of images, such as blur and aberrations, depth of field and depth of focus, will also be studied.

**Objectives:** The objective of this course is to equip the students with a thorough knowledge of mirrors and lenses. At the end of this course, students will be able to predict the basic properties of the images formed on the retina by the optics of the eye.

**Unit: I**

Nature of light – light as electromagnetic oscillation; ideas of sinusoidal oscillations; amplitude and phase; speed of light in vacuum and other media; refractive index

Wavefronts – spherical, elliptical and plane; Curvature and vergence; rays; convergence and divergence in terms of rays and vergence; vergence at a distance Refractive index; its dependence on wavelength Fermat's and Huygen's Principle – Derivation of laws of reflection and refraction (Snell's law) from these principles Plane mirrors – height of the mirror; rotation of the mirror Reflection by a spherical mirror – paraxial approximation; sign convention; derivation of vergence equation

Imaging by concave mirror, Imaging by convex mirror, Reflectivity; transmittivity, Snell's Law; refraction at a plane surface

Glass slab; displacement without deviation; displacement without dispersion

Thic prisms; angle of prism; deviation produced by a prism; refractive index of the prism

**Unit: II**

Prisms; angular dispersion; dispersive power; Abbe's number.

Definition of crown and flint glasses; materials of high refractive index

Thin prism – definition; definition of Prism diopter; deviation produced by a thin prism; its dependence on refractive index

Refraction by a spherical surface; *sign convention*; introduction to spherical aberration using image formed by a spherical surface of a distance object; *sag formula*

Paraxial approximation; derivation of vergence equation

Imaging by a positive powered surface, Imaging by a negative powered surface

Vergence at a distance formula; effectivity of a refracting surface

Definition of a lens as a combination of two surfaces; different types of lens shapes.

Image formation by a lens by application of vergence at a distance formula; definitions of front and back vertex powers; equivalent power; first and second principal planes/points; primary and secondary focal planes/points; primary and secondary focal lengths

**Unit: III**

Newton's formula; linear magnification; angular magnification

Nodal Planes, Thin lens as a special case of thick lens; review of sign convention

Imaging by a thin convex lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions

Imaging by a thin concave lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions

Prentice's Rule

System of two thin lenses; review of front and back vertex powers and equivalent power, review of six cardinal points., System of more than two thin lenses; calculation of equivalent power using magnification formula

Cylindrical Lenses; image formation; relation between cylinder axis and line image orientation

Imaging due to two cylinders in contact with axes parallel

Two cylinders in contact with axes perpendicular; line images and their orientations to the cylinders' powers; interval of Sturm; circle of least confusion (CLC); spherical equivalent; position of CLC

Spherical lens and a cylindrical lens in contact; spherical equivalent; interval of Sturm and CLC

Spherocylindrical lens notations – plus/minus cylinder form, cross cylinder/meridian form; transformations between them

**Unit: IV**

Field stops and apertures; entrance and exit pupils

Apertures and defocus blur

Receiver/detector diameter; depth of focus; depth of field

Chromatic Aberrations; methods of removing chromatic aberrations; Abbe number

Monochromatic Aberrations – deviation from paraxial approximation; difference between ray aberrations and wavefront aberrations

Third order aberrations – spherical aberrations; coma; astigmatism; distortion and curvature of fields

Ways of minimizing spherical aberrations – pupil size, bending of lens, shape factor

Lens tilt – astigmatism

Higher order aberrations; introduction to Zernike Polynomials

### **Unit: V**

Telescopes – Keplerian, Galilean and Newtonian; position of cardinal points, entrance and exit pupils; magnifications; advantages and disadvantages

Microscopes – magnification; tube length.

Gullstrand's Schematic Eye (GSE); calculation of the power of the cornea, the lens and the eye; axial length; calculation of the position of the cardinal points; magnification

GSE - Purkinje images and their reflectances

GSE - entrance and exit pupils for a 3mm pupil; ocular aberrations – spherical aberrations and coma; chromatic aberrations.

GSE – introduction to refractive errors - myopia and hyperopia; corneal curvature; axial length; far point; blur size calculations; corrections; astigmatism; blur size; circle of least confusion; correction.

GSE - Object closer than at infinity; introduction to accommodation; far point; near point; presbyopia; spectacle and contact Lens corrections - comparison of magnification

### **Text book:**

1. Pedrotti L. S, Pedrotti Sr. F. L, *Optics and Vision*, Prentice Hall, New Jersey, USA, 1998.
2. Subrahmanyam N, Brij Lal, *A text book of Optics*, S. Chand Co Ltd, New Delhi, India, 2003

### **Reference Books:**

1. Loshin D. S. *The Geometric Optics Workbook*, Butterworth-Heinemann, Boston, USA, 1991.
2. Schwartz S. H. *Geometrical and Visual Optics: A Clinical Introduction*, McGraw-Hill, New York, USA, 2002.
3. Tunnacliffe A. H, Hirst J. G, *Optics*, The association of British Dispensing Opticians, London, U.K., 1990.

## **SEMESTER II**

### **ALLIED PAPER II – MICROBIOLOGY**

**Course Description:** This course covers the basic biological, biochemical and pathogenic characteristics of pathogenic organisms.

**Course Objectives:** The objectives of the course are:

- to prepare the students to gain essential knowledge about the characteristics of bacteria, viruses, fungi and parasites;
- to acquire knowledge of the principles of sterilization and disinfection in hospital and ophthalmic practice;
- to understand the pathogenesis of the diseases caused by the organisms in the human body with particular reference to the eye infections and to understand basic principles of diagnostic ocular Microbiology

#### **Unit: I**

Introduction to Microbiology

Types of Microorganisms

Physiology of Microorganisms – Nutrition, Enzymes, Metabolism and energy, Microbial Growth  
Sterilization and disinfection in the laboratory

#### **Unit: II**

Control of Microbial Growth – Antimicrobial methods and Chemotherapy

Microbes versus Humans- The development of Infection, the disease process, pathogenicity and virulence - Ocular Bacteriology - Gram positive,(Staphylococcus aureus, Staphylococcus epidermidis, Streptococcus, propionibacterium, actinomyces,Nocardia) Bacteria including acid fast bacilli ( Myobacterium tuberculosis, Myobacterium leprae)

#### **Unit: III**

Ocular Bacteriology - Gram negative Bacteria (pseudomonas, haemophiilus, Brucella, Neisseria, Moraxella) Spirochetes (Treponema, Leptospiraceae)

#### **Unit: V**

Virology: Classification of Viruses in Ocular Disease, Rubella, Adenovirus, Oncogenic Viruses (HPV, HBV, EBV, Retroviruses), HIV.

Fungi : Yeasts, Filamentous, Dimorphic - Intracellular parasites - Chlamydia, Protozoa (Taxoplasmosis, Acanthamoeba,) Helminths ( Toxocariasis, Filariasis, Onchocerciasis, Trematodes)

#### **Text books:**

1. BURTON G.R.W: Microbiology for the Health Sciences, third edition, J.P. Lippincott Co., St. Louis, 1988.
2. M J Pelczar (Jr),ECS Chan, NR Krieg : Microbiology ,fifth edition, TATA McGRAW-HILL Publisher, New Delhi,1993

**Reference Books:**

1. KJ Ryan, CG Ray: Sherris Medical Microbiology- An Introduction to infectious Diseases, fourth edition, McGRAW HILL Publisher, NewDelhi, 1994
2. MACKIE & McCartney Practical Medical Microbiology, SYDNEY M. FINEGOLD & ELLEN JO BARON: Diagnostic Microbiology (DM)

**SEMESTER II**

**CORE PRACTICAL I – GEOMETRIC & PHYSICAL OPTICS**

(Examination at the end of second semester)

1. Gratings – determination of grating constant using Sodium vapour lamp; determination of wavelengths of light from Mercury vapour lamp
2. Circular Apertures – measurements of Airy's disc for apertures of various sizes
3. Verification of Malus' Law using a polarizer – analyzer combination
4. Demonstration of birefringence using Calcite crystals
5. Measurement of the resolving power of telescopes.
6. Newton's rings
7. Demonstration of fluorescence and phosphorescence using crystals and paints
8. Thick Prism – determination of prism angle and dispersive power; calculation of the refractive index
9. Thin Prism – measurement of deviation; calculation of the prism diopter
10. Image formation by spherical mirrors
11. Convex lens - power determination using lens gauge, power determination using distant object method; power determination using the vergence formula
12. Concave lens – in combination with a convex lens – power determination.
13. Construction of a tabletop telescope – all three types of telescopes.
14. Construction of a tabletop microscope
15. Imaging by a cylindrical lens – relationship between cylinder axis and image orientation
16. Imaging by two cylinders in contact – determination of the position of CLC; verification of CLC using a spherical lens with power equal to the spherical equivalent; orientations and position of the line images and their relation to the cylinders' powers and orientations
17. Imaging by a spherocylindrical lens – sphere and cylinder in contact – determination of the position of CLC; verification of CLC using a spherical lens with power equal to the spherical equivalent; orientations and position of the line images and their relation to the cylinder's power and orientation

## SEMESTER III

### CORE PAPER V – OPTOMETRIC OPTICS

**Course Description:** This course deals with understanding the theory behind spectacle lenses and frames, their materials, types, advantages and disadvantages, calculations involved, when and how to prescribe. It will impart construction, design application and development of lenses, particularly of the methods of calculating their power and effect.

**Course Objectives:** Skills/knowledge to be acquired at the end of this course:

- Measurement of lens power , lens centration using conventional techniques
- Transposition of various types of lenses
- Knowledge to identify different forms of lenses (equi- convex, planoconvex, periscopic, etc.)
- Knowledge to select the tool power for grinding process.
- Measurement of surface powers using lens measure.
- Method of laying off the lens for glazing process.
- Ophthalmic prism knowledge – effects, units, base-apex notation, compounding and resolving prisms.
- Knowledge of prism and decentration in ophthalmic lenses
- Knowledge of different types of materials used to make lenses and its characteristics
- Knowledge lens designs – single vision, bifocals, progressive lens
- Knowledge on tinted and protective lenses
- Knowledge on special lenses like iseikonic, spectacle magnifiers.
- Knowledge on spectacle frames – manufacture, materials

#### **Unit: I**

Introduction – Light, Mirror, Reflection, Refraction and Absorption

Prisms – Definition, properties, Refraction through prisms, Thickness difference, Base-apex notation, uses, nomenclature and units, Sign Conventions, Fresnel's prisms, rotary prisms

Lenses – Definition, units, terminology used to describe, form of lenses

Vertex distance and vertex power, Effectivity calculations

Lens shape, size and types i.e. spherical, cylindrical and Sphero-cylindrical

Transpositions – Simple, Toric and Spherical equivalent

Prismatic effect, centration, decent ration and Prentice rule, Prismatic effect of Plano-cylinder and Sphero-cylinder lenses

Spherometer & Sag formula, Edge thickness calculations

Magnification in high plus lenses, Minification in high minus lenses

Tilt induced power in spectacles

Aberration in Ophthalmic Lenses

**Unit: II**

Raw materials – History and General Outline, Manufacturing of Ophthalmic Blanks – Glass & Plastics, Terminology used in Lens Workshops, Surfacing process from Blanks to lenses  
Definition & Materials (Glass, Plastics, Polycarbonate, Triology) types and Characteristics  
Properties (Refractive index, specific gravity, UV cut off, impact resistance – include drop ball test, abbe value, Center thickness)

**Unit: III**

Best form of lenses & Safety standards for Ophthalmic lenses (FDA, ANSI, ISI, Others)  
Design of High Powered Lenses - Hi-index lenses, Calculation of Refractive index  
Bifocal designs, their manufacturing & uses (Kryptok, Univis D, Executive, Invisible, Occupational) Progressive Addition Lenses, modified near vision lenses (designs, advantages, limitations)

**Unit: IV**

Lens enhancements (Scratch resistant coatings – spin/dip, Anti-reflection coating, UV coating, Hydrophobic coating, anti-static coating  
Lens defects – Description and Detection  
Glazing & edging (manual & automatic)  
Special lenses

- Lenticulars
- Aspherics
- Fresnel lenses & Prisms
- Aniseikonic lenses
- Photochromics
- Polaroids
- Tinted lenses – Tints, filters

Project to ensure awareness on lens availability in Indian market

**Unit: V**

History of Spectacles, manufacturing overview, Definition, parts & measurements  
Classification of frames – Materials (cover in detail), Colours and Temple position (advantages & disadvantages, where to use) , Special purpose frames (sports, kids, reading)

**Text Books:**

1. Jalie M: The principles of Ophthalmic Lenses, The Association of Dispensing Opticians, London, 1972

**Reference Books:**

2. David Wilson: Practical Optical Dispensing, OTEN- DE, NSW TAFE Commission, 1999
3. C V Brooks, IM Borish: System for Ophthalmic Dispensing, Second edition, Butterworth-Heinemann, USA, 1996

## SEMESTER III

### CORE PAPER VI – VISUAL OPTICS I

**Course Description:** This course deals with the concept of eye as an optical instrument and thereby covers various optical components of eye, types of refractive errors, clinical approach in diagnosis and management of various types of refractive errors.

**Course Objectives:** Upon completion of the course, the student should be able:

- to understand the fundamentals of optical components of the eye
- to gain theoretical knowledge and practical skill on visual acuity measurement, objective and subjective clinical refraction.

#### Unit: I

##### REVIEW OF GEOMETRICAL OPTICS

VERGENCE AND POWER:, Conjugacy, object space and image space. Sign convention

Spherical refracting surface, Spherical mirror; catoptric power, Cardinal points, Magnification

Light and visual function

Clinical Relevance of: Fluorescence, Interference, Diffraction, Polarization, Bi-refringence, Dichroism Aberration and application, Spherical and Chromatic

#### Unit: II

##### OPTICS OF OCULAR STRUCTURE

Cornea and aqueous

Crystalline lens

Vitreous

Schematic and reduced eye

#### Unit: III

##### MEASUREMENTS OF OPTICAL CONSTANTS OF THE EYE

Corneal curvature and thickness

Keratometry

3.3 Curvature of the lens and ophthalmometry

Axial and axis of the eye

Basic Aspects of Vision.

#### Unit: IV

Visual Acuity, Light and Dark Adaptation, Color Vision, Spatial and Temporal Resolution

Science of Measuring visual performance and Application to Clinical Optometry

#### Unit: V

##### REFRACTIVE ANOMALIES AND THEIR CAUSES

Etiology of refractive anomalies Contributing variability and their ranges

Populating distributions of anomalies.

Optical component measurements

Growth of the eye in relation to refractive errors

**Text books:**

1. A H Tunncliffe: Visual optics, The Association of British Optician, 1987
2. AG Bennett & RB Rabbets: Clinical Visual optics, 3rd edition, Butterworth Heinemann, 1998

**Reference Books:**

1. M P Keating: Geometric, Physical and Visual optics, 2<sup>nd</sup> edition, Butterworth-Heinemann, USA, 2002
2. HL Rubin: Optics for clinicians, 2<sup>nd</sup> edition, Triad publishing company. Florida, 1974.
3. H Obstfeld: Optic in Vision- Foundations of visual optics & associated computations, 2<sup>nd</sup> edition, Butterworth, UK, 1982.
4. WJ Benjamin: Borish's clinical refraction, 2<sup>nd</sup> edition, Butterworth Heinemann, Missouri, USA, 2006
5. T Grosvenor: Primary Care Optometry, 4<sup>th</sup> edition, Butterworth – heinneman, USA, 2002

**SEMESTER III**

**CORE PAPER VII – OPTOMETRIC INSTRUMENTS & EXAMINATION OF VISUAL SYSTEM**

**Course Description:** This course covers commonly used optometric instruments, its basic principle, description and usage in clinical practice. Also it covers various clinical optometry procedures involving external examination, anterior segment and posterior segment examination, neurophthalmic examination, pediatric optometry examination, and Glaucoma evaluation.

**Course Objectives:** Upon completion of the course, the student should be able to gain theoretical knowledge and basic practical skill in handling the Optometric & Ophthalmic instruments - And the students will be skilled in knowing the purpose, set-up and devices required for the test, indications and contraindications of the test, step-by-step procedures, documentation of the findings, and interpretation of the findings of the various clinical optometry procedures.

**Unit: I**

**REFRACTIVE INSTRUMENTS**

- Optotypes and MTF, Spatial Frequency
- Test charts standards.
- Choice of test charts
- Trial case lenses
- Refractor (phoropter) head units
- Optical considerations of refractor units
- Trial frame design
- Near vision difficulties with units and trial frames
- Retinoscope – types available
- Adjustment of Retinoscopes- special features
- Objective optometers.

- Infrared optometer devices.
- Projection charts
- Illumination of the consulting room.
- Brightness acuity test
- Vision analyzer
- Pupilometer
- Potential Acuity Meter
- Abberometer

**Unit: II**

**OPHTHALMOSCOPES AND RELATED DEVICES**

- Design of ophthalmoscopes - illumination
- Design of ophthalmoscopes- viewing
- Ophthalmoscope disc
- Filters for ophthalmoscopy
- Indirect ophthalmoscope

**Unit: III**

Lensometer, Lens gauges or clock

Slit Lamp , Tonometers

Keratometer and corneal topography, Refractometer

Orthoptic Instruments (Synoptophore Only), Color Vision Testing Devices

Fields Of Vision And Screening Devices

Scans, ERG, New Instruments

**Unit: IV**

Examination of Visual System

History taking, Visual acuity estimation

Extraocular motility, Cover test, Alternating cover test, Hirschberg test, Modified Krimsky,

Pupils Examination, Maddox Rod, van Herrick,

**Unit: V**

External examination of the eye, Lid Eversion

Schirmer's, TBUT, tear meniscus level, NITBUT (keratometer),

Color Vision, Stereopsis,

Confrontation test, Photostress test,

Slitlamp biomicroscopy, Direct Ophthalmoscopy,

Digital pressure, Schiottz Tonometry, Applanation Tonometry

Gonioscopy ROPLAS, Amsler test,

Corneal Sensitivity, HVID

Saccades and Pursuits

**Text books:**

1. David Henson: Optometric Instrumentations, Butterworth- Heinnemann, UK, 1991
2. T Grosvenor: Primary Care Optometry, 5th edition, Butterworth – Heinneman, USA, 2007

**Reference books:**

1. **P R Yoder:** Mounting Optics in Optical Instruments, SPIE Society of Photo-Optical Instrumentation, 2002
2. **G Smith, D A. Atchison:** The Eye and Visual Optical Instruments, Cambridge University Press, 1997
3. **A K Khurana:** Comprehensive Ophthalmology, 4<sup>th</sup> edition, New age international (p) Ltd. Publishers, New Delhi, 2007
4. **D B. Elliott :** Clinical Procedures in Primary Eye Care, 3<sup>rd</sup> edition, Butterworth-Heinemann, 2007
5. **Jack J. Kanski** Clinical Ophthalmology: A Systematic Approach, 6<sup>th</sup> edition, Butterworth-Heinemann, 2007
6. **J.B Eskridge, J F. Amos, J D. Bartlett:** Clinical Procedures in Optometry, Lippincott Williams and Wilkins, 1991
7. **N B. Carlson , DI Kurtz:** Clinical Procedures for Ocular Examination , 3<sup>rd</sup> edition, McGraw-Hill Medical, 2003

**SEMESTER III**

**ALLIED PAPER III – PHARMACOLOGY**

**Course Description:** This course covers the actions, uses, adverse effects and mode of administration of drugs, especially related to eyes.

**Course Objective:** At the end of the course students will be knowledgeable in the following:

- basic principles of Pharmacokinetics and Pharmacodynamics
- commonly used ocular drugs, mechanism, indications, contraindications, drug dosage, and adverse effects.

**Unit: I**

Pharmacokinetics : Drug absorption, distribution, metabolism and excretion

Pharmacodynamics : Drug Handling by the body – effect of drug and the relationship between drug concentration and response, Drug – Receptor interactions

**Unit: II**

Ocular Pharmacology : Drug Handling by cells and Tissues - Pharmacokinetics, and Pharmacodynamics– specific to ocular surface and intraocular conditions

**Unit: III**

Delivery methods of Ocular Medication: Residence in the Conjunctival sac, drug vehicles affect drug delivery, advanced ocular delivery systems

Reconstituting the tear film: Tear Substitutes

**Unit: IV**

Ocular Drugs and the Autonomic Nervous system: Parasympathetic( antimuscaranic) and Sympathetic

Intraocular pressure Drugs

Eicosanoids : prostaglandins,thromboxaes and leukotrienes

Serotonin : Neurotransmitter; Glucocorticoids, Immunosuppressive agents

**Unit: V**

Local Anaesthetics, Ocular Toxicity from systemic administration of Drugs

**Textbook:**

1. K D TRIPATHI: Essentials of Medical Pharmacology. 5<sup>th</sup> edition, Jaypee, New Delhi, 2004
2. Ashok Garg: Manual of Ocular Therapeutics, Jaypee, NewDelhi, 1996

**Reference Books:**

- T J Zimmerman, K S Kooner, M Sharir, R D Fechtner: Text Book of Ocular Pharmacology, Lippincott-Raven, Philadelphia, 1997

## SEMESTER IV

### CORE PAPER VIII –VISUAL OPTICS II

**Course Description:** This course deals with the concept of eye as an optical instrument and thereby covers various optical components of eye, types of refractive errors, clinical approach in diagnosis and management of various types of refractive errors.

**Course Objectives:** Upon completion of the course, the student should be able

- to understand the fundamentals of optical components of the eye
- to gain theoretical knowledge and practical skill on visual acuity measurement, objective and subjective clinical refraction.

**Unit: I**

Refractive conditions

- Emmetropia
- Myopia
- Hyperopia
- Astigmatism
- Accommodation
- Presbyopia
- Anisometropia and Aniseikonia
- Aphakia and Pseudophakia

**Unit: II**

Accommodation

- Far and near points of accommodation
- Correction of spherical ametropia
- Axial versus refractive ametropia
- Relationship between accommodation and convergence, AC / A ratio

**Unit: III**

Objective refraction

- Streak Retinoscopy only

**Unit: IV**

Subjective Refraction

- Review of subjective refractive methods
- Cross cylinder methods for astigmatism, Astigmatic Fan Test
- Difficulties in subjective and objective tests and their avoidance
- Ocular refraction versus spectacle refraction

**Unit: V**

Subjective Refraction

- Ocular accommodation versus spectacle accommodation
- Spectacle magnification and relative spectacle magnification
- Retinal image blur; depth of focus and depth of field
- Prescribing Prisms / Binocular Refraction

**Text books:**

- A H Tunnacliffe: Visual optics, The Association of British Optician, 1987
- AG Bennett & RB Rabbets: Clinical Visual optics, 3rd edition, Butterworth Heinemann, 1998

**Reference Books:**

- M P Keating: Geometric, Physical and Visual optics, 2<sup>nd</sup> edition, Butterworth-Heinemann, USA, 2002
- HL Rubin: Optics for clinicians, 2<sup>nd</sup> edition, Triad publishing company. Florida, 1974.
- H Obstfeld: Optic in Vision- Foundations of visual optics & associated computations, 2<sup>nd</sup> edition, Butterworth, UK, 1982.
- WJ Benjamin: Borish's clinical refraction, 2<sup>nd</sup> edition, Butterworth Heinemann, Missouri, USA, 2006
- T Grosvenor: Primary Care Optometry, 4<sup>th</sup> edition, Butterworth – heinneman, USA, 2002

## SEMESTER IV

### CORE PAPER IX – DISPENSING OPTICS

**Course Description:** This course will deal with the dispensing aspects of spectacle lenses and frames needed to manage the customer in an Optical set up, from counseling to delivering the spectacles.

**Course Objective:** Skills to be acquired at the end of this course

- Reading of spectacle prescription
- Counseling the patient

- Lens edge thickness calculation
- Frame & lens measurements and selection
- Writing spectacle lens order
- Facial measurements - Interpupillary distance measurement and measuring heights (single vision, multifocal, progressives)
- Lens verification and axis marking and fitting of all lens types
- Final checking of finished spectacle with frame adjustments
- Delivery and follow-up
- Troubleshooting complaints and handling patient's questions.

**Unit: I**

Components of spectacle prescription & interpretation, transposition, Add and near power relation - Frame selection – based on spectacle prescription, professional requirements, age group, face shape

**Unit: II**

Measuring Inter-pupillary distance (IPD) for distance & near, bifocal height  
Lens & Frame markings, Pupillary centers, bifocal heights, Progressive markings & adjustments – facial wrap, pantoscopic tilt

**Unit: III**

Recording and ordering of lenses (power, add, diameter, base, material, type, lens enhancements)  
Neutralization – Hand & lensometer, axis marking, prism marking  
Faults in spectacles (lens fitting, frame fitting, patients complaints, description, detection and correction)  
Final checking & dispensing of spectacles to customers, counseling on wearing & maintaining of spectacles, Accessories – Bands, chains, boxes, slevets, cleaners, screwdriver kit  
Spectacle repairs – tools, methods, soldering, riveting, frame adjustments

**Unit: IV**

Special types of spectacle frames

- Monocles
- Ptosis crutches
- Industrial safety glasses
- Welding glasses

**Unit: V**

Frame availability in Indian market, FAQ's by customers and their ideal answers

**Text Book:**

- David Wilson: Practical Optical Dispensing, OTEN- DE, NSW TAFE Commission, 1999
- C V Brooks, IM Borish: System for Ophthalmic Dispensing, Second edition, Butterworth-Heinemann, USA, 1996

**Reference Book:**

- David Wilson, Steve stenersen: Practical optical workshop, OTEN- DE, NSW TAFE Commission, 2002
- Margaret Dowaliby: Practical Aspects of Ophthalmic optics, Fourth edition, Butterworth Heinemann, USA, 2001

**SEMESTER IV**

**CORE PAPER X – SYSTEMIC DISEASE**

**Course Description:** This course deals with definition, classification, clinical diagnosis, complications, and management of various systemic diseases. In indicated cases ocular manifestations also will be discussed.

**Course Objectives:** At the end of the course, students should get acquainted with the following:

- Common Systemic conditions: Definition, diagnostic approach, complications and management options
- Ocular findings of the systemic conditions
- First Aid knowledge

**Unit: I**

Hypertension

- Definition, classification, Epidemiology, clinical examination, complications, and management.
- Hypertensive retinopathy

Diabetes Mellitus

- Classification, pathophysiology, clinical presentations, diagnosis, and management, Complications
- Diabetic Retinopathy

Thyroid Disease

- Physiology, testing for thyroid disease, Hyperthyroidism, Hypothyroidism, Thyroiditis, Thyroid tumors
- Grave's Ophthalmopathy

Acquired Heart Disease

- Ischemic Heart Disease, Congestive heart failure, Disorders of cardiac rhythm
- Ophthalmic considerations

Cancer :

- Incidence
- Etiology
- Therapy
- Ophthalmologic considerations

**Unit: II**

Connective Tissue Disease

- Rheumatic arthritis
- Systemic lupus erythematosus
- Scleroderma
- Polymyositis and dermatomyositis
- Sjogren syndrome
- Behcet's syndrome
- Eye and connective tissue disease

Tuberculosis

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

Herpes virus ( Herpes simplex, Varicella Zoster, Cytomegalovirus, Epstein Barr Virus)

Herpes and the eye - Hepatitis ( Hepatitis A, B, C)

Acquired Immunodeficiency Syndrome - Anemia (Diagnosis, clinical evaluation, consequences, Sickle cell disease, treatment, Ophthalmologic considerations)

**Unit: III**

Common Tropical Medical Ailments

- Malaria
- Typhoid
- Dengue
- Filariases
- Onchocerciasis
- Cysticercosis
- Leprosy

**Unit: IV**

Nutritional and Metabolic disorders:

- Obesity
- Hyperlipidaemias
- Kwashiorkor
- Vitamin A Deficiency
- Vitamin D Deficiency
- Vitamin E Deficiency
- Vitamin K Deficiency
- Vitamin B1,B2, Deficiency
- Vitamin C Deficiency

Myasthenia Gravis

- First Aid
- General Medical Emergencies
- Preoperative precautions in ocular surgeries

Psychiatry

- Basic knowledge of psychiatric condition and
- Patient Management

**Unit: V**

Genetics

- Introduction to genetics
- Organisation of the cell
- Chromosome structure and cell division
- Gene structure and basic principles of Genetics.
- Genetic disorders and their diagnosis.
- Genes and the eye
- Genetic counseling and genetic engineering.

**Text book:**

- C Haslett, E R Chilvers, N A boon, N R Coledge, J A A Hunter: Davidson's , Principles and Practice of Medicine, Ed. John Macleod, 19<sup>th</sup> Ed., ELBS/Churchill , Livingstone. (PPM), 2002
- Basic and clinical Science course: Update on General Medicine, American Academy of Ophthalmology, Section 1, 1999

**SEMESTER IV**

**CORE PRACTICAL II – EXAMINATION OF VISUAL SYSTEM**

(Examination at the end of second semester)

1. History taking - General, Specific, Conditions
2. Lensometry
3. Vision Check, Pinhole acuity
4. Push up test (Amplitude of Accommodation)
5. Push up test ( Near point of Convergence)
6. Tear Break up time
7. Amsler's Grid test
8. Color vision test
9. Schirmer's test
10. Confrontation test
11. Slit lamp examination
12. Finger tension, Schiötz Tonometry, Applanation Tonometry
13. Negative Relative Accommodation
14. Positive Relative Accommodation
15. von Herick Grading of Anterior chamber depth
16. Accommodative facility( $\pm 2.00$  D)
17. IPD
18. HVID
19. Maddox rod (Phoria)
20. Negative Fusional vergence
21. Positive Fusional Vergence
22. Retinoscopy- Static, Dynamic and Cycloplegic Retinoscopy
23. Keratometry
24. Subjective Refraction – JCC, Clock Dial, Duochrome, Borish Delayed

## **SEMESTER IV**

### **ALLIED PAPER IV – PATHOLOGY**

**Course Description:** This course describes basic aspects of disease processes with reference to specific entities relevant in optometry/ophthalmology.

**Course Objective:** At the end of the course students will acquire knowledge in the following aspects:

- Inflammation and repair aspects.
- Pathology of various eye parts and adnexa

#### **Unit: I**

General Pathology : Principles  
Pathophysiology of Ocular Angiogenesis  
Ocular Infections

#### **Unit: II**

Pathology of cornea and Conjunctiva  
Pathology of Uvea  
Pathology of Glaucoma

#### **Unit: III**

Pathology of Retina  
Pathology of retina in systemic disease/disorders  
Pathology of eyelids and adnexa

#### **Unit: IV**

Pathology of orbital space occupying lesions  
Pathology of the optic nerve

#### **Unit: V**

Retinoblastoma  
Pathology of Lens

#### **Text books:**

- K S Ratnagar: Pathology of the eye & orbit, Jaypee brothers Medical Publishers, 1997

#### **Reference books:**

- CORTON KUMAR AND ROBINS: Pathological Basis of the Disease, 7<sup>th</sup> Edition, Elsevier, New Delhi, 2004.
- S R Lakhani Susan AD & Caroline JF: Basic Pathology: An introduction to the mechanism of disease, 1993.

## **SEMESTER V**

### **CORE PAPER XI– CONTACT LENS I**

**Course Description:** The subject provides the student with suitable knowledge both in theoretical and practical aspects of Contact Lenses.

**Course Objectives:** Upon completion of the course, the student should be able to:

- Understand the basics of contact lenses
- List the important properties of contact lenses
- Finalise the CL design for various kinds patients
- Recognize various types of fitting
- Explain all the procedures to patient
- Identify and manage the adverse effects of contact lens

#### **Unit: I**

Introduction to Contact lenses

- Definition
- Classification / Types
- History of Contact Lenses

#### **Unit: II**

Optics of Contact Lenses

- Magnification & Visual field
- Accommodation & Convergence
- Back & Front Vertex Power / Vertex distance calculation

Review of Anatomy & Physiology of

- Tear film
- Cornea
- Lids & Conjunctiva

#### **Unit: III**

Introduction to CL materials

- Monomers, Polymers

Properties of CL materials

- Physiological (Dk, Ionicity, Water content)
- Physical (Elasticity, Tensile strength, Rigidity)
- Optical (Transmission, Refractive index)

Indications and contraindications Parameters / Designs of Contact Lenses & Terminology

RGP Contact Lens materials

Manufacturing Rigid and Soft Contact Lenses – various methods

#### **Unit: IV**

Pre-Fitting examination – steps, significance, recording of results

Correction of Astigmatism with RGP lens  
Types of fit – Steep, Flat, Optimum – on spherical cornea with spherical lenses  
Types of fit – Steep, Flat, Optimum – on Toric cornea with spherical lenses  
Calculation and finalising Contact lens parameters  
Ordering Rigid Contact Lenses – writing a prescription to the Laboratory  
Checking and verifying Contact lenses from Laboratory  
Modifications possible with Rigid lenses

**Unit: V**

Common Handling Instructions

- Insertion & Removal Techniques
- Do's and Dont's

Care and Maintenance of Rigid lenses

- Cleaning agents & Importance
- Rinsing agents & Importance
- Disinfecting agents & importance
- Lubricating & Enzymatic cleaners

Follow up visit examination

Complications of RGP lenses

**Text books:**

IACLE modules 1 - 10

CLAO Volumes 1, 2, 3

**Reference books:**

1. **Anthony J. Phillips** : Contact Lenses, 5<sup>th</sup> edition, Butterworth-Heinemann, 2006
2. **Elisabeth A. W. Millis**: Medical Contact Lens Practice, Butterworth-Heinemann, 2004
3. **E S. Bennett ,V A Henry** :Clinical manual of Contact Lenses, 3<sup>rd</sup> edition, Lippincott Williams and Wilkins, 2008

**SEMESTER V**  
**CORE PAPER XII – OCULAR DISEASE I**

**Course Description:** This course deals with various ocular diseases affecting various parts of the eyes. It covers clinical signs and symptoms, cause, pathophysiological mechanism, diagnostic approach, differential diagnosis and management aspects of the ocular diseases.

**Course Objective:** At the end of the course the students will be knowledgeable in the following aspects of ocular diseases: knowledge

- on the etiology,
- epidemiology,
- symptoms,
- signs,
- course sequelae of ocular disease,
- diagnostic approach, and
- management of the ocular diseases.

**Unit: I**

a) **ORBIT**

- Applied Anatomy
- Proptosis  
(Classification, Causes, Investigations)
- Enophthalmos
- Developmental Anomalies  
( craniosynostosis, Craniofacial Dysostosis, Hypertelorism, Median facial cleft syndrome)
- Orbital Inflammations (Preseptal cellulites, Orbital cellulitis Orbital Periostitis, cavernous sinus Thrombosis)
- Grave's Ophthalmopathy
- Orbital tumors( Dermoids, capillary haemangioma, Optic nerve glioma)
- Orbital blowout fractures
- Orbital surgery (Orbitotomy)
- Orbital tumors
- Orbital trauma
- Approach to a patient with proptosis

**Unit: II**

b) **LIDS**

- Applied Anatomy
- Congenital anomalies  
( Ptosis, Coloboma, Epicanthus, Distichiasis, Cryptophthalmos)
- 3.Oedema of the eyelids  
(Inflammatory, Solid, Passive edema)
- Inflammatory disorders (Blepharitis, External Hordeolum, Chalazion,
- Internal hordeolum,,Molluscum Contagiosum)
- Anomalies in the position of the lashes and Lid Margin (Trichiasis, Ectropion, Entropion, Symblepharon, Blepharophimosis, Lagophthalmos, Blepharospasm, Ptosis).
- Tumors (Papillomas, Xanthelasma, Haemangioma, Basal carcinoma, Squamous cell carcinoma, sebaceous gland melanoma)

c) **LACRIMAL SYSTEM**

- Applied Anatomy
- Tear Film
- The Dry Eye ( Sjogren's Syndrome)
- The watering eye ( Etiology, clinical evaluation)
- Dacryocystitis
- Swelling of the Lacrimal gland ( Dacryoadenitis)

**Unit: III**

d) **CONJUNCTIVA**

- Applied Anatomy
- Inflammations of conjunctiva ( Infective conjunctivitis – bacterial, chlamydial, viral , Allergic conjunctivitis, Granulomatous conjunctivitis)

- Degenerative conditions
- ( Pinguecula, Pterygium, Concretions)
- Symptomatic conditions
- ( Hyperaemia, Chemosis, Ecchymosis, Xerosis, Discoloration)
- 5.Cysts and Tumors

#### **Unit: IV**

##### **e) CORNEA**

- Applied Anatomy and Physiology
- Congenital Anomalies  
(Megalocornea, Microcornea, Cornea plana, Congenital cloudy cornea)
- Inflammations of the cornea (Topographical classifications: Ulcerative keratitis and Non ulcerative)
- Etiological classifications: Infective, Allergic, Trophic, Traumatic, Idiopathic)
- Degenerations ( classifications, Arcus senilis, Vogt's white limbal girdle, Hassal-henle bodies, Lipoid Keratopathy, Band shaped keratopathy, Salzmann's nodular degeneration, Droplet keratopathy, Pellucid Marginal degeneration)
- Dystrophies ( Reis Buckler dystrophy, Recurrent corneal erosion syndrome, Granular dystrophy, Lattice dystrophy, Macular dystrophy, cornea guttata, Fuch's epithelial endothelial dystrophy, Congenital hereditary endothelial dystrophy)
- Keratoconus, Keratoglobus
- Corneal oedema, Corneal opacity, Corneal vascularisation
- Penetrating Keratoplasty

#### **Unit: V**

##### **f) UVEAL TRACT AND SCLERA**

- Applied Anatomy,
- Classification of uveitis
- Etiology
- Pathology
- Anterior Uveitis
- Posterior Uveitis
- Purulent Uveitis
- Endophthalmitis
- Panophthalmitis
- Pars Planitis
- Tumors of uveal tract( Melanoma)
- Episcleritis and scleritis

Clinical examination of Uveitis and Scleritis

#### **Text books:**

- A K Khurana: Comprehensive Ophthalmology, 4<sup>th</sup> edition, New age international (p) Ltd. Publishers, New Delhi, 2007

**Reference Books:**

- **Stephen J. Miller** : Parsons Diseases of the Eye, 18<sup>th</sup> edition, Churchill Livingstone, 1990
- **Jack J. Kanski** Clinical Ophthalmology: A Systematic Approach, 6<sup>th</sup> edition, Butterworth - Heinemann, 2007

**SEMESTER V**  
**CORE PAPER XIII – BINOCULAR VISION I**

**Course Description:**

This course provides theoretical aspects of Binocular Vision and its clinical application. It deals with basis of normal binocular vision and space perception, Gross anatomy and physiology of extrocular muscles, various binocular vision anomalies, its diagnostic approaches and management.

**Course Objectives:**

- On successful completion of this module, a student will be expected to be able to:-
- Demonstrate an in-depth knowledge of the gross anatomy and physiology relating to the extroocular muscles.
- Provide a detailed explanation of, and differentiate between the aetiology, investigation and management of binocular vision anomalies.
- Adapt skills and interpret clinical results following investigation of binocular vision anomalies appropriately and safely.

**Unit: I**

Binocular Vision and Space perception.

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

**Unit: II**

Anatomy of Extra Ocular Muscles.

- Rectii and Obliques, LPS.
- Innervation & Blood Supply.

Physiology of Ocular movements.

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

Laws of ocular motility

- Donder's and Listing's law
- Sherrington's law
- Hering's law

### **Unit: III**

Unocular & Binocular movements - fixation, saccadic & pursuits.

- Version & Vergence.
- Fixation & field of fixation

Near Vision Complex

Accommodation

- Definition and mechanism (process).
- Methods of measurement.
- Stimulus and innervation.
- Types of accommodation.
- Anomalies of accommodation – aetiology and management.

### **Unit: IV**

Convergence

- Definition and mechanism.
- Methods of measurement.
- Types and components of convergence - Tonic, accommodative, fusional, proximal.
- Anomalies of Convergence – aetiology and management.

Sensory adaptations Confusion

Suppression Investigations

Management Blind spot syndrome

### **Unit: V**

Abnormal Retinal Correspondence

Investigation and management

Blind spot syndrome

Eccentric Fixation

Investigation and management

Amblyopia Classification

Aetiology Investigation Management

### **Text Books:**

1. Pradeep Sharma: Strabismus simplified, New Delhi, First edition, 1999, Modern publishers.
2. Fiona J. Rowe: Clinical Orthoptics, second edition, 2004, Blackwell Science Ltd

3. Gunter K. Von Noorden: BURIAN- VON NOORDEN'S Binocular vision and ocular motility theory and management of strabismus, Missouri, Second edition, 1980, C. V. Mosby Company
4. Mitchell Scheiman; Bruce Wick: [Clinical Management of Binocular Vision](#) Heterophoric, Accommodative, and Eye Movement Disorders, 2008, Lippincot Williams & Wilkins publishers

## **SEMESTER V**

### **CORE PAPER XIV – LOW VISION AID**

**Course Description:** This course deal with the definition of low vision, epidemiology aspect of visual impairment, types of low vision devices and its optical principles, clinical approach of the low vision patients, assistive devices for totally visually challenged, art of prescribing low vision devices and training the low vision patients and other rehabilitation measures.

**Course Objectives:** At the end of the course , the student will be knowledgeable in the following:

- Definition and epidemiology of Low Vision
- Clinical examination of Low vision subjects
- Optical, Non-Optical, Electronic, and Assistive devices.
- Training for Low Vision subjects with Low vision devices
- Referrals and follow-up

#### **Unit: I**

Definitions & classification of Low vision  
Epidemiology of low vision

#### **Unit: II**

Model of low vision service  
Pre-clinical evaluation of low vision patients – prognostic & psychological factors; psycho-social impact of low vision, Types of low vision aids – optical aids, non-optical aids & electronic devices

#### **Unit: III**

Optics of low vision aids  
Clinical evaluation – assessment of visual acuity, visual field, selection of low vision aids, instruction & training, Pediatric Low Vision care

#### **Unit: IV**

Low vision aids – dispensing & prescribing aspects  
Visual rehabilitation & counseling  
Legal aspects of Low vision in India

#### **Unit: V**

Case Analysis

**Text books:**

- **Christine Dickinson:** Low Vision: Principles and Practice Low vision care, E Vaithilingam: practice of
- Low vision – A guide book, Medical Research Foundation, 2000.

**Reference Books:**

**Richard L. Brilliant:** Essentials of Low Vision Practice, Butterworth-Heinemann, 1999  
**Helen Farral:** optometric Management of Visual Handicap, Blackwell Scientific publications, 1991  
**A J Jackson, J S Wolffsohn:** Low Vision Manual, Butterworth Heinemann, 2007

**SEMESTER V**  
**CORE PAPER XV – OCCUPATIONAL OPTOMETRY**

**Course Description** : This course deals with general aspects of occupational health, Visual demand in various job, task analyzing method, visual standards for various jobs, occupational hazards and remedial aspects through classroom sessions and field visit to the factories.

**Course Objectives:** At the end of the course the students will be knowledgeable in the following aspects:

- in visual requirements of jobs;
- in effects of physical, chemical and other hazards on eye and vision;
- to identify occupational causes of visual and eye problems;
- to be able to prescribe suitable corrective lenses and eye protective wear and
- to set visual requirements, standards for different jobs.

**Unit: I**

Introduction to Occupational health, hygiene and safety, international bodies like ILO, WHO, National bodies etc, Acts and Rules - Factories Act, WCA,ESI Act.

**Unit: II**

Electromagnetic Radiation and its effects on Eye  
Light – Definitions and units, Sources, advantages and disadvantages, standards  
Color – Definition, Color theory, Color coding, Color defects, Color Vision tests

**Unit: II I**

Occupational hazards and preventive/protective methods  
Task Analysis

**Unit: IV**

Industrial Vision Screening – Modified clinical method and Industrial Vision test  
Vision Standards – Railways, Roadways, Airlines

**Unit: V**

Visual Display Units  
Contact lens and work

**Text Books:**

R V North: Work and the eye, Second edition, Butterworth Heinemann, 2001

**Reference Books:**

- G W Good: Occupational Vision Manual available in the following website: [www.aoa.org](http://www.aoa.org)
- N.A. Smith: Lighting for Occupational Optometry, HHSC Handbook Series, Safchem Services, 1999
- G Carson, S Doshi, W Harvey: Eye Essentials: Environmental & Occupational Optometry, Butterworth-Heinemann, 2008

**SEMESTER VI**  
**CORE PAPER XV I – CONTACT LENS II**

**Course Description:** The subject provides the student with suitable knowledge both in theoretical and practical aspects of Contact Lenses.

**Course Objectives:** Upon completion of the course, the student should be able to:

- Understand the basics of contact lenses
- List the important properties of contact lenses
- Finalise the CL design for various kinds patients
- Recognize various types of fitting
- Explain all the procedures to patient
- Identify and manage the adverse effects of contact lens

**Unit: I**

SCL Materials & Review of manufacturing techniques  
Comparison of RGP vs. SCL  
Pre-fitting considerations for SCL  
Fitting philosophies for SCL

**Unit: II**

SCL fitting assessment  
Types of fit – Steep, Flat, Optimum  
Calculation and finalising SCL parameters

Disposable lenses

Advantages and availability

**Unit: III**

Soft Toric CL

➤ Stabilization techniques

- Parameter selection
- Fitting assessment

#### **Unit: IV**

Common Handling Instructions

- Insertion & Removal Techniques
- Do's and Dont's

Care and Maintenance of Soft lenses

- Cleaning agents & Importance
- Rinsing agents & Importance
- Disinfecting agents & importance
- Lubricating & Enzymatic cleaners

Follow up visit examination

Complications of Soft lenses

Therapeutic contact lenses

- Indications
- Fitting consideration

#### **Unit: V**

Specialty fitting

- Aphakia
- Pediatric
- Post refractive surgery
- Introduction to Bifocal CL

#### **Text books:**

- IACLE modules 1 - 10
- CLAO Volumes 1, 2, 3

#### **Reference books:**

- **Anthony J. Phillips** : Contact Lenses, 5<sup>th</sup> edition, Butterworth-Heinemann, 2006
- **Elisabeth A. W. Millis**: Medical Contact Lens Practice, Butterworth-Heinemann, 2004
- **E S. Bennett ,V A Henry** :Clinical manual of Contact Lenses, 3<sup>rd</sup> edition, Lippincott Williams and Wilkins, 2008

## **SEMESTER VI CORE PAPER XVII – OCULAR DISEASE II**

**Course Description:** This course deals with various ocular diseases affecting various parts of the eyes. It covers clinical signs and symptoms, cause, pathophysiological mechanism, diagnostic approach, differential diagnosis and management aspects of the ocular diseases.

**Course Objective:** At the end of the course the students will be knowledgeable in the following aspects of ocular diseases: knowledge

- on the etiology,
- epidemiology,
- symptoms,

- signs,
- course sequelae of ocular disease,
- diagnostic approach, and
- Management of the ocular diseases.

**Unit: I**

Retina and Vitreous:

- Applied Anatomy
- Congenital and Developmental Disorders ( Optic Disc: Coloboma, Drusen, Hypoplasia, Medullated nerve fibers; Persistent Hyaloid Artery)
- Inflammatory disorders ( Retinitis : Acute purulent , Bacterial, Virus, mycotic)
- Retinal Vasculitis ( Eales's)
- Retinal Artery Occlusion ( Central retinal Artery occlusion)
- Retinal Vein occlusion ( Ischaemic, Non Ischaemic , Branch retinal vein occlusion)
- Retinal degenerations : Retinitis Pigmentosa, Lattice degenerations
- Macular disorders: Solar retinopathy, central serous retinopathy, cystoid macular edema, Age related macular degeneration.
- Retinal Detachment: Rhegmatogenous, Tractional, Exudative)
- Retinoblastoma

**Unit: II**

Ocular Injuries:

Terminology : Closed globe injury ( contusion, lamellar laceration) Open globe injury ( rupture, laceration, penetrating injury, perforating injury)

- Mechanical injuries ( Extraocular foreign body, blunt trauma, perforating injury, sympathetic ophthalmitis)
- Non Mechanical Injuries ( Chemical injuries, Thermal, Electrical, Radiational)
- Clinical approach towards ocular injury patients

**Unit: III**

Lens

- Applied Anatomy and Physiology
- Clinical examination
- Classification of cataract
- Congenital and Developmental cataract
- Acquired ( Senile, Traumatic, Complicated, Metabolic, Electric, Radiational, Toxic)
- Morphological: Capsular, Subcapsular, Cortical, Supranuclear, Nuclear, Polar.
- Management of cataract ( Non surgical and surgical measures; preoperative evaluation, Types of surgeries,)
- Complications of cataract surgery
- Displacement of lens: Subluxation, Displacement
- Lens coloboma, Lenticonus, Microspherophakia.

#### **Unit: IV**

##### Clinical Neuro-ophthalmology

- Anatomy of visual pathway
- Lesions of the visual pathway
- Pupillary reflexes and abnormalities (Amaurotic light reflex, Efferent pathway defect, Wernicke's hemianopic pupil, Marcus Gunn pupil, Argyll Robertson pupil, Adie's tonic pupil)
- Optic neuritis, Anterior Ischemic optic neuropathy, Pappilloedema, optic atrophy
- Cortical blindness
- Malingering
- Nystagmus
- Clinical examination

#### **Unit: V**

##### Glaucoma

- Applied anatomy and physiology of anterior segment
- Clinical Examination
- Definitions and classification of glaucoma
- Pathogenesis of glaucomatous ocular damage
- Congenital glaucomas
- Primary open angle glaucoma
- Ocular hypertension
- Normal Tension Glaucoma
- Primary angle closure glaucoma ( Primary angle closure suspect, Intermittent glaucoma, acute congestive, chronic angle closure)
- Secondary Glaucomas

Management : common medications, laser intervention and surgical techniques

#### **Text books:**

- A K Khurana: Comprehensive Ophthalmology, 4<sup>th</sup> edition, New age international (p) Ltd. Publishers, New Delhi, 2007

#### **Reference Books:**

1. **Stephen J. Miller** : Parsons Diseases of the Eye, 18<sup>th</sup> edition, Churchill Livingstone, 1990
2. **Jack J. Kanski** Clinical Ophthalmology: A Systematic Approach, 6<sup>th</sup> edition, Butterworth- Heinemann, 2007

## **SEMESTER VI CORE PAPER XVIII – BINOCULAR VISION II**

#### **Course Description:**

This course provides theoretical aspects of Binocular Vision and its clinical application. It deals with basis of normal binocular vision and space perception, Gross anatomy and physiology of extraocular muscles, various binocular vision anomalies, its diagnostic approaches and management.

**Course Objectives:**

- On successful completion of this module, a student will be expected to be able to:-
- Demonstrate an in-depth knowledge of the gross anatomy and physiology relating to the extroocular muscles.
- Provide a detailed explanation of, and differentiate between the aetiology, investigation and management of binocular vision anomalies.
- Adapt skills and interpret clinical results following investigation of binocular vision anomalies appropriately and safely.

**Unit: I**

Neuro-muscular anomalies, Classification and etiological factors

History – recording and significance.

Convergent strabismus

- Accommodative convergent squint
- Classification
- Investigation and Management
- B Non accommodative Convergent squint
- Classification
- Investigation and Management

**Unit: II**

Divergent Strabismus

Classification

A& V phenomenon

Investigation and

Management

**Unit: III**

Vertical strabismus

Classification

Investigation and

Management

**Unit: IV**

Paralytic Strabismus

Acquired and Congenital

Clinical Characteristics

Distinction from comitant and restrictive Squint

Investigations

- History and symptoms
- Head Posture
- Diplopia Charting

- Hess chart
  - PBCT
  - Nine directions
  - Binocular field of vision
- Non surgical Management of Squint

#### **Unit: IV**

##### **Restrictive Strabismus**

##### **Features**

- Musculo fascical anomalies
- Duane's Retraction syndrome
- Clinical features and management
- Brown's Superior oblique sheath syndrome
- Strabismus fixus
- Congenital muscle fibrosis
- Surgical management

#### **Text Books:**

1. Pradeep Sharma: Strabismus simplified, New Delhi, First edition, 1999, Modern publishers.
2. Fiona J. Rowe: Clinical Orthoptics, second edition, 2004, Blackwell Science Ltd
3. Gunter K. Von Noorden: BURIAN- VON NOORDEN'S Binocular vision and ocular motility theory and management of strabismus, Missouri, Second edition, 1980, C. V. Mosby Company
4. Mitchell Scheiman; Bruce Wick: [Clinical Management of Binocular Vision](#) Heterophoric, Accommodative, and Eye Movement Disorders, 2008, Lippincot Williams & Wilkins publishers

## **SEMESTER VI**

### **CORE PAPER XIX– GERIATRIC & PEDIATRIC OPTOMETRY**

**Course Description** : This course deals with general and ocular physiological changes of ageing, common geriatric systemic and ocular diseases, clinical approach in geriatric patients, pharmacological aspects of ageing, and spectacle dispensing aspects in ageing patients.

And provide the students adequate knowledge in theoretical and practical aspects of diagnosis, and management of eye conditions related to pediatric population. Also it will inculcate the skill of transferring/communicating the medical information to the attender /patient by the students. The scope of this subject is to train the optometrists to develop a systematic way of dealing with children below 12, so as to implement primary eye care and have better, specialized management of anomalies.

#### **Course Objectives:**

The student on taking this course should

- be able to identify, investigate the age related changes in the eyes.

- be able to dispense spectacles with proper instructions.
- adequately gained knowledge on common ocular diseases
- have a knowledge of the principal theories of childhood development, and visual development
- have the ability to take a thorough paediatric history which encompasses the relevant developmental, visual, medical and educational issues
- be familiar with the accommodative-vergence system, the genesis of ametropia, the disorders of refraction, accommodation and vergence, and the assessment and management of these disorders
- be familiar with the aetiology, clinical presentation and treatment of amblyopia, comitant strabismus and commonly presenting incomitant strabismus
- have a knowledge of the epidemiology of eye disease in children, the assessment techniques available for examining visual function of children of all ages and an understanding varied management concepts of paediatric vision disorders
- have knowledge of the art of dispensing contact lens, low vision aids and referral to the surgeon or other specialists at the appropriate timing. .

### **Unit: I**

#### **Geriatric Optometry**

Structural , and morphological changes of eye in elderly    Physiological changes in eye in the course of aging.

Introduction to geriatric medicine – epidemiology , need for optometry care, systemic diseases (Hypertension, Atherosclerosis, coronary heart disease, congestive Heart failure, Cerebrovascular disease, Diabetes, COPD)

Optometric Examination of the Older Adult

### **Unit: II**

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

Contact lenses in elderly

Pharmacological aspects of aging

Low vision causes, management and rehabilitation in geriatrics.

Spectacle dispensing in elderly – Considerations of spectacle lenses and frames

### **Unit: III**

#### **Pediatric optometry**

Pediatric optometry

The Development of Eye and Vision

History taking Paediatric subjects

Assessment of visual acuity

Normal appearance, pathology and structural anomalies of

a) Orbit, Eye lids, Lacrimal system,

- b) Conjunctiva, Cornea, Sclera  
Anterior chamber, Uveal tract, Pupil
- c) Lens, vitreous, Fundus  
Oculomotor system

**Unit: IV**

Refractive Examination

Determining binocular status

Determining sensory motor adaptability

Compensatory treatment and remedial therapy for : Myopia, Pseudomyopia, Hyperopia, Astigmatism, Anisometropia, Amblyopia

Remedial and Compensatory treatment of Strabismus and Nystagmus

**Unit: V**

Paediatric eye disorders : Cataract, Retinopathy of Prematurity, Retinoblastoma, Neuromuscular conditions (myotonic dystrophy, mitochondrial cytopathy), and Genetics

Anterior segment dysgenesis, Aniridia, Microphthalmos, Coloboma, Albinism

Spectacle dispensing for children

Paediatric contact lenses

Low vision assessment in children

**Text books :**

1. A.J. ROSSENBLOOM Jr & M.W.MORGAN: Vision and Aging, Butterworth-Heinemann, Missouri, 2007
2. Pediatric Optometry - JEROME ROSNER, Butterworth, London 1982
3. Paediatric Optometry – William Harvey/ Bernard Gilmartin, Butterworth –Heinemann, 2004

**References:**

1. OP Sharma: Geriatric Care – A textbook of geriatrics and Gerontology, viva books, New Delhi, 2005
2. VS Natarajan: An update on Geriatrics, Sakthi Pathipagam, Chennai, 1998
3. DE Rosenblatt, VS Natarajan: Primer on geriatric Care A clinical approach to the older patient, Printers Castle, Cochin, 2002
4. Binocular Vision and Ocular Motility - VON NOORDEN G K Burian Von Noorden's, 2<sup>nd</sup> Ed., C.V.Mosby Co. St. Louis, 1980.
5. Assessing Children's Vision. By Susan J Leat, Rosalyn H Shute, Carol A Westall.45 Oxford: Butterworth-Heinemann, 1999.
6. Clinical pediatric optometry. LJ Press, BD Moore, Butterworth- Heinemann, 1993

## **SEMESTER VI**

### **CORE PRACTICAL III – CONTACT LENS & LOW VISION AID**

1. Pre fitting evaluation
2. RGP CL insertion & Removal
3. Fitting assessment
4. Over refraction
5. Follow up examination
6. SCL insertion & Removal
7. Fitting assessment
8. Over refraction
9. Follow-up Examination
10. Toric contact lens fitting and assessment
11. Cosmetic contact lens fitting and assessment
12. Attending in low vision care clinic and history taking.
13. Determining the type of telescope and its magnification (Direct comparison method & calculated method)
14. Determining the change in field of view with different magnification and different eye to lens distances with telescopes and magnifiers.
15. Inducing visual impairment and prescribing magnification.
16. Determining reading speed with different types of low vision aids with same magnification.
17. Determining reading speed with a low vision aid of different magnifications.

### **ELECTIVE 1-A**

## **NUTRITION**

**Course Description:** This course covers the basic aspects of Nutrition for good health. It also includes nutrients and nutrient derivatives relevant to ocular health, nutrition deficiency and ocular disease, Nutrition and ocular aging, and contraindications, adverse reactions and ocular nutritional supplements.

**Course Objective:** At the end of the course student would have gained the knowledge of the following:

- Balanced diet.
- Protein, carbohydrates, vitamins, Minerals, carotenoids and eye.
- Nutrition and Ocular aging
- Adverse effects of ocular nutritional supplements

**Unit: I**

Introduction to Nutrition and Food Science, Food Groups and Food Pyramid  
Balanced diet for different age groups, Recommended dietary Allowances  
Assessment of Nutritional Status.

**Unit: II**

Energy – Units, Metabolisms, Energy expenditure, and Energy imbalance.  
Digestion, absorption and transport of Food  
Proteins and eye

**Unit: III**

Lipids and eye  
Carbohydrates and eye  
Vitamins and eye

**Unit: IV**

Minerals and trace elements and eye  
Carotenoids and eye  
Oxidative stress and the eye

**Unit: V**

Vitamin A, C and E deficiency  
Nutrition and ocular aging  
Contraindications, Adverse reactions and ocular nutritional supplements

**Text books:**

- M Swaminathan: Hand book of Food and Nutrition, fifth edition, Bangalore printing & publishing Co.Ltd, Bangalore,2004
- C Gopalan, BV Rama Sastri, SC Balasubramanian: Nutritive Value of Indian Foods , National Institute of Nutrition, ICMR, Hyderabad,2004
- Frank Eperjesi & Stephen Beatty: Nutrition and the Eye A practical Approach,

**ELECTIVE 2-A  
COMMUNITY OPTOMETRY**

**Course Description:** Introduction to the foundation and basic sciences of public health optometry with an emphasis on the epidemiology of vision problems especially focused on Indian scenario.

**Course Objectives:** At the end of the course students will be be knowledgeable in the following areas:

- Community based eye care in India.
- Prevalence of various eye diseases
- Developing Information Education Communication materials on eye and vision care for the benefit of the public
- Organize health education programmes in the community
- Vision screening for various eye diseases in the community and for different age groups.

**Unit: I**

Public Health Optometry: Concepts and implementation  
Dimensions, determinants and indicators of health  
Levels of disease prevention and levels of health care patterns

**Unit: II**

Epidemiology of blindness – Defining blindness and visual impairment  
Eye in primary health care  
Contrasting between Clinical and community health programs

**Unit: III**

Community Eye Care Programs  
Community based rehabilitation programs  
Nutritional Blindness with reference to Vitamin A deficiency  
Vision 2020: The Right to Sight

**Unit: IV**

Screening for eye diseases  
National and International health agencies, NPCB  
Role of an optometrist in Public Health  
Organization and Management of Eye Care Programs – Service Delivery models  
Health manpower and planning & Health Economics

**Unit: V**

Evaluation and assessment of health programmes  
Optometrists role in school eye health programmes  
Basics of Tele Optometry and its application in Public Health  
Information, Education and Communication for Eye Care programs

**Text books:**

- GVS Murthy, S K Gupta, D Bachani: The principles and practice of community Ophthalmology, National programme for control of blindness, New Delhi, 2002
- Newcomb RD, Jolley JL : Public Health and Community Optometry, Charles C Thomas Publisher, Illinois, 1980
- K Park: Park's Text Book of Preventive and Social Medicine, 19th edition, Banarsidas Bhanot publishers, Jabalpur, 2007

**Reference books:**

1. MC Gupta, Mahajan BK, Murthy GVS, 3<sup>rd</sup> edition. Text Book of Community Medicine, Jaypee Brothers, New Delhi, 2002

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