Second Semester

Sl. No.	Course Titles	Hours/semester		
		Lecture	Practicals	Total
BOP201	General Pharmacology	45	0	45
BOP202	General Pathology	30	0	30
BOP203	Ocular and related neuroanatomy	45	15	60
BOP204	Ocular and related neurophysiology	45	30	75
BOP205	Ocular Biochemistry	45	30	75
BOP206	Geometrical Optics-II	45	30	75
BOP207	Basics of Computers[#]	0	30	30
BOP208	Clinical Optometry-II	0	60	60
TOTAL		**255**	**195**	**450**

Non-university exams

Second Semester

CL	CP	L	P
3	0	45	0

GENERAL PHARMACOLOGY

INSTRUCTOR INCHARGE: MD Pharmacology/M.Pharm or Pharm D who have adequate experience in teaching pharmacology.

COURSE DESCRIPTION: This course covers the actions, uses, adverse effects and mode of administration of drugs.

OBJECTIVES: At the end of the course the students will acquire knowledge in the following aspects-

1. Basic principle of pharmacokinetics & Pharmacodynamics
2. Commonly used ocular drugs, mechanism, indications, contraindications, drug dosage and adverse effects.

TEXT BOOK/REFERENCE BOOKS:

3. 1.Essentials of medical pharmacology - K D Tripathi 8th edition
4. 2. Ocular Therapeutics Handbook by Dr. Bruce E. Onofrey

PREREQUISITES: General Physiology & Biochemistry

COURSE PLAN

Unit	Topics	Hours
1	General Pharmacology: Introduction & sources of drugs, Routes of drug administration, Pharmacokinetics (emphasis on ocular pharmacokinetics), Pharmacodynamics & factors modifying drug actions	15
2	Systemic Pharmacology: Autonomic nervous system, Cardiovascular system: Anti-hypertensive and drugs useful in Angina; Diuretics: Drugs used in ocular disorders; Central Nervous System: Alcohol, sedative hypnotics, Depressants. Histamines and Anti histamines, Serotonin, Prostaglandin	10

3	General & local anaesthetics, Opioids & non-opioids; Chemotherapy : Introduction on general chemotherapy, Specific chemotherapy –Antiviral, antifungal, antibiotics; Hormones : Corticosteroids, Antidiabetics; Blood Coagulants	10
4	Principles and classification of autonomic drugs, Sympathomimetics – Sympatholytics, Parasympathomimetics – Parasympatholytics, Diagnostic use of autonomic drugs, Sulfonamides, Antibiotics, Anaesthetics-Proteolytic enzymes	10

GENERAL PATHOLOGY

CL	CP	L	P
2	0	30	0

INSTRUCTOR INCHARGE: MD Pathology.

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

OBJECTIVES At the end of the course students will acquire knowledge in the following aspects:

1. Inflammation and repair aspects.
2. Pathology of various eye parts and adnexa.

TEXT BOOK

1. Textbook of pathology - Harsh Mohan 8th edition

REFERENCE BOOKS:

1. CORTON KUMAR AND ROBINS: Pathological Basis of the Disease, 7th Edition, Elsevier, New Delhi, 2004.

2. S R Lakhani Susan AD & Caroline JF: Basic Pathology: An introduction to the mechanism of disease, 1993.

PREREQUISITES: Higher Secondary Biology, General and Ocular Anatomy, General and Ocular Physiology

COURSE PLAN

Unit	Topics	Hours
1	Modes of cell injury, Necrosis & gangrene, Inflammation and repair (Chronic and Acute), Infection in general, Specific infections: Tuberculosis, Leprosy, Syphilis, Fungal infection, Viral, chlamydial infection	15
2	Neoplasia, Haematology, Anemia, Leukemia, Bleeding disorders. Circulatory disturbances: Thrombosis, Infarction, Embolism, Hypersensitivity reactions	10
3	Clinical pathology: Immune system, Shock, Anaphylaxis, Allergy	5

OCULAR AND RELATED NEURO-ANATOMY

CL	CP	L	P
3	0.5	45	15

INSTRUCTOR IN CHARGE: M Optom who have adequate experience in teaching anatomy or MD (Anatomy) or M.Sc (Anatomy).

COURSE DESCRIPTION: This course deals with detailed anatomy of the orbit, eyeball and cranial nerves associated with ocular functions.

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

1. Comprehend the normal disposition, inter-relationships, gross, functional and applied anatomy of various structures in the eye and adnexa.

2. Identify the microscopic structures of various tissues in the eye and correlate the structure with the functions.

3. 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.

4. To understand the basic principles of ocular embryology.

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

PREREQUISITES: General anatomy

COURSE PLAN

Unit	Topics	Hours
1	Ocular Embryology. Ocular Structures: Eyeball, Visual pathway, orbit, extraocular muscles and appendages. Ocular Embryology. Eyebrows: Gross anatomy, structure, vessels and nerves, functions. Orbit: Bony orbit, periorbita, orbital fascia, surgical spaces in the orbit, orbital fat and reticular tissue, apertures at the base of orbit, contents of the orbit; Paranasal sinuses. Anatomy of eyelids: Gross, structure, Glands of eyelids, vessels and nerves. Extraocular muscles: rectus, oblique, nerve supply, blood supply.	9
2	Conjunctiva: Parts of conjunctiva, Structure of conjunctiva, the conjunctival glands, Plica semilunaris, the caruncle, Blood supply of the conjunctiva, venous drainage of conjunctiva, lymphatics of the conjunctiva, nerve supply of conjunctiva. Cornea: Dimensions, histology, blood supply, nerve supply, Limbus: Anatomical limbus, surgical limbus, cataract incision; Sclera: Thickness of sclera, special regions of the sclera, scleral apertures, microscopic structure, nerve supply, Uvea : iris, ciliary body choroid, blood supply; Aqueous Humour: Ciliary body, posterior chamber, anterior chamber, angle of the anterior chamber, Gonioscopic grading of the angle, Aqueous outflow system	9
3	The crystalline lens: structure of the lens, ciliary zonules. Vitreous Humour: general features, Structure (Hyaloid membrane, cortical vitreous, medullary vitreous), attachments, vitreous base. Retina and Visual Pathway : Gross anatomy of retina, microscopic structure, blood-supply of retina, blood retinal barrier; Anatomy of different components of visual pathway, arrangement of nerve fibres, blood supply, lesions of visual pathway.	9

4	Lacrimal apparatus: Lacrimal glands (main and accessory; structure, blood supply, lymphatic drainage, nerve supply), Lacrimal passages (Puncta, canaliculi, lacrimal sac, nasolacrimal duct, blood supply, nerve supply). Tear film: Functions, structure (all layers), Physical properties, Chemical composition (water, proteins, metabolites, electrolytes, and lipids). Blood vessels and ocular circulations: Blood vessels – arteries and venous drainage; Ocular circulation – structural characteristics of ocular vessels. Orbital Nerves: Oculomotor, trochlear, abducent, trigeminal, facial, autonomic nerves	9
5	Central nervous system: Spinal cord and brain stem, Cerebellum, Cerebrum. 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	9

PRACTICAL (15 Hours)

1. Practical demonstration of bovine eye dissection.
2. Retina Layers - Video Demonstration and OCT
3. Cranial Nerve Examination
4. Meibomian glands using meibography
5. Syringing to understand lacrimal apparatus

OCULAR AND RELATED NEUROPHYSIOLOGY

CL	CP	L	P
3	1	45	30

INSTRUCTOR IN CHARGE: M Optom with experience in teaching ocular and neurophysiology or MD Physiology, M. Sc (Physiology)

COURSE DESCRIPTION: Ocular physiology deals with the physiological and neurological functions of each part of the eye.

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

1. Explain the normal functioning of all structures of the eye and their interactions
2. Elucidate the physiological aspects of normal growth and development of the eye
3. Understand the phenomenon of vision
4. List the physiological principles underlying pathogenesis and treatment of diseases of the eye

TEXT BOOK:

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

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

REFERENCE BOOKS:

1. PL Kaufman, A Alm: Adler's Physiology of the eye clinical application, 10th edition, Mosby, 2002

PREREQUISITES: General Physiology

COURSE PLAN:

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

PRACTICALS (30 Hours)

1. Examination of Lid movements and Extra ocular movements
2. Tests for lacrimation
3. Experiments on Binocular vision(Accommodation, Vergence, Disparity, Single Vision, Fusion & Stereopsis)
4. Examination of Pupillary reflexes
5. Experiments on Light and dark adaptation
6. Experiments on Colour Vision

OCULAR BIOCHEMISTRY

CL	CP	L	P
3	1	45	30

INSTRUCTOR IN CHARGE: M Optom with experience in teaching Biochemistry or Masters or PhD in Biochemistry

COURSE DESCRIPTION: Ocular Biochemistry deals with the metabolism that takes place in the human body. It also deals with ocular biochemistry in detail. Clinical estimation as well as the clinical significance of biochemical values is also taught.

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

1. Structure ,function and interrelationship of biomolecules and consequences of deviation from the normal
2. Integration of various aspects of metabolism and their regulatory pathways
3. Principles of various conventional and specialized laboratory investigations and instrumentation, analysis and interpretation of a given data
4. Understand metabolic processes taking place in different ocular structures.

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: Biochemistry of the Eye, 2nd edition, Butterworth Heinemann, Pennsylvania, 2003

PREREQUISITES: Higher secondary level chemistry with good knowledge of organic chemistry and knowledge of Basic Biochemistry

COURSE PLAN:

Unit	Topics	Hours
1	Importance of ocular biochemistry in ophthalmic practice; Tear film – Functions of Tear film. Different layers of Tear film. Chemical composition of tears. Tear film abnormalities. Tests for film Adequacy, Cornea – Biochemical composition of cornea. Sources of Nutrients-Oxygen, Glucose, Amino acid. Metabolic pathway in cornea – Glycolysis, HMP shunt	9
2	Lens – Biochemical composition of lens. Lens protein – their types & characteristics. Lens Metabolism - Carbohydrate metabolism, protein metabolism. Cataract – Due to biochemical defects of lens. Antioxidant mechanism in the lens	9
3	Retina – structure – composition – photoreceptor cell – metabolism and functions – phagocytosis; Retinal neurochemistry – Monoamines – acetylcholine – GABA – amino acids – taurine – neuropeptides – Biochemical correlates of retinal diseases	9
4	Biochemistry of the visual process; Photopigments – Rhodopsin & Iodopsin. Chemical nature of Rhodopsin. Visual cycle (Bleaching of Rhodopsin, Transducin cycle, Role of Phosphodiesterases)	9
5	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.	9

PRACTICAL (30 Hours)

- Quantitative and qualitative analysis by spectrophotometry
- Electrophoresis
    - Chromatography – Lysozyme, Lactoferin, IgA etc
- Preparation of normal, molar and percentage solutions – matching Tear Osmolarity.

- Measurement of tear osmolarity
    - Preparation of buffers, pH determination
- pH estimation of tears.
- Biochemistry Assay using following specimens
    - Tears of different age groups
    - Cataract lens
    - Different types of used contact lenses
    - Contact lens solutions on tears
    - Demonstration of various techniques as given in unit 5.

GEOMETRICAL OPTICS II

CL	CP	L	P
3	1	45	30

INSTRUCTOR IN CHARGE: A post-graduate, preferably a Ph D, in physics, with adequate exposure to the profession of optometry as evidenced by previous teaching experience or publications in optometry journals/magazines OR M Optom

COURSE DESCRIPTION: This course will be taught in two consecutive semesters. 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.

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, New York, USA, 2002.

PREREQUISITES: Higher secondary level mathematics, physics, Geometric Optics I.

COURSE PLAN:

Unit	Topics	Hours
1	Vergence and vergence techniques revised. Gullstrand's schematic eyes, visual acuity, Stile Crawford. Emmetropia and ametropia	10
2	Blur retinal Imaginary, 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. Astigmatism. - To calculate the position of the line image in a sphero-cylindrical lens.	15
3	Thin lens model of the eye –angular magnification –spectacle and relative spectacle magnification. Aperture stops- entrance and exit pupils. Aberrations Spherical – Coma - Oblique astigmatism - Curvature of the field – Distortion - Chromatic (longitudinal and lateral) - higher order aberrations.	10
4	Telescopes and Microscopes, Accommodation – Accommodation formulae and calculations. angular magnification of spectacle lens, near point, calculation of add, depth of field.	10

PRACTICAL (30 Hours)

1. Image formation with Cylindrical Lenses, Imaging by two cylinders in contact –
2. Image formation with spherocylindrical lens – sphere and cylinder in contact
3. Calculation of Spectacle and Relative Spectacle Magnification
4. Construction of a tabletop telescope – all three types of telescopes.
5. Construction of a tabletop microscope
6. Demonstration of Aberrations

BASICS OF COMPUTERS

CL	CP	L	P
0	1	0	30

INSTRUCTOR IN CHARGE: M Optom with adequate computer knowledge and with teaching experience or Graduate in Information and technology

COURSE DESCRIPTION: The course has focus on computer organization, computer operating system and software, and MS windows, Word processing, Excel data worksheet and PowerPoint presentation.

OBJECTIVES: The students will be able to appreciate the role of computer technology and some extent able to gain hand-on experience in using computers.

TEXTBOOK: Faculty can decide

COURSE PLAN:

1. Introduction to computer: Input and output devices: Processor and memory: The Central Processing Unit (CPU), main memory. Storage Devices, Introduction of windows, Introduction of Operating System
2. Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.
3. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.
4. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.
5. Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), Internet and its Applications.
6. Introduction to computer applications in health and hospital data management system

CL	CP	L	P
0	2	0	60

CLINICAL OPTOMETRY II

Students will observe the basic operations of the optometry clinic while interacting with the multidisciplinary team members involved in providing optimal care to patients. The student will be introduced to optical terminology, equipment, and techniques used for treatment.

Students will maintain a log of all the cases seen in the outpatient department. Students will be given hands on training on basic optometry procedures such as history taking, vision testing, basic binocular vision testing and other ancillary procedures that are part of a comprehensive eye examination.

COURSE PLAN:

1. History Taking in systemic conditions and its relevant ocular implications
2. General medications and its systemic conditions
3. Interpretation of lab reports: Blood reports, urine reports, endocrinology reports
4. Estimation of random blood sugar
5. Estimation of Blood Pressure and pulse rate
6. Demonstration of CPR
7. Clinical Assessment of cranial nerve functions
8. Visual Acuity tests for adult and children
9. Basic Binocular Vision tests
10. Tear film and lid assessment