B. Sc – Optometry

HINDUSTAN INSTITUTE OF TECHNOLOGY AND SCIENCE, CHENNAI

CURRICULUM

HINDUSTAN
INSTITUTE OF TECHNOLOGY & SCIENCE
(DEEMED TO BE UNIVERSITY)

Learning Objectives: At the completion of this course, the student should –

1. Be able to develop skills to provide comprehensive eye examination

    a. To acquire knowledge on ocular structures, its functions and pathological changes.
    b. To carry out Ophthalmic investigations.
    c. To impart knowledge with regard to common eye diseases
    d. To impart knowledge on treatment modalities from the perspective of counselling
    e. To acquire knowledge about the referral guidelines for ocular and systemic conditions

2. Be able to correct refractive error and provide spectacle prescription.

3. Be able to fit, evaluate, prescribe and dispense contact lenses for refractive correction and other ocular conditions.

4. Be able to assess the low vision and provide comprehensive low vision care.

5. Be able to have adequate knowledge to develop skill in manufacturing of spectacle lenses, contact lenses and low vision devices.

6. Be able to do complete binocular vision assessment, manage non-strabismic binocular vision anomalies and refer condition which warrants surgery.

7. Be able to assess the visual demands for various occupations and match it to the Visual capabilities. Also be able to advice on eye safety wear for various occupations.

8. Have knowledge and skill for early detection of various ocular conditions and pathologies – Refractive error, Strabismus, Cataract, Diabetic retinopathy, Glaucoma etc.

9. Have knowledge regarding organizations of eye banks and preservation of ocular tissues.

10. Have knowledge on sensory substitution and other rehabilitation measures for totally visually challenged.

11. Have knowledge of counselling on visual/ocular hygiene, nutritional and environmental modifications

Learning Outcomes:

1. Optometrist will work independently or in conjunction with other eye/health care professionals.

2. The optometrist will be knowledgeable, skilful and analytical in diagnosis, treatment planning, management of visual defects & impairments and in co-managements of ocular conditions.

3. The optometrist can work in hospitals (both private and public sectors), optical Outlets and/or work as independent practitioner.

4. The course will lead to a basic degree in optometry, which is considered as the minimum essential for statutory registration of optometrists in countries where optometry has been brought under legislation.

5. Undertake public health optometry projects and vision screening eye camps in schools, colleges, urban slums, rural areas and also practice occupational optometry in industries.

6. Public education on ocular hygiene and related nutritional and environmental counselling.

7. Offer a helping hand and or efficiently manage and successfully run any ophthalmic clinic, optometry department in hospitals, optical shops, and offer product expertise in ophthalmic industry & trade.

B.Sc Optometry

First Year

First Semester

1. General Anatomy
2. General Physiology
3. General Biochemistry
4. General Pathology and Microbiology
5. Physical Optics – I
6. Geometrical Optics – I
7. English & Communication

Paper 1: General Anatomy

COURSE PLAN:

Unit I	:	Introduction to Human Anatomy - Anatomy : Definition and its relevance in medicine and Optometry, Planes of the body, relationship of structures, Organ System.
Unit II	:	Skeleton System
Unit III	:	Tissues of the Body – Epithelium, connective tissue, bond and cartilage, Embryology, histology, different types of each of them, types of cells, cellular differentiation and different tissues.
Unit IV	:	Muscles – Different types of muscles, their functional differentiation, their relationship with different structures, their neural supply
Unit V	:	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 VI	:	Skin and appendages – Embryology, anatomical differences in different areas, functional and protective variations, innervations, relationship with muscles and nerves.
Unit VII	:	Lymphatic System - Embryology, functions, relationship with blood vessels and organs.
Unit VIII	:	Glands - Embryology, different types of glands (exocrine and endocrine), functional differences, neural control of glands
Unit IX	:	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.

Unit X : Brain and Cranial nerves - Major parts of Brain, Protective coverings of the Brain, Cerebrospinal Fluid, Brain stem, Cerebellum, Diencephalon, Cerebrum, Cranial nerves.

PRACTICAL (15 Hours): Practical demonstration of each organ using specimen. If specimen for certain organs are not available, then videos can be shown to make the student understand the anatomic structures.

TEXT BOOKS:-

1. MARIANO S.H. DIFIORE: Atlas of Human Histology, 5th Ed. 1981, Lea and Feliger.
2. G.J. TORTORA & N.P ANAGNOSTAKOS: Principles of Anatomy and Physiology. (recent edition)
3. B.D. CHAURASIA: Handbook of General Anatomy, 2nd Ed., CBS Publishers and Distributors, New Delhi - 110 032.

REFERENCE BOOKS:-

1. PETER L. WILLIAMS AND ROGER WARWICK: - GRAY'S ANATOMY – DESCRIPTIVE AND APPLIED, 36TH ED., 1980, CHURCHILL LIVINGSTONE.
2. T.S. RANGANATHAN: TEXT BOOK OF HUMAN ANATOMY, 1982, S. CHAND & CO., NEW DELHI 110 055.
3. INDERBIR SINGH: HUMAN EMBRYOLOGY, 3RD ED., MACMILLAN INDIA, 1981.
4. R. KANAGASUNTHARAM, P. SIVANANDA-SINGHAM & A. KRISHNAMURTI: ANATOMY- REGIONAL,FUNCTIONAL, & CLINICAL, P.G. PUBLISHER, SINGAPORE 1987.

PREREQUISITES: Higher secondary level biology or remedial biology

Paper 2: General Physiology

COURSE PLAN:

Unit I : Cell Stucture & Organisation - 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.

Unit II : 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 Osmotic stability.

Reticulo endothelial system

- Spleen
- lymphatic tissue
- Thymus
- bone marrow
- immune system
- cellular
- Humoral
- Autoimmune

Unit III : Digestion – General arrangement

Salivary digestion – function & 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.

Unit V : 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 VI : Reproduction - Male reproductive system –control & regulation Female reproductive system –uterus –ovaries –menstrual cycle – regulation pregnancy & delivery –breast –family planning.

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

Unit VIII: Circulation – General Principles - Heart: myocardium – innervation – 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.

Unit IX : Environmental Physiology - Body temperature regulation (including skin Physiology). Exposure to low and high atmospheric pressure.

Unit X : 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.

Unit XI : Special Senses – (Elementary) Olfaction –Taste –Hearing.

PRACTICAL (Total: 15 hours)

1. Blood test: Microscope, Haemocytometer, Blood, RBC count, Hb, WBC count, Differential Count, Haematocrit demonstration, ESR, Blood group & Rh. type, Bleeding time and clotting time
2. Digestion: Test salivary digestions
3. Excretion: Examination of Urine, Specific gravity, Albumin, Sugar, Microscopic examination for cells and cysts
4. Endocrinology and Reproduction: Dry experiments in the form of cases showing different endocrine disorders.
5. Respiratory System: Clinical examination of respiratory system, Spirometry, Breath holding test
6. Cardio Vascular System: Clinical examination of circulatory system, Measurement of blood pressure and pulse rate, Effect of exercise on blood pressure and pulse rate
7. Central Nervous System: Sensory system, Motor system, Cranial system, Superficial and deep reflexes

TEXT BOOKS:-

1. L Prakasam reddy, Fundamentals of Medical Physiology, 4th Edition, Paras medical Publisher, Hyderabad, 2008
2. Sujit K. Chaudhuri, Concise Medical Physiology, 6th edition, New Central Book Agency, Kolkata, 2008

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, 8th edition, saunders company, Japan,
3. G J Tortora, B Derrickson: Principles of anatomy & physiology,11th edition, Harper & Row Publishers, New York
4. John Wiley & Sons Inc, New Jersey, 2007

Paper 3: General Biochemistry

COURSE PLAN:

Unit I	:	Carbohydrates: Glucose; fructose; galactose; lactose; sucrose; starch and glycogen (properties and tests, Structure and function)
Unit II	:	Proteins - Amino acids, peptides, and proteins (general properties & tests with a few examples like glycine, trytophan, glutathione, albumin, hemoglobin, collagen)
Unit III	:	Lipids - Fatty acids, saturated and unsaturated, cholesterol and triacyglycerol, phospholipids and plasma membrane.
Unit IV	:	Vitamins - General with emphasis on A,B2, C, E and inositol (requirements, assimilation and properties).
Unit V	:	Minerals - Na, K, Ca, P, Fe, Cu and Se.(requirements, availability and properties)

PRACTICAL (Total: 15 hours)

1. Reactions of monosaccharides, disaccharides and starch: Glucose Fructose
   Galactose Maltose, lactose
   Sucrose Starch

2. Analysis of Unknown Sugars
   Estimation:
   Photometry Biofluid of choice – blood, plasma, serum
   Standard graphs Glucose
   Proteins Urea
   Creatinine Bilirubin

TEXT BOOK : S. Ramakrishnan: Essentials of biochemistry and ocular biochemistry, Annamalai University Publications, Chidambaram, India, 1992

REFERENCE BOOKS:

1. S. Ramakrishnan, K G Prasannan and R Rajan: Text book of Medical Biochemistry, Orient Longman, Madras, 1990
2. D.R. Whikehart: Biochemistryof the Eye, 2nd edition, Butterworth Heinemann, Pennsylvania, 2003

Paper 4: General Pathology and Microbiology

COURSE PLAN:

General Pathology

Unit 1 : Definitions of various terms, Milestones in Pathology, Divisions under Pathology.

Unit 2 : Structure and function of immune system – structure and function of Thymus, spleen and red bone marrow-Immunity and its types, cells involved in immune system. Humoral immunity – theories of antibody formation. Non specific immunity, antibody mediated immunity, specific immunity, cell mediated immunity, active and passive immunity

Unit 3 : Inflammation, Types of inflammation, the acute inflammatory reaction – changes in acute inflammation, changes in the calibre of blood vessels, changes in blood flow, exudation, types of exudates, Local sequelae of acute inflammation, the chemical mediators of acute Inflammation and Repair, Role of mast cells, Role of platelets in inflammation, Chronic inflammation – cause, classification, general feature.

Unit 4 : Cell death – Necrosis, Types of necrosis, Apoptosis, programmed cell death, senescence, terms associated with growth-aplasia, metaplasia, dysplasia, neoplasia – types of neoplasia, hyperplasia, hypoplasis, atrophy, hypertrophy, hypotrophy, Circulatory disturbances – thrombosis, infarction, ischemia,hypoxia, embolism, Degeneration (calcification).

Unit 5 : Infection – sources of infection, transmission of organisms to the body, wound infections, wound healing, Immuno-pathogenesis – type I , type II, type III and IV hypersensitivity. Mechanism of auto immunity – Organ specific and non organ specific immune disease. The HLA system – histocompatibility complex. Pyogenic and bacterial infections

General Microbiology

Unit 1	:	Plant and animal cell structure, Difference between a Eukaryotic cell and a Prokaryotic cell.
Unit 2	:	Bacteria : Cell structure, classification and morphological basis, staining techniques : gram staining, Gram positive and Gram negative, spore staining, acid fast staining. Culture media and growth curve, modern methods in staining techniques, Bacterial growth : nutritional requirements. Bacterio static and Bacteriocidal agents, sterilization techniques, pasteurization, Introduction to Antibiotics.
Unit 3	:	Viral morphology, Viral genome and classification, viral replication, Herpes viruses, hepatitis viruses, miscellaneous viruses, Human immunodeficiency viruses.
Unit 4	:	Microbial growth and death, Laboratory culture, host pathogen interactions, antimicrobial chemotherapy, pathogenic mechanisms common to external ocular infections process.

Reference Books:

1. Text book of Pathology – Harsh Mohan
2. Text book of Microbiology – Ananthanarayan & Paniker.

Paper 5: Physical Optics – I

COURSE PLAN:

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.
Unit II	:	Sources of light; Electromagnetic Spectrum.
Unit III	:	Polarized light; linearly polarized light; and circularly polarized light.
Unit IV	:	Intensity of polarized light; Malus' Law; polarizers and analyzers. Methods of producing polarized light; Brewster's angle.
Unit V	:	Birefringence; ordinary and extraordinary rays.
Unit VI	:	Relationship between amplitude and intensity.
Unit VII	:	Coherence; interference; constructive interference, destructive interference; fringes; fringe width.
Unit VIII	:	Double slits, multiple slits, gratings.
Unit IX	:	Diffraction; diffraction by a circular aperture; Airy's disc
Unit X	:	Resolution of an instrument (telescope, for example); Raleigh's criterion
Unit XI	:	Scattering; Raleigh's scattering; Tyndall effect.
Unit XII	:	Fluorescence and Phosphorescence
Unit XIII	:	Basics of Lasers –coherence; population inversion; spontaneous emission; Einstein's

Unit XIV	:	Radiometry; solid angle; radiometric units; photopic and scotopic luminous efficiency and efficacy curves; photometric units
Unit XV	:	Inverse square law of photometry; Lambert's law.
Unit XVI	:	Other units of light measurement; retinal illumination; Trolands

PRACTICAL:

Each practical session could be evaluated for 10 marks and the total could be added to the final evaluations. These practical could be customized as per the university requirements and spaced apart conveniently. The practical to be done include the following:

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

TEXT BOOK:

Subrahmanyan N, BrijLal, 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.

Paper 6: Geometrical Optics – I

COURSE PLAN:

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.
Unit II	:	Wavefronts–spherical, elliptical and plane; Curvature and vergence; rays; Convergence and divergence in terms of rays and vergence; vergence at a Distance.
Unit III	:	Refractive index; its dependence on wavelength
Unit IV	:	Fermat's and Huygen's Principle –Derivation of laws of reflection and Refraction (Snell's law) from these principles.
Unit V	:	Plane mirrors –height of the mirror; rotation of the mirror
Unit VI	:	Reflection by a spherical mirror –paraxial approximation; sign convention; derivation of vergence equation.
Unit VII	:	Imaging by concave mirror, convex mirror
Unit VII	:	Reflectivity; transmissivity; Snell's Law, Refraction at a plane surface.
Unit IX	:	Glass slab; displacement without deviation; displacement without dispersion
Unit X	:	Thick prisms; angle of prism; deviation produced by a prism; refractive index of the prism.
Unit XI	:	Prisms; angular dispersion; dispersive power; Abbe's number.

Unit XII	:	Definition of crown and flint glasses; materials of high refractive index.
Unit XIII	:	Thin prism –definition; definition of Prism diopter; deviation produced by a thin prism; it dependence on refractive index.
Unit XIV	:	Refraction by a spherical surface; sign convention; introduction to spherical aberration using image formed by a spherical surface of a distance object; sag formula
Unit XV	:	Paraxial approximation; derivation of vergence equation
Unit XVI	:	Imaging by a positive powered surface and negative powered surface
Unit XVII	:	Vergence at a distance formula; effectivity of a refracting surface.
Unit XVIII	:	Definition of a lens as a combination of two surfaces; different types of lens shapes.
Unit XIX	:	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 XX	:	Newton's formula; linear magnification; angular Magnification.
Unit XXI	:	Nodal Planes
Unit XXII	:	Thin lens as a special case of thick lens; review of sign convention
Unit XXIII	:	Imaging by a thin convex lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions.

Unit XXIV	:	Imaging by a thin concave lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions.
Unit XXV	:	Prentice's Rule
Unit XXVI	:	System of two thin lenses; review of front and back vertex powers and Equivalent power, review of six cardinal points.
Unit XXVII	:	System of more than two thin lenses; calculation of equivalent power using magnification formula.

PRACTICAL

1. Thick Prism – determination of prism angle and dispersive power; calculation of the refractive index
2. Thin Prism – measurement of deviation; calculation of the prism diopter
3. Image formation by spherical mirrors
4. Convex lens - power determination using lens gauge, power determination using distant object method; power determination using the vergence formula
5. Concave lens – in combination with a convex lens – power determination.

TEXT BOOK:

1. Tunnacliffe A. H, Hirst J. G, Optics, The association of British Dispensing Opticians, London, U.K., 1990.
2. Pedrotti L. S, Pedrotti Sr. F. L, Optics and Vision, Prentice Hall, New Jersey, USA, 1998.

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, NewYork, USA, 2002.

Paper 7: English & Communication

COURSE PLAN:

Unit I	:	Basics of Grammar – Vocabulary - Synonyms, Antonyms, Prefix and Suffix, Homonyms, Analogies and Portmanteau words.
Unit II	:	Basics of Grammar – Part II - Active, Passive, Direct and Indirect speech, Prepositions, Conjunctions and Euphemisms.
Unit III	:	Writing Skills - Letter Writing, Email, Essay, Articles, Memos, one word substitutes, note making and Comprehension.
Unit IV	:	Writing and Reading - Summary writing, Creative writing, newspaper reading.
Unit V	:	Practical Exercise - Formal speech, Phonetics, semantics and pronunciation.

Communication

Introduction

- Communication process.
- Elements of communication
- Barriers of communication and how to overcome them.
- Nuances for communicating with patients and their attenders in hospitals

Speaking

- Importance of speaking efficiently
- Voice culture.
- Preparation of speech. Secrets of good delivery
- Audience psychology, handling

- Presentation skills.
- Individual feedback for each student
- Conference/Interview technique

Listening

- Importance of listening
- Self-assessment
- Action plan execution.
- Barriers in listening.
- Good and persuasive listening

Reading

- What is efficient and fast reading
- Awareness of existing reading habits
- Tested techniques for improving speed
- Improving concentration and comprehension through systematic study.

Non Verbal Communication

- Basics of non-verbal communication
- Rapport building skills using neuro- linguistic programming (NLP)

Communication in Optometry practice

TEXT BOOK:

1. Graham Lock, Functional English Grammar: Introduction to second Language
   Teachers.Cambridge University Press, New York, 1996.
2. Gwen Van Servellen. Communication for Health care professionals: Concepts, practice and evidence, Jones & Bartlett Publications , USA, 2009

REFERENCE BOOKS: Faculty may decide.

Second Semester

1. Ocular Anatomy
2. Ocular Physiology
3. Ocular Biochemistry
4. Geometrical Optics – II
5. Ocular Pathology and Microbiology
6. Nutrition
7. Hospital Procedure
8. Computers for Optometrists

Paper 1: Ocular Anatomy

COURSE PLAN:

1. Central nervous system:
   1.1 Spinal cord and brain stem
   1.2 Cerebellum
   1.3 Cerebrum.
2. Orbit
   2.1 Eye
   2.2 Sclera
   2.3 Cornea
   2.4 Choroid
   2.5 Ciliary body
   2.6 Iris
   2.7 Retina
3. Refractory media-
   3.1 Aqueous humor
   3.2 Anterior chamber
   3.3 Posterior chamber
   3.4 Lens
   3.5 Vitreous body
4. Eyelids
5. Conjunctiva
6. Embryology

PRACTICAL (Total: 15 hours)

1. Eye: Practical dissection of bull's eye
2. Orbit: Practical demonstration of orbital structures.

TEXT BOOK: L A Remington: Clinical Anatomy of the Visual System, Second edition, Elsevier
Butterworth Heinemann, Missouri, USA, 2005.

REFERENCE BOOKS: AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006

Paper 2: Ocular Physiology

COURSE PLAN:

1. Protective mechanisms in the eye: Eye lids and lacrimation, description of the globe.
2. Extrinsic eye muscles, their actions and control of their movements
3. Coats of the eye ball
4. Cornea
5. Aqueous humor and vitreous: Intra ocular pressure
6. Iris and pupil
7. Crystalline lens and accommodation – presbyopia
8. Retina – structure and functions
9. Vision – general aspects of sensation
10. Pigments of the eye and photochemistry
11. The visual stimulus, refractive errors
12. Visual acuity, Vernier acuity and principle of measurement
13. Visual perception – Binocular vision, stereoscopic vision, optical illusions
14. Visual pathway, central and cerebral connections
15. Colour vision and colour defects. Theories and diagnostic tests
16. Introduction to electro physiology
17. Scotopic and Photopic vision
18. Color vision, Color mixing
19. Mechanism of accommodation
20. Retinal sensitivity and Visibility
21. Receptive stimulation and flicker
22. Ocular, movements and saccades
23. Visual perception and adaptation
24. Introduction to visual psychology (Psychophysics)

PRACTICAL:

1. Lid movements
2. Tests for lacrimation tests
3. Extra ocular movements
4. Break up time
5. Pupillary reflexes
6. Applanation tonometry
7. Schiotz tonometry.
8. Measurement of accommodation and convergence
9. Visual acuity measurement.
10. Direct ophthalmoscopy
11. Indirect ophthalmoscopy
12. Retinoscopy
13. Light and dark adaptation.
14. Binocular vision(Stereopsis)

TEXT BOOK: AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006

REFERENCE BOOKS:

1. RD Ravindran: Physiology of the eye, Arvind eye hospitals, Pondicherry, 2001
2. PL Kaufman, A Alm: Adler's Physiology of the eye clinical application, 10th edition, Mosby, 2002

Paper 3: Ocular Biochemistry

COURSE PLAN:

1. Hormones basic concepts in metabolic regulation with examples say insulin.

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

3. Ocular Biochemistry: Various aspects of the eye, viz., cornea, lens aqueous, vitreous, retina and pigment rhodopsin. (The important chemicals in each and their roles.) Immunology of anterior segment

3. Technique: Colloidal state, sol. Gel. Emulsion, dialysis, electrophoresis. pH buffers mode of action, molar and percentage solutions, photometer, colorimeter and spectrometry. Radio isotopes: application in medicine and basic research.

4. Clinical Biochemistry: Blood sugar, urea, creatinine and bilirubin significance of their estimation.

PRACTICAL (Total: 15 hours)

1. Quantitative analysis
2. Abnormal constituents in urine, sugar proteins, ketones, blood and bile salts.
3. Techniques of detection of abnormal constituents of urine:
4. Electrophoresis
   - 4.1 Chromatography
   - 4.2 Preparation of normal, molar and percentage solutions.
   - 4.3 Preparation of buffers, pH determination
5. Demonstration
   - 5.1 Estimation of blood cholesterol
   - 5.2 Estimation of alkaline phosphatase.
   - 5.3 Salivary amylase (effect of ph, etc)

TEXT BOOK: S. Ramakrishnan: Essentials of biochemistry and ocular biochemistry, Annamalai University Publiations, Chidambaram, India, 1992

REFERENCE BOOKS:

1. S. Ramakrishnan, K G Prasannan and R Rajan: Text book of Medical Biochemistry, Orient Longman, Madras, 1990
2. D R Whikehart: Biochemistry of the Eye, 2nd edition, Butterworth Heinemann, Pennsylvania, 2003

Paper 4: Geometrical Optics – II

COURSE PLAN:

1. Vergence and vergence techniques revised.
2. Gullstrand's schematic eyes, visual acuity, Stile Crawford
3. Emmetropia and ametropia
4. Blur retinal Imaginary
5. Correction of spherical ammetropia, vertex distance and effective power, dioptric power of the spectacle, to calculate the dioptoric power, angular magnification of spectacles in aphakic
6. Thin lens model of the eye –angular magnification –spectacle and relative Spectacle magnification.
7. Aperture stops- entrance and exit pupils.
8. Astigmatism. - To calculate the position of the line image in a sphero-cylindrical lens.
9. Accommodation –Accommodation formulae and calculations.
10. Presbyopia- Spectacle magnification, angular magnification of spectacle lens, near point, calculation of add, depth of field.
11. Spatial distribution of optical information- modulation transfer functions- Spatial filtering- applications.
12. Visual optics of aphakia and pseudophakia.

PRACTICAL: Total: 15 hours

1. Construction of a tabletop telescope – all three types of telescopes.
2. Construction of a tabletop microscope
3. Imaging by a cylindrical lens – relationship between cylinder axis and image orientation.
4. 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
5. 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

TEXT BOOK:

1. Tunnacliffe A. H, Hirst J. G, Optics, The association of British Dispensing Opticians, London, U.K., 1990.
2. Pedrotti L. S, Pedrotti Sr. F. L, Optics and Vision, Prentice Hall, New Jersey, USA, 1998.

REFERENCE BOOKS:

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2. Schwartz S. H. Geometrical and Visual Optics: A Clinical Introduction, McGraw-Hill, New York, USA, 2002.

Paper 5: Ocular Pathology and Microbiology

COURSE PLAN:

PATHOLOGY

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

MICROBIOLOGY

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

Reference Books:

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

Paper 6: Nutrition

COURSE PLAN:

1. Introduction.
   - 1.1 History of Nutrition
   - 1.2 Nutrition as a science
   - 1.3 Food groups, RDA
   - 1.4 Balanced diet, diet planning.
   - 1.5 Assessment of nutritional status
2. Energy
   - 2.1 Units of energy.
   - 2.2 Measurements of energy and value of food
   - 2.3 Energy expenditure.
   - 2.4 Total energy/calorie requirement for different age groups and diseases.
   - 2.5 Satiety value
   - 2.6 Energy imbalance- obesity, starvation.
   - 2.7 Limitations of the daily food guide.
3. Proteins
   - 3.1 Sources and functions
   - 3.2 Essential and non- essential amino- acids.
   - 3.3 Incomplete and complete proteins
   - 3.4 Supplementary foods.
   - 3.5 PEM and the eye
   - 3.6 Nitrogen balance
   - 3.7 Changes in protein requirement.
4. Fats
   - 4.1 Sources and functions
   - 4.2 Essential fatty acids
   - 4.3 Excess and deficiency
   - 4.4 Lipids and the eye.
   - 4.5 Hyperlipidemia, heart diseases, atherosclerosis.

5. Minerals
   5.1 General functions and sources
   5.2 Macro and micro minerals associated with the eye.
   5.3 Deficiencies and excess –ophthalmic complications (e.g. iron, calcium, iodine etc.)
6. Vitamins
   6.1 General functions, and food sources
   6.2 Vitamin deficiencies and associated eye disorders with particular emphasis to Vitamin A
   6.3 Promoting sound habits in pregnancy, lactation and infancy.
   6.4 Nutrient with antioxidant.
   6.5 Properties
   6.6 Digestion of Proteins, carbohydrates & lipids
7. Essential amino acids.
8. Miscellaneous
   8.1 Measles and associated eye disorders, low birth weight

TEXT BOOK:

1. M Swaminathan: Hand book of Food and Nutrition, fifth edition, Bangalore printing & publishing Co.Ltd, Bangalore, 2004
2. C Gopalan, BV Rama Sastri, SC Balasubramanian: Nutritive Value of Indian Foods, National Institute of Nutrition, ICMR, Hyderabad,2004
3. Frank Eperjesi & Stephen Beatty: Nutrition and the Eye A practical Approach, Elsevier Butterworth- Heinemann, USA, 2006

REFERENCE BOOKS:

No recommendation. It is left to the faculty.

Paper 7: Hospital Procedure

COURSE PLAN:

1. Accounts Department
2. Laboratory
3. Bio-Medical Engineering Department
4. Medical Records Department
5. Correspondence
6. Stores
7. House Keeping
8. Reception
9. IT / Computer Department
10. Diagonostic Equipment labs
11. Human Resources Department
12. Medical social work Department
13. Message centre
14. Patients Relation Department
15. Biometry Department
16. Surgery fixing centre

Paper 8: Computers for Optometrists

COURSE PLAN:

UNIT 1: Introduction to MS WORD

Starting MS Word, Document window, Components of Document Window, Creating Document, Opening Document, Locating Documents, Saving Document, Protecting Documents, Manipulating Text, Editing text, Inserting text, Selecting text, Deleting and moving text, Copying text, Undoing / Redoing Text , Converting case, Drag and Drop feature, Getting Help with MS – WORD Formatting Document, Viewing Documents, Formatting Text, Formatting Paragraphs, Formatting Pages, Advanced Formatting features, Auto format, Headers and Footers, Inserting section break, Numbering the Pages, Desktop Publishing features, Proof Reading a Document, Set language Option, Spell Check for a Document, Using the Auto Correct feature, Using the Auto Text feature, Use find and Replace Option, Previewing Documents, Printing Documents ADVANCED FEATURES IN WORD - Mail Merge, Creating Main Document, Specifying the Data Source, Merging the Data file and the Main Document, Table, Creating a Table, Converting a Table to Text, Editing a Table

UNIT 2: Introduction to MS EXCEL

Starting Excel, Excel Worksheet, Navigating Worksheets, Entering Data, Entering Text, Entering Numbers, Entering Date and Time, Entering Formulas, Excel Functions, Selecting Cell Ranges, Creating Text, Number and Date series, Creating Text series, Using the Autofill feature , Editing Worksheet Data, Clearing a cell, Copying Data, Cut and paste, Inserting and Deleting Rows, Columns and Cell Ranges, Worksheet Formatting, Numeric Formatting, Custom formats, Date and Time formats , Changing Column width and Row Height, Auto formats, Alignment Data, Horizontal Control, Orienting Text, Controlling text within a cell, Applying Borders, Working with Graphic Objects, Adding Graphic Objects to a Work sheet, Selecting, Resizing Objects, Creating a Text Box

UNIT 3: Starting Power Point

Power Point Presentation Screen, Rulers and Guides, Creating a New Presentation, Creating a Presentation using a Template, Creating a Blank Presentation, Opening and Closing an Existing Presentation, Inserting and Deleting Slides in a Presentation, Viewing a Presentation Entering and Editing text, Enhancing Text Presentation, Working with Colour and Line style, Adding Headers and Footers, Advanced features of Microsoft Power Point, Inserting Objects in a Presentation, Adding Clip art Pictures, Auto Clip art, Adding Graphic Objects, Drawing Rectangles and Ovals, Using Auto Shapes, Drawing Lines and Arcs,

Drawing Text Boxes, Drawing Freeform Shape, Editing Freeform shapes, Adding Movies and Sounds in a Power Point Presentation, Inserting a Word table or an Excel Work sheet, Inserting other Objects, Moving and Copying Objects, Resizing and Scaling an object, Checking slides, Choosing a set-up for Presentation Components, Printing Presentation Components, Making settings in the Print Dialog Box, Printing Different kinds of Output, Setting up and Running a slide show on Screen, Setting Transition and slide timings, Automating a Slide show, Building slide Text, Interacting with Objects during a Presentation

UNIT – 4 Electronic Patient Records

Manual versus Computerized Record Keeping disadvantages of Manual Records, Advantages of Computerised Record-keeping, Medical Software, How should an ideal software be ? What features should the software contain? Out Patient Department features (OPD), Optical Outlet software, Financial Accounting software, Readymade versus custom made software, Internet and Ophthalmology

REFERENCE BOOKS :

1. Lele, Ramchandra, Computer in Medicine – Progress in Medical Informatics
2. Perry Greg, Windows 2000 in 24 hours.
3. Hutchinson, Computer, Communication, Information : A Users Introduction, Tata McGraw Hill Publications.
4. Crawford, Sharon, Chapter 14, Windows 98 – No experience required

Third Semester

1. Visual Optics – I
2. Optometry Optics – I
3. Optometric Instruments
4. Ocular Disease – I
5. Clinical Examination of Visual System
6. General Pharmacology

Paper 1: Visual Optics - I

COURSE PLAN:

1. Review of Geometrical Optics: Vergence and power
   - 1.1 Conjugacy, object space and image space
   - 1.2 Sign convention
   - 1.3 Spherical refracting surface
   - 1.4 Spherical mirror; catoptric power
   - 1.5 Cardinal Points
   - 1.6 Magnification
   - 1.7 Light and Visual function
   - 1.8 Clinical relevance of: Flourescence, Interference, Diffraction, Polarization, Bi-refringence, Dichroism

2. Optics of Ocular Structure
   - 2.1 Cornea and aqueous
   - 2.2 Crystalline lens
   - 2.3 Vitreous
   - 2.4 Schematic and reduced eye

3. Measurements of Optical Constants of the Eye
   - 3.1 Corneal curvature and thickness
   - 3.2 Keratometry
   - 3.3 Curvature of the lens and ophthalmophakometry
   - 3.4 Axial and axis of the eye
   - 3.5 Basic Aspects of Vision.
     - 3.5.1 Visual Acuity
     - 3.5.2 Light and Dark Adaptation
     - 3.5.3 Color Vision
     - 3.5.4 Spatial and Temporal Resolution
     - 3.5.5 Science of Measuring visual performance and application to Clinical Optometry

4. Refractive anomalies and their causes
   - 4.1 Etiology of refractive anomalies
   - 4.2 Contributing variability and their ranges
   - 4.3 Populating distributions of anomalies.
   - 4.4 Optical component measurements
   - 4.5 Growth of the eye in relation to refractive errors

TEXT BOOK:

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

Paper 2: Optometric Optics - I

COURSE PLAN:

1. Introduction –Light, Mirror, Reflection, Refraction and Absorption
2. Prisms –Definition, properties, Refraction through prisms, Thickness difference, Base-apex notation, uses, nomenclature and units, Sign Conventions, Fresnel's prisms, rotary prisms
3. Lenses –Definition, units, terminology used to describe, form of lenses
4. Vertex distance and vertex power, Effectivity calculations
5. Lens shape, size and types i.e. Spherical, cylindrical and Sphero-cylindrical
6. Transpositions –Simple, Toric and Spherical equivalent
7. Prismatic effect, centration, decentration and Prentice rule, Prismatic effect of Plano- cylinder and Spherocylinderlenses
8. Spherometer & Sag formula, Edge thickness calculations
9. Magnification in high plus lenses, Minification in high minus lenses
10. Tilt induced power in spectacles
11. Aberration in Ophthalmic Lenses

TEXT BOOK:

Jalie M: The principles of Ophthalmic Lenses, The Association of Dispensing Opticians, London, 1994.

REFERENCE BOOKS:

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

Paper 3: Optometric Instruments

COURSE PLAN:

1. Refractive instruments
   - 1.1 Optotypes and MTF, Spatial Frequency
   - 1.2 Test charts standards.
   - 1.3 Choice of test charts
   - 1.4 Trial case lenses
   - 1.5 Refractor (phoropter) head units
   - 1.6 Optical considerations of refractor units
   - 1.7 Trial frame design
   - 1.8 Near vision difficulties with units and trial frames
   - 1.9 Retinoscope – types available
   - 1.10 Adjustment of Retinoscopes- special 1.10 features
   - 1.11 Objective optometers.
   - 1.12 Infrared optometer devices
   - 1.13 Projection charts
   - 1.14 Illumination of the consulting room
   - 1.15 Brightness acuity test
   - 1.16 Vision analyzer
   - 1.17 Pupilometer
   - 1.18 Potential Acuity Meter
   - 1.19 Abberometer

2. Ophthalmoscopes and related devices
   - 2.1 Design of ophthalmoscopes –
   - 2.2 Design of ophthalmoscopes- viewing
   - 2.3 Ophthalmoscope disc
   - 2.4 Filters for ophthalmoscopy
   - 2.5 Indirect ophthalmoscope

3. Lensometer, Lens gauges or clock
4. Slit lamp
5. Tonometers
6. Keratometer and corneal topography
7. Refractometer

8. Orthoptic Instruments (Synaptophore Only)
9. Color Vision Testing Devices
10. Fields of Vision And Screening Devices
11. Scans
12. ERG
13. New Instruments

TEXT BOOK: David Henson: Optometric Instrumentations, Butterworth-Heinnemann, UK, 1991

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

Paper 4: Ocular Disease – I

COURSE PLAN:

1. Orbit
   - 1.1 Applied Anatomy
   - 1.2 Proptosis (Classification, Causes, Investigations)
   - 1.3 Enophthalmos
   - 1.4 Developmental Anomalies (craniosynostosis, Craniofacial Dysostosis, Hypertelorism, Median facial cleft syndrome)
   - 1.5 Orbital Inflammations (Preseptal cellulites, Orbital cellulitis Orbital Periostitis, cavernous sinus Thrombosis)
   - 1.6 Grave's Ophthalmopathy
   - 1.7 Orbital tumors(Dermoids, capillary haemangioma, Optic nerve glioma)
   - 1.8 Orbital blowout fractures
   - 1.9 Orbital surgery (Orbitotomy)
   - 1.10 Orbital tumors
   - 1.11 Orbital trauma
   - 1.12 Approach to a patient with proptosis

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

3. Lacrimal System
   - 3.1 Applied Anatomy
   - 3.2 Tear Film
   - 3.3 The Dry Eye (Sjogren's Syndrome)
   - 3.4 The watering eye (Etiology, clinical evaluation)
   - 3.5 Dacryocystitis
   - 3.6 Swelling of the Lacrimal gland(Dacryoadenitis)

4. Conjunctiva
   - 4.1 Applied Anatomy
   - 4.2 Inflammations of conjunctiva (Infective conjunctivitis – bacterial, chlamydial, viral , Allergic conjunctivitis, Granulomatous conjunctivitis)
   - 4.3 Degenerative conditions(Pinguecula, Pterygium, Concretions)
   - 4.4 Symptomatic conditions(Hyperaemia, Chemosis, Ecchymosis, Xerosis, Discoloration)
   - 4.5 Cysts and Tumors

5. Cornea
   - 5.1 Applied Anatomy and Physiology
   - 5.2 Congenital Anomalies (Megalocornea, Microcornea, Cornea plana, Congenital cloudy cornea)
   - 5.3 Inflammations of the cornea (Topographical classifications: Ulcerative keratitis and Non ulcerative
   - 5.4 Etiological classifications: Infective, Allergic, Trophic, Traumatic, Idiopathic))
   - 5.5 Degenerations (classifications, Arcussenilis, Vogt's white limbal girdle, Hassal-henle bodies, Lipoid Keratopathy, Band shaped keratopathy, Salzmann's nodular degeneration, Droplet keratopathy, Pellucid Marginal degeneration)
   - 5.6 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)
   - 5.7 Keratoconus, Keratoglobus
   - 5.8 Corneal oedema, Corneal opacity, Corneal vascularisation
   - 5.9 Penetrating Keratoplasty

6. Uveal Tract and Sclera
   - 6.1 Applied Anatomy,
   - 6.2 Classification of uveitis
   - 6.3 Etiology
   - 6.4 Pathology
   - 6.5 Anterior Uveitis
   - 6.6 Posterior Uveitis
   - 6.7 Purulent Uveitis

6.8 Endophthalmitis
6.9 Panophthalmitis
6.10 Pars Planitis
6.11 Tumors of uveal tract(Melanoma)
6.12 Episcleritis and scleritis
6.13 Clinical examination of Uveitis and Scleritis

TEXT BOOK: A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007

REFERENCE BOOKS:

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

Paper 5: Clinical Examination of Visual System

COURSE PLAN:

1. History taking
2. Visual acuity estimation
3. Extra ocular motility, Cover teat, Alternating cover test
4. Hirschberg test, Modified Krimsky
5. Pupils Examination
6. Maddox Rod
7. Van Herrick
8. External examination of the eye, Lid Eversion
9. Schirmer's, TBUT, tear meniscus level, NITBUT (keratometer),
10. Color Vision
11. Stereopsis
12. Confrontation test
13. Photostress test
14. Slit lamp biomicroscopy
15. Ophthalmoscopy
16. Tonometry
17. ROPLAS
18. Amsler test
19. Contrast sensitivity function test
20. Saccades and pursuit test

TEXT BOOK: T Grosvenor: Primary Care Optometry, 5th edition, Butterworth –Heinneman, USA, 2007.

REFERENCE BOOKS:

1. A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international(p) Ltd. Publishers, New Delhi, 2007
2. D B. Elliott :Clinical Procedures in Primary Eye Care,3rd edition, Butterworth-Heinemann, 2007
3. Jack J. Kanski Clinical Ophthalmology: A Systematic Approach,6th edition, Butterworth- Heinemann, 2007

Paper 6: General Pharmacology

COURSE PLAN:

Unit I	-	General Pharmacology: Introduction & sources of drugs, Routes of drug administration, Pharmacokinetics (emphasis on ocular harmacokinetics), Pharmacodynamics & factors modifying drug actions
Unit II	-	Systemic Pharmacology: Autonomic nervous system: Drugs affecting papillary size and light reflex, Intraocular tension, Accommodation; Cardiovascular system: Anti- hypertensive sand drugs useful in Angina; Diuretics: Drugs used in ocular disorders; Central Nervous System: Alcohol, sedative hypnotics, General & local anaesthetics, Opioids & non-opioids; Chemotherapy : Introduction on general chemotherapy, Specific chemotherapy –Antiviral, antifungal, antibiotics; Hormones : Corticosteroids, Antidiabetics; Blood Coagulants
Unit III	-	Ocular Pharmacology: Ocular preparations, formulations and requirements of an ideal agent; Ocular Pharmacokinetics, methods of drug administration & Special drug delivery system; Ocular Toxicology
Unit IV	-	Diagnostic & Therapeutic applications of drugs used in Ophthalmology: Diagnostic Drugs & biological agents used in ocular surgery, Anaesthetics used in ophthalmic procedures, Anti-glaucoma drugs; Pharmacotherapy of ocular infections –Bacterial, viral, fungal & chlamydial; Drugs used in allergic, inflammatory& degenerative conditions of the eye; Immune modulators in Ophthalmic practice, Wetting agents & tear substitutes, Antioxidants

TEXT BOOK/REFERENCE BOOKS:

1. K D Tripathi: Essentials of Medical Pharmacology. 5th edition, Jaypee, New Delhi, 2004
2. Ashok Garg: Manual of Ocular Therapeutics, Jaypee, New Delhi, 1996
3. T J Zimmerman, K S Kooner : Text Book of Ocular Pharmacology, Lippincott-Raven, 1997

Fourth Semester

1. Visual Optics – II
2. Optometric Optics – II
3. Ocular Disease – II
4. Clinical Examination of Visual System – II
5. Ocular Pharmacology
6. Medical Psychology
7. Clinical Examination of Visual System - Practical

Paper 1: Visual Optics – II

COURSE PLAN:

1. Accommodation & Presbyopia
    - Far and near point of accommodation
    - Range and amplitude of accommodation
    - Mechanism of accommodation
    - Variation of accommodation with age
    - Anomalies of accommodation
    - Presbyopia
    - Hypermetropia and accommodation

2. Convergence:
    - Type, Measurement and Anomalies
    - Relationship between accommodation and convergence-AC/A ratio

3. Objective Refraction (Static & Dynamic)
    - Streak retinoscopy
    - Principle, Procedure, Difficulties and interpretation of findings
    - Transposition and spherical equivalent
    - Dynamic retinoscopy various methods
    - Radical retinoscopy and near retinoscopy
    - Cycloplegic refraction

4. Subjective Refraction:
    - Principle and fogging
    - Fixed astigmatic dial(Clock dial),Combination of fixed and rotator dial(Fan and block test),J.C.C
    - Duochrome test
        - Binocular balancing- alternate occlusion, prism dissociation, dissociate Duochrome balance, Borish dissociated fogging
        - Binocular refraction-Various techniques

5. Effective Power &Magnification :
    - Ocular refraction vs. Spectacle refraction
    - Spectacle magnification vs. Relative spectacle magnification
    - Axial vs. Refractive ammetropia, Knapp's law
    - Ocular accommodation vs. Spectacle accommodation
    - Retinal image blur-Depth of focus and depth of field

TEXT BOOK/REFERENCE BOOKS:

1. Theodore Grosvenor: Primary Care Optometry, 5th edition, Butterworth – Heinemann, 2007
2. Duke –Elder's practice of Refraction
3. AI Lens: Optics, Retinoscopy, and Refractometry: 2nd edition, SLACK Incorporated (p) Ltd, 2006
3. George K. Hans, Kenneth Cuiffreda: Models of the visual system, Kluwer Academic, NY, 2002
4. Leonard Werner, Leonard J. Press: Clinical Pearls in Refractive Care, Butterworth – Heinemann, 2002
5. David B. Elliot: Clinical Procedures in Primary Eye care, 3rd edition, Butterworth – Heinemann, 2007
6. WJ Benjamin : Borish's Clinical refraction, 2nd edition, Butterworth Heinemann Missouri, USA, 2006

Paper 2: Optometric Optics – II

COURSE PLAN:

1. Spectacle Lenses - II:
    - Manufacture of glass
    - Lens materials
    - Lens surfacing
    - Principle of surface generation and glass cements
    - Terminology used in Lens workshop
    - Lens properties
    - Lens quality
    - Faults in lens material
    - Faults on lens surface
    - Methods of Inspecting the quality of lenses
    - Safety standards for ophthalmic lenses (FDA, ANSI, ISI, Others)
2. Spectacle Frames:
    - Types and parts
    - Classification of spectacle frames-material, weight, temple position, Coloration
    - Frame construction
    - Frame selection
    - Size, shape, mounting and field of view of ophthalmic lenses
3. Tinted & Protective Lenses
    - Characteristics of tinted lenses Absorptive Glasses
    - Polarizing Filters, Photochromic & Reflecting filters
    - Safety lenses-Toughened lenses, Laminated Lenses, CR 39, Polycarbonate lenses
4. Multifocal Lenses:
    - Introduction, history and development, types
    - Bifocal lenses, Trifocal & Progressive addition lenses
5. Reflection from spectacle lens surface & lens coatings:
    - Reflection from spectacle lenses - ghost images -Reflections in bifocals at the dividing line
    - Antireflection coating, Mirror coating, Hard Multi Coating [HMC], Hydrophobic coating

6. Miscellaneous Spectacle:
    - Iseikonic lenses
    - Spectacle magnifiers
    - Recumbent prisms
    - Fresnel prism and lenses
    - Lenticular &Aspherical lenses
    - High Refractive index glasses

TEXT BOOK/REFERENCE BOOKS:

1. Jalie MO: Ophthalmic lens and Dispensing, 3rd edition, Butterworth – Heinemann, 2008
2. Troy E. Fannin, Theodore Grosvenor: Clinical Optics, 2nd edition, Butterworth – Heinemann, 1996
3. C W Brooks, IM Borish: System for Ophthalmic Dispensing, 3rd edition, Butterworth - Heinemann, 2007
4. Michael P Keating: Geometric, Phisical& Visual Optics, 2nd edition, Butterworth – Heinemann, 2002

Paper 3: Ocular Disease – II

COURSE PLAN:

1. 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 Detachement: Rhegmatogenous, Tractional, Exudative)
    - Retinablastoma
    - Diabetic retinopathy

2. 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

3. 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, Microsperophakia.

4. 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 Robetson pupil, Adie's tonic pupil)
    - Optic neuritis, Anterior Ischemic optic neuropathy, Pappilloedema, optic atrophy
    - Cortical blindness
    - Malingering
    - Nystagmus
    - Clinical examination

5. Glaucoma
    - Applied anatomy and physiology of anterior segment
    - Clinical Examination
    - Definitions and classification of glaucoma
    - Pathogenesis of glaucomatous ocular damage
    - Congenital glaucoma's
    - 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 Glaucoma's
    - Management : common medications, laser intervention and surgical techniques

TEXT BOOK: A K Khurana: Comprehensive Ophthalmology, 4th edition, New age International (p) Ltd. Publishers, New Delhi, 2007

REFERENCE BOOKS:

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

Paper 4: Clinical Examination of Visual System – II

COURSE PLAN:

1. History taking in detail
   General history, Past medical history, past ocular history, medical history, birth history, social history, drugs currently taken, history of allergies
2. Lensometry – Importance of checking PGP
3. Visual acuity testing – distance vision, near vision, colour vision, pinhole vision
4. Refractive conditions and their management
5. Refraction –
   Practice of Retinoscopy in
   a. Emmetropia
   b. Myopia correction – simple myopia, high myopia
   c. Hypermetropia
   d. Astigmatism – Regular, irregular, oblique
   e. Media opacities
   f. Strabismus and eccentric fixation
6. Cycloplegic Refraction
7. Subjective cross verification methods – Duochrome, JCC, Binocular Balancing
8. Prescription writing
9. Refraction by AutoRefractometers
10. Extraocular motility tests – EOM, Broad H testing
11. Cover tests – cover and uncover tests, alternate cover tests
12. Prism Bar Cover Test
13. Tests for Stereopsis
14. Slit Lamp Examination
    a. Examination of Eyelids, conjunctiva and sclera
    b. Examination of cornea
    c. Examination of iris, ciliary body and pupil
    d. Examination of lens
    e. Examination of Pupils

15. Examination of intra ocular pressure and examination of angle of anterior chamber
16. Examination of fundus (vitreous and disc),(choroids and retina)
17. Examination of Lacrimal system
18. Examination of the orbit
19. Macular function test
20. Neuro Ophthalmological examination

Reference Books:

1. Clinical Refraction by Borisch
2. Pediatric Optometry & Bioncular Vision by American Academy of Ophthalmology.

Paper 5: Ocular Pharmacology

COURSE PLAN:

Unit I	:	Ocular Pharmacology: Introduction & sources of drugs, Routes of drug administration, Pharmacokinetics (emphasis on ocular pharmacokinetics), Pharmacodynamics & factors modifying drug actions.
Unit II	:	Systemic Pharmacology: Autonomic nervous system: Drugs affecting papillary size and light reflex, Intraocular tension, Accommodation; Cardiovascular system: Anti- hypertensive sand drugs useful in Angina; Diuretics: Drugs used in ocular disorders; Central Nervous System: Alcohol, sedative hypnotics, General & local anaesthetics, Opioids & non-opioids; Chemotherapy : Introduction on general chemotherapy, Specific chemotherapy –Antiviral, antifungal, antibiotics Hormones : Corticosteroids, Antidiabetics; Blood Coagulants
Unit III	:	Ocular Pharmacology: Ocular preparations, formulations and requirements of an ideal agent; Ocular Pharmacokinetics, methods of drug administration & Special drug delivery system; Ocular Toxicology

Unit IV	:	Diagnostic & Therapeutic applications of drugs used in Ophthalmology: Diagnostic Drugs & biological agents used in ocular surgery, Anaesthetics used in ophthalmic procedures, Anti-glaucoma drugs;
Unit V	:	Pharmacotherapy of ocular infections –Bacterial, viral, fungal & chlamydial; Drugs used in allergic, inflammatory & degenerative conditions of the eye; Immune modulators in Ophthalmic practice, Ocular Lubricants, Wetting agents & tear substitutes, Antioxidants

TEXT BOOK/REFERENCE BOOKS:

1. K D Tripathi: Essentials of Medical Pharmacology. 5th edition, Jaypee, New Delhi, 2004
2. Ashok Garg: Manual of Ocular Therapeutics, Jaypee, New Delhi, 1996
3. T J Zimmerman, K S Kooner : Text Book of Ocular Pharmacology, Lippincott-Raven, 1997

Paper 6: Medical Psychology

COURSE PLAN:

1. Introduction to Psychology
2. Intelligence Learning, Memory, Personality, Motiviation
3. Body Integrity – one's body image
4. The patient in his Milen
5. The self-concept of the therapist, Therapist-patient relationship – some guidelines
6. Illness, its impact on the patient
7. Maladies of the age and their impact on the patient's own and others concept of his body image
8. Adapting changes in Vision
9. Why Medical Psychology demands commitment?
10. Transactional analysis

TEXT BOOK: Patricia Barkway. Psychology for health professionals, 2nd edition, Elsevier, 2013

REFERENCE BOOKS: Faculty may decide.

Paper 7: Clinical Examination of Visual system – Practical

COURSE PLAN:

Practical training of Paper IV to be conducted of during the CEVS practical session.

Fifth Semester

1. Contact Lens – I
2. Low Vision Care
3. Binocular Vision – I
4. Paediatric Optometry
5. Systemic Diseases and the eye
6. Research Methodology and Bio-statistics
7. Clinics – I

Paper 1: Contact Lens - I

COURSE PLAN:

1. Introduction to Contact lenses
   1.1 Definition
   1.2 Classification / Types

2. History of Contact Lenses

3. Optics of Contact Lenses
   3.1 Magnification & Visual field
   3.2 Accommodation & Convergence
   3.3 Back & Front Vertex Power / Vertex distance calculation

4. Review of Anatomy & Physiology of
   4.1 Tear film
   4.2 Cornea
   4.3 Lids & Conjunctiva

5. Introduction to CL materials
   5.1 Monomers, Polymers

6. Properties of CL materials
   6.1 Physiological (Dk, Ionicity, Water content)
   6.2 Physical (Elasticity, Tensile strength, Rigidity)
   6.3 Optical (Transmission, Refractive index)

7. Indications and contraindications
8. Parameters / Designs of Contact Lenses & Terminology
9. RGP Contact Lens materials
10. Manufacturing Rigid and Soft Contact Lenses – various methods
11. Pre-Fitting examination – steps, significance, recording of results
12. Correction of Astigmatism with RGP lens
13. Types of fit – Steep, Flat, Optimum – on spherical cornea with spherical lenses

14. Types of fit – Steep, Flat, Optimum – on Toric cornea with spherical lenses
15. Calculation and finalising Contact lens parameters
16. Ordering Rigid Contact Lenses – writing a prescription to the Laboratory
17. Checking and verifying Contact lenses from Laboratory
18. Modifications possible with Rigid lenses
19. Common Handling Instructions
    - 19.1 Insertion & Removal Techniques
    - 19.2 Do's and Dont's
20. Care and Maintenance of Rigid lenses
    - 20.1 Cleaning agents & Importance
    - 20.2 Rinsing agents & Importance
    - 20.3 Disinfecting agents & importance
    - 20.4 Lubricating & Enzymatic cleaners
21. Follow up visit examination
22. Complications of RGP lenses

PRACTICAL

1. Measurement of Ocular dimensions
2. Pupillary diameter and lid characteristics
3. Blink rate and TBUT
4. Schrimers test, Slit lamp examination of tear layer
5. Keratometry
6. Placido's disc
7. Soft Contact Lens fitting – Aspherical
8. Soft Contact Lens fitting – Lathecut lenses
9. Soft Contact Lens over refraction
10. Lens insertion and removal
11. Lens handling and cleaning
12. Examination of old soft Lens
13. RGP Lens fitting
14. RGP Lens Fit Assessment and fluorescein pattern

15. Special RGP fitting (Aphakia, pseudo phakia & Keratoconus)
16. RGP over refraction and Lens flexure
17. Examination of old RGP Lens
18. RGP Lens parameters
19. Slit lamp examination of Contact Lens wearers

TEXT BOOKS:

1. IACLE modules 1 - 10
2. CLAO Volumes 1, 2, 3
3. Anthony J. Phillips : Contact Lenses, 5thedition, Butterworth-Heinemann, 2006
4. Elisabeth A. W. Millis: Medical Contact Lens Practice, Butterworth-Heinemann, 2004
5. E S. Bennett ,V A Henry :Clinical manual of Contact Lenses, 3rd edition, Lippincott Williams and Wilkins, 2008

Paper 2: Low Vision Care

COURSE PLAN:

1. Definitions & classification of Low vision
2. Epidemiology of low vision
3. Model of low vision service
4. Pre-clinical evaluation of low vision patients – prognostic & psychological factors; psycho- social impact of low vision
5. Types of low vision aids – optical aids, non-optical aids & electronic devices
6. Optics of low vision aids
7. Clinical evaluation – assessment of visual acuity, visual field, selection of low vision aids, instruction & training
8. Pediatric Low Vision care
9. Low vision aids – dispensing & prescribing aspects
10. Visual rehabilitation & counseling
11. Legal aspects of Low vision in India
12. Case Analysis

PRACTICALS

1. Practical 1: Attending in low vision care clinic and history taking.
2. Practical 2:
   - 2.1 Determining the type of telescope and its magnification (Direct comparison method & calculated method)
   - 2.2 Determining the change in field of view with different magnification and different eye to lens distances with telescopes and magnifiers.
3. Practical 3:
   - 3.1 Inducing visual impairment and prescribing magnification.
   - 3.2 Determining reading speed with different types of low vision aids with same magnification.
   - 3.3 Determining reading speed with a low vision aid of different magnifications.

TEXT BOOKS:

1. Christine Dickinson: Low Vision: Principles and Practice Low vision care, 4th edition, Butterworth-Heinemann, 1998
2. Sarika G, Sailaja MVSE Vaithilingam: practice of Low vision –A guide book, Medical Research Foundation, 2015.

REFERENCE BOOKS:

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

Paper 3: Binocular Vision - I

COURSE PLAN:

1. Binocular Vision and Space perception.
   - 1.1 Relative subjective visual direction.
   - 1.2 Retino motor value
   - 1.3 Grades of BSV
   - 1.4 SMP and Cyclopean Eye
   - 1.5 Correspondence,
   - 1.6 Fusion, Diplopia, Retinal rivalry
   - 1.7 Horopter
   - 1.8 Physiological Diplopia and Suppression
   - 1.9 Stereopsis, Panum's area, BSV.
   - 1.10 Stereopsis and monocular clues - significance.
   - 1.11 Egocentric location, clinical applications.
   - 1.12 Theories of Binocular vision.

2. Anatomy of Extra Ocular Muscles.
   - 2.1 Rectii and Obliques, LPS.
   - 2.2 Innervation & Blood Supply.

3. Physiology of Ocular movements.
   - 3.1 Center of rotation, Axes of Fick.
   - 3.2 Action of individual muscle.

4. Laws of ocular motility
   - 4.1 Donder's and Listing's law
   - 4.2 Sherrington's law
   - 4.3 Hering's law

5. Uniocular& Binocular movements - fixation, saccadic & pursuits.
   - 5.1 Version &Vergence.
   - 5.2 Fixation & field of fixation

6. Near Vision Complex Accommodation
   - 6.1 Definition and mechanism (process).
   - 6.2 Methods of measurement.
   - 6.3 Stimulus and innervation.
   - 6.4 Types of accommodation.
   - 6.5 Anomalies of accommodation – aetiology and management.

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

8. Sensory adaptations
   - 8.1 Confusion

9. Suppression
   - 9.1 Investigations
   - 9.2 Management
   - 9.3 Blind spot syndrome

10. Abnormal Retinal Correspondence
    - 10.1 Investigation and management
    - 10.2 Blind spot syndrome

11. Eccentric Fixation
    - 11.1 Investigation and management

12. Amblyopia
    - 12.1 Classsification
    - 12.2 Aeitiology
    - 12.3 Investigation
    - 12.4 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. V. Mosby Company
4. Mitchell Scheiman; Bruce Wick: Clinical Management of Binocular VisionHeterophoric, Accommodative, and Eye Movement Disorders, 2008, Lippincot Williams & Wilkins publishers

Paper 4: Paediatric Optometry

COURSE PLAN:

1. Refractive Development:
   - 1.1 Early Refractive Development
   - 1.2 Visually Guided control of Refractive State: Animal Studies
   - 1.3 Infant Accommodation and Convergence

2. Oculomotor Function:
   - 2.1 Conjugate Eye Movements of Infants
   - 2.2 Development of the Vestibuloocular and Optokinetic reflexes

3. Spatial and Chromatic Vision:
   - 3.1 Front-end Limitations to Infant Spatial vision: Examination of two analyses
   - 3.2 Development of the Human Visual Field
   - 3.3 Development of Scotopic Retinal Sensitivity
   - 3.4 Infant Color vision
   - 3.5 Orientation and Motion selective Mechanisms in Infants
   - 3.6 Intrinsic Noise and Infant performance

4. Binocular Vision:
   - 4.1 Development of interocular vision in Infants
   - 4.2 Stereopsis in Infants and its developmental relation to visual acuity
   - 4.3 Sensorimotor Adaptation and Development of the Horopter
   - 4.4 Two stages in the development of Binocular Vision and Eye Alignment

5. Retinal and cortical Development
6. Abnormal Visual Development
7. What next in Infant Research
8. Clinical Applications:
   - 8.1 Assessment of Child Vision and Refractive Error
   - 8.2 Refractive Routines in the Examination of Children
   - 8.3 Cycloplegic Refraction
   - 8.4 Color Vision Assessment in Children
   - 8.5 Dispensing for the Child patient
   - 8.6 Pediatric Contact Lens Practice
   - 8.7 Dyslexia and Optometry Management

8.8 Electrodiagnostic Needs of Multiple Handicapped Children
8.9 Management Guidelines – Ametropia, Contant Strabismus
8.10 Management Guidelines – Amblyopia
8.11 Accommodation and Vergence anomalies
8.12 Nystagmus
8.13 Common genetic problems in Paediatric optometry
8.14 Pediatric Ocular Diseases
8.15 Ocular Trauma in Children
8.16 Myopia control
8.17 Clinical uses of prism

TEXT/ REFERENCE BOOKS:

1. Clinical management of binocular vision Mitchell Scheiman and Bruce Wick
2. Applied concepts in vision therapy: Leonard Press
3. Pediatric optometry: Jerome K Rosner

Paper 5: Systemic Diseases and the eye

COURSE PLAN:

1. Hypertension
   - 1.1 Definition, classification, Epidemiology, clinical examination, management.
   - 1.2 Hypertensice retinopathy

2. Diabetes Mellitus
   - 2.1 Classification, pathophysiology, clinical presentations, diagnosis, and management, Complications
   - 2.2 Diabetic Retinopathy

3. Thyroid Disease
   - 3.1 Physiology, testing for thyroid disease, Hyperthyroidism, Hypothroidism, Thyroiditis, Thyroid tumors
   - 3.2 Grave's Ophthalmopathy

4. Acquired Heart Disease
   - 4.1 Ischemic Heart Disease, Congestive heart failure, Disorders of cardiac rhythm
   - 4.2 Ophthalmic considerations

5. Cancer :
   - 5.1 Incidence
   - 5.2 Etiology
   - 5.3 Therapy
   - 5.4 Ophthalmologic considerations

6. Connective Tissue Disease
   - 6.1 Rheumatic arthritis
   - 6.2 Systemic lupus erythematosus
   - 6.3 Scleroderma
   - 6.4 Polymyositis and dermatomyositis
   - 6.5 Sjogren syndrome
   - 6.6 Behcet's syndrome
   - 6.7 Eye and connective tissue disease

7. Tuberculosis
   7.1 Aetiology,pathology,clinical features, pulmonary tuberculosis, diagnosis, complications, treatment tuberculosis and the eye.
8. Herpes virus (Herepes simplex, Varicella Zoster, Cytomegalovirus, Epstein Barr Virus)
   8.1 Herpes and the eye
9. Hepatitis (Hepatitis A, B, C)
10. Acquired Immunodeficiency Syndrome
11. Anemia (Diagnosis, clinical evaluation, consequences, Sickle cell disease, treatment, Ophthalmologic considerations)
12. Common Tropical Medical Ailments
   12.1 Malaria
   12.2 Typhoid
   12.3 Dengue
   12.4 Filariases
   12.5 Onchocerciasis
   12.6 Cysticercosis
   12.7 Leprosy
13. Nutritional and Metabolic disorders:
   13.1 Obesity
   13.2 Hyperlipidaemias
   13.3 Kwashiorkor
   13.4 Vitamin A Deficiency
   13.5 Vitamin D Deficiency
   13.6 Vitamin E Deficiency
   13.7 Vitamin K Deficiency
   13.8 Vitamin B1,B2, Deficiency
   13.9 Vitamin C Deficiency
14. Myasthenia Gravis
15. First Aid
   General Medical Emergencies
   Preoperative precautions in ocular surgeries
16. Psychiatry
   16.1 Basic knowledge of psychiatric condition and Patient Management

17. Genetics
    17.1 Introduction to genetics
    17.2 Organisation of the cell
    17.3 Chromosome structure and cell division
    17.4 Gene structure and basic principles of Genetics.
    17.5 Genetic disorders and their diagnosis.
    17.6 Genes and the eye
    17.7 Genetic counseling and genetic engineering.

TEXT BOOKS:

1. 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, 19th Ed., ELBS/Churchill Livingstone. (PPM), 2002
2. Basic and clinical Science course: Update on General Medicine, American Academy of Ophthalmology, Section 1, 1999

Paper 6: Research Methodology and Bio-statistics

COURSE PLAN:

Research Methodology

1. Introduction to research methods
2. Identifying research problem
3. Ethical issues in research
4. Research design
5. Types of Data
6. Research tools and Data collection methods
7. Sampling methods
8. Developing a research proposal

Biostatistics

1. Basics of Biostatistics
   - 1.1 Introduction of Biostatistics
   - 1.2 Measures of Morality
   - 1.3 Sampling
   - 1.4 Statistical significance
   - 1.5 Correlation
   - 1.6 Sample size determination.
   - 1.7 Statistics –Collection of Data - presentation including classification and diagrammatic representation –frequency distribution. Measures of central tendency; measures of dispersion.
   - 1.8 Theoretical distributions.
     - 1.8.1 Binomial
     - 1.8.2 Normal
     - 1.8.3 Sampling –necessity of methods and techniques.
     - 1.8.4 Chi. Square test (2 x 2)
2. Hospital Statistics
3. Use of computerized software for statistics

TEXT BOOKS:

1. Mausner & Bahn: Epidemiology-An Introductory text, 2nd Ed., W. B. Saunders Co.
2. Richard F. Morton & J. Richard Hebd: A study guide to Epidemiology and Biostatistics, 2nd Ed., University Park Press, Baltimore.
3. Sylvia W Smoller, J Smoller, Biostatistics & Epidemiology A Primer for health and Biomedical professionals, 4th edition, Springs, 2015

Paper 7: Clinics - I

COURSE PLAN:

OBJECTIVES: The objective of clinics in this semester is to be able to examine the eye and understand the all eye procedures with clinical management.

An approximate of guided 240 hours needs to be completed in this semester. The students will be by rotation go to community clinics, Campus clinics, and associated hospital and optical / optometric clinics.

The logbook has to be maintained and case sheets of each subject in the semester with complete management and follow up are mandatory for submission at the end of the semester

The log book needs to be signed by the supervisor during every visit. No case record will be considered without the supervisor's signature

Sixth Semester

1. Contact Lens – II
2. Binocular Vision – II
3. Geriatric Optometry
4. Public Health and Community Optometry
5. Medical Law and Ethics
6. Occupational Optometry
7. Clinics – II

Paper 1: Contact Lens – II

COURSE PLAN:

1. SCL Materials & Review of manufacturing techniques
2. Comparison of RGP vs. SCL
3. Pre-fitting considerations for SCL
4. Fitting philosophies for SCL
5. Fit assessment in Soft Contact Lenses: Types of fit – Steep, Flat, Optimum
6. Calculation and finalising SCL parameters
   - 6.1 Disposable lenses
   - 6.2 Advantages and availability
7. Soft Toric CL
   - 7.1 Stabilization techniques
   - 7.2 Parameter selection
   - 7.3 Fitting assessment
8. Common Handling Instructions
   - 8.1 Insertion & Removal Techniques
   - 8.2 Do's and Dont's
9. Care and Maintenance of Soft lenses
   - 9.1 Cleaning agents & Importance
   - 9.2 Rinsing agents & Importance
   - 9.3 Disinfecting agents & importance
   - 9.4 Lubricating & Enzymatic cleaners
10. Follow up visit examination
11. Complications of Soft lenses
12. Therapeutic contact lenses
    - 12.1 Indications
    - 12.2 Fitting consideration
13. Specialty fitting
    - 13.1 Aphakia
    - 13.2 Pediatric
    - 13.3 Post refractive surgery
14. Management of Presbyopia with Contact lenses

PRACTICAL

1. Examination of old soft Lens
2. RGP Lens fitting
3. RGP Lens Fit Assessment and fluroscein pattern
4. Special RGP fitting (Aphakia, pseudo phakia&Keratoconus)
5. RGP over refraction and Lens flexure
6. Examination of old RGP Lens
7. RGP Lens parameters
8. Fitting Cosmetic Contact Lens
9. Slit lamp examination of Contact Lens wearers
10. Fitting Toric Contact Lens
11. Bandage Contact Lens
12. SPM & Pachymetry
13. Specialty Contact Lens fitting

TEXT BOOKS:

1. IACLE modules 1 - 10
2. CLAO Volumes 1, 2, 3
3. Anthony J. Phillips : Contact Lenses, 5thedition, Butterworth-Heinemann, 2006
4. Elisabeth A. W. Millis: Medical Contact Lens Practice, Butterworth-Heinemann, 2004
5. E S. Bennett ,V A Henry :Clinical manual of Contact Lenses, 3rd edition, Lippincott Williams and Wilkins, 2008

Paper 2: Binocular Vision - II

COURSE PLAN:

1. Neuro-muscular anomalies
   1.1 Classification and etiological factors
2. History – recording and significance.
3. Convergent strabismus
   3.1 Accommodative convergent squint
      3.1.1 Classification
      3.1.2 Investigation and Management
   3.2 Non accommodative Convergent squint
      3.1.3 Classification
      3.1.4 Investigation and Management
4. Divergent Strabismus
   4.1 Classification
   4.2 A& V phenomenon
   4.3 Investigation and Management
5. Vertical strabismus
   5.1 Classification
   5.2 Investigation and Management
6. Paralytic Strabismus
   6.1 Acquired and Congenital
   6.2 Clinical Characteristics
7. Distinction from comitant and restrictive Squint
8. Investigations
   8.1 History and symptoms
   8.2 Head Posture
   8.3 Diplopia Charting
   8.4 Hess chart
   8.5 PBCT
   8.6 Nine directions
   8.7 Binocular field of vision
9. Amblyopia and Treatment of Amblyopia
10. Nystagmus
11. Non-surgical Management of Squint

12. Restrictive Strabismus
    12.1 Features
    12.2 Musculo-fascical anomalies
    12.3 Duane's Retraction syndrome
    12.4 Clinical features and management
    12.5 Brown's Superior oblique sheath syndrome
    12.6 Strabismus fixus
    12.7 Congenital muscle fibrosis
13. Surgical management

PRACTICAL

Deals with hand-on session the basic binocular vision evaluation techniques.

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

Paper 3: Geriatric Optometry

COURSE PLAN:

1. Visual Disorders – Medical Perspective
   - 1.1 The Epidemiology of Vision Impairment
   - 1.2 Vision Impairment in the pediatric population
   - 1.3 Ocular Diseases:
     - 1.3.1 Age – Related Cataract,
     - 1.3.2 Glaucoma
     - 1.3.3 ARMD
     - 1.3.4 Diabetic retinopathy
     - 1.3.5 Corneal Disorders
     - 1.3.6 Ocular Trauma
     - 1.3.7 Sensory Neuro-ophthalmology and Vision Impairment
     - 1.3.8 Refractive Disorders

2. Visual Disorders – The Functional Perspective
   - 2.1 Low Vision and Psychophysics
   - 2.2 Visual Functioning in Pediatric Populations with Low Vision
   - 2.3 Perceptual correlates of Optical Disorders
   - 2.4 Functional aspects of Neural Visual Disorders of the eye and Brain
   - 2.5 Visual Disorders and Performance of specific Tasks requiring vision

3. Visual Disorders – The Psychosocial Perspective
   - 3.1 Developmental perspectives – Youth
   - 3.2 Vision Impairment and Cognition
   - 3.3 Spatial orientation and Mobility of people with vision impairments
   - 3.4 Social skills Issues in vision impairment
   - 3.5 Communication and language: Issues and concerns
   - 3.6 Developmental perspectives on Aging and vision loss
   - 3.7 Vision and cognitive Functioning in old age

4. Interactions of Vision Impairment with other Disabilities and sensory Impairments.
   - 4.1 Children with Multiple Impairments
   - 4.2 Dual Vision and Hearing Impairment
   - 4.3 Diabetes Mellitus and Vision Impairment
   - 4.4 Vision Problems associated with Multiple Sclerosis
   - 4.5 Vision Impairment related to Acquired Brain Injury
   - 4.6 Vision and Dementia
   - 4.7 Low Vision and HIV infection

5. The Environment and Vision Impairment: Towards Universal Design
   - 5.1 Indian Disabilities act
   - 5.2 Children's Environments
   - 5.3 Environments of Older people
   - 5.4 Outdoor environments
   - 5.5 Lighting to enhance visual capabilities
   - 5.6 Signage and way finding
   - 5.7 Accessible Environments through Technology

6. Vision Rehabilitation:
   - 6.1 In Western Countries
   - 6.2 In Asia
   - 6.3 Personnel preparation in Vision Rehabilitation

7. Psychological and social factors in visual Adaptation and Rehabilitation
   - 7.1 The Role of psychosocial Factors in adaptation to vision Impairment and Habilitation outcomes for Children and Youth
   - 7.2 The Role of psychosocial Factors in adaptation to vision Impairment and Habilitation outcomes for Adults and Older adults
   - 7.3 Social support and adjustment to vision Impairment across the life span
   - 7.4 The person – Environment perspective of vision impairment
   - 7.5 Associated Depression, Disability and rehabilitation
   - 7.6 Methodological strategies and issues in social research on vision Impairment and rehabilitation

TEXT/REFERENCE BOOKS: The lighthouse handbook on vision impairment and Vision rehabilitation: Barbara Silverstone, Mary Ann Lang, Bruce Rosenthal, Faye.

Paper 4: Public Health and Community Optometry

COURSE PLAN:

1. Public Health Optometry: Concepts and implementation, Stages of diseases
2. Dimensions, determinants and indicators of health
3. Levels of disease prevention and levels of health care patterns
4. Epidemiology of blindness – Defining blindness and visual impairment
5. Eye in primary health care
6. Contrasting between Clinical and community health programs
7. Community Eye Care Programs
8. Community based rehabilitation programs
9. Nutritional Blindness with reference to Vitamin A deficiency
10. Vision 2020: The Right to Sight
11. Screening for eye diseases
12. National and International health agencies, NPCB
13. Role of an optometrist in Public Health
14. Organization and Management of Eye Care Programs – Service Delivery models
15. Health manpower and planning & Health Economics
16. Evaluation and assessment of health programmes
17. Optometrists role in school eye health programmes
18. Basics of Tele Optometry and its application in Public Health
19. Information, Education and Communication for Eye Care programs

TEXT BOOKS:

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

REFERENCE BOOKS: MC Gupta, Mahajan BK, Murthy GVS, 3rd edition. Text Book of Community Medicine, Jaypee Brothers, New Delhi, 2002

Paper 5: Medical Law & Ethics

COURSE PLAN:

Few of the important and relevant topics that need to focus on are as follows:

1. Medical ethics - Definition - Goal - Scope b
2. Introduction to Code of conduct
3. Basic principles of medical ethics –Confidentiality
4. Malpractice and negligence - Rational and irrational drug therapy
5. Autonomy and informed consent - Right of patients
6. Care of the terminally ill- Euthanasia
7. Organ transplantation
8. Medico legal aspects of medical records –Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.
9. Professional Indemnity insurance policy
10. Development of standardized protocol to avoid near miss or sentinel events
11. Obtaining an informed consent.

Paper 6: Occupational Optometry

COURSE PLAN:

1. Introduction to Occupational health, hygiene and safety, international bodies like ILO, WHO, National bodies etc.
    1.1 Acts and Rules - Factories Act, WCA, ESI Act.
2. Electromagnetic Radiation and its effects on Eye
3. Light – Definitions and units, Sources, advantages and disadvantages, standards
4. Color – Definition, Color theory, Color coding, Color defects, Color Vision tests
5. Occupational hazards and preventive/protective methods
6. Task Analysis
7. Industrial Vision Screening – Modified clinical method and Industrial Vision test
8. Vision Standards – Railways, Roadways, Airlines
9. Visual Display Units
10. Contact lens and work

TEXT BOOKS:

1. PP Santanam, R Krishnakumar, Monica R. Dr. Santanam's text book of Occupational optometry. 1st edition, Published by Elite School of optometry , unit of Medical Research Foundation, Chennai, India , 2015
2. R V North: Work and the eye, Second edition, Butterworth Heinemann, 2001

REFERENCE BOOKS:

1. G W Good: Occupational Vision Manual available in the following website: www.aoa.org
2. N.A. Smith: Lighting for Occupational Optometry, HHSC Handbook Series, Safchem Services, 1999
3. J Anshel: Visual Ergonomics Handbook, CRC Press, 2005
4. G Carson, S Doshi, W Harvey: Eye Essentials: Environmental & Occupational Optometry, Butterworth-Heinemann, 2008

Paper 6: Clinics – II (Practical)

COURSE PLAN:

OBJECTIVES: The objective of clinics in this semester is to be able to gets hand-on experience related to diagnosis, interpretation of the reports/findings and management.

An approximate of guided 240 hours needs to be completed in this semester. The students will be by rotation go to community clinics, Campus clinics, and associated hospital and optical / optometric clinics.

The focus will be on the specialized subjects studies in this semester.

The logbook has to be maintained and case sheets of each subject in the semester with complete management and follow up are mandatory for submission at the end of the semester

The log book needs to be signed by the supervisor during every visit. No case record will be considered without the supervisor's signature