

COURSE NAME: BOOT (Bachelor of Optometry and Ophthalmic Technology)

YEAR I

Course Code	Course Title
OPH14103	Ocular Anatomy, Physiology and Biochemistry
OPH14104	Ocular Pathology and Microbiology
OPH14105	Physical and Visual Optics
ANT14105	Human Anatomy and Physiology
CSC14105	Fundamentals of Computer Science
ENG14102	Communication for Professionals
OPH14104P	Ocular Pathology and Microbiology (P)
OPH14105P	Physical and Visual Optics (P)
ANT14105P	Human Anatomy and Physiology (P)

YEAR II

Course Code	Course Title
BOX14201	Biostatistics and Occupational Optometry
OPH14203	Contact Lenses and Clinical Refraction
OPH14204	Ocular Diseases and Pharmacology
OPH14205	Optoelectronics
OPH14206	Mathematical Analysis and Geometric Optics
OPH14207	Optometric Instruments
OPH14203P	Contact Lenses and Clinical Refraction (P)
OPH14206P	Mathematical Analysis and Geometric Optics (P)
OPH14207P	Optometric Instruments (P)

YEAR III

Course Code	Course Title
OPH14306	Clinical Investigative Optometry
OPH14307	Advanced Contact Lenses and Low Vision Aids
OPH14308	Community Optometry and Eye Banking
OPH14309	Geriatric and Pediatric Optometry
OPH14310	Clinical and Advanced Orthoptics
OPH14306P	Clinical Investigative Optometry (P)
OPH14307P	Advanced Contact Lenses and Low Vision Aids (P)
OPH14309P	Geriatric and Pediatric Optometry (P)
OPH14310P	Clinical and Advanced Orthoptics (P)
TRN14301	Hospital Training

YEAR IV

Course Code	Course Title
CST14401	Ophthalmic Case Studies
RPT14401	Optometry Reflective Reports

SYLLABUS

YEAR I

OCULAR ANATOMY, PHYSIOLOGY AND BIOCHEMISTRY – OPH14103

UNIT	CONTENT
SECTION A – OCULAR ANATOMY	
1.	Orbit and Eyelid: Spaces of orbit; orbit apertures; orbital fat & reticular tissue; contents of the orbit; bony orbit- shape, size, walls of the orbit, base and apex of the orbit; Orbital fascia- fascia bulbi, fascial sheaths of extraocular muscles, intermuscular septa; Orbital nerve- Occulomotor, Trochlear, Abducent, Trigeminal; Fascial nerves- their functional components and clinical aspects; Ocular Muscles- Extraocular muscles, nerve supply, motor nuclei, supra nuclear motor centers; Lids – structures of lids- skin, subcutaneous areolar layer, layer of striated muscle, submuscular areolar tissue, fibrous layer; Eyelid glands- Meibomian glands, Glands of Zeis, and Glands of Moll; nerve supply, blood supply and lymphatic drainage of lids.
2	Coats of eyeball: Conjunctiva: Brief discussion, parts of conjunctiva; Palpebral, Bulbar; conjunctival fornix, Microscopic structure of conjunctiva- Epithelium, Substantia propria, conjunctival glands, Henley’s glands, Manz glands, blood and nerve supply of conjunctiva, caruncle, Plia Semilunaris; Cornea -Structural layers of cornea, Corneal Transparency and nerve supply of the cornea; Sclera- Episclera, Sclera proper, Lamina fusca, Blood and nerve supply of the sclera; Retina - Anatomical structure of retina, fovea centralis, optic nerve optic chaisma optic tracts , Lateral Geniculate body, optic radiation, Arrangement of nerve fibers.
3	Lens and Uveal Tract (Iris, Ciliary body, Choroid): Structure of the lens – capsule, Ant epithelium, lens fibers, Ciliary zonules – structure gross appearance, Arrangement of zonules fibers; Structure and function of Iris, ciliary body, choroids, Blood supply to uveal structure; venous drainage system.
4	Aqueous & Vitreous humour of Eye: Aqueous & Anterior chamber and its angle - Formation of Aqueous humour, Drainage of aqueous humor, angle of the anterior chamber, Trabecular meshwork, Canal of Schlemm, Schwalbe’s line; Vitreous humour - Composition and formation of vitreous, Hyaloidean vitreous, Vitreous cells and functions.
5.	Lacrimal apparatus: Lacrimal Gland; Lacrimal Canaliculi; Lacrimal Sac; Nasolacrimal Duct; Nerve Supply of Lacrimal Apparatus.
6.	Embryology of the Eye: Formation of optic cup, optic vesicle & optic stalk, lens vesicle; changes in associated mesoderm, development of various structure of eye ball – sclera, cornea, iris, lens, ciliary body, vitreous, retina, optic nerve, choroids Growth and development of other structures of eyeball – eyelids, lacrimal apparatus, extra-ocular muscles, orbit & developmental anomalies.
SECTION B – OCULAR PHYSIOLOGY	
1	General physiology of the Eye - An introduction: Maintenance of Transparency of the Cornea; Physiology of corneal transparency & hydration, Maurice theory and Goldman’s theory; Maintenance of Transparency of the Lens; Function of lens, Lens transparency, Changes in ageing lens, Process of Cataract.
2	Physiology of Vision: Photoreceptors and photo pigments, retina, Light and dark adaption,

	release of neurotransmitters by photoreceptors; Night Vision; Cones and Colour Vision; Colour blindness and night blindness; Image formation - refraction of light rays, Accommodation and the near point vision, refraction abnormalities, Astigmatism; constriction of the pupil; Convergence; divergence; vertical vergence; Visual acuity and sensitivity; Pupillary reflexes.
3	The Visual Pathway & Eye Movements: Processing of visual input in the retina; Brain pathway and visual Fields; Higher Visual Centers and righting reflexes; Extrinsic Muscles, Actions and Ocular Movements; Neural control of eye movements; Conjugate and Disjunctive -Movements of the eye.
4	Fluid System of the Eye-Intraocular Fluid: Formation of Aqueous Humor by the Ciliary Body; Outflow of Aqueous Humor from the Eye; Intra Ocular Pressure – Tonometry, regulation of intraocular pressure, Mechanism for Cleansing the Trabecular Spaces and Intraocular Fluid, “Glaucoma,” a Principal Cause of Blindness.
5	Electro Physiology: Electro retinogram, Electro oculogram; Clinical connection - Detached Retina, Age-related Macular Disease, Presbyopia, LASIK, Color Blindness and Night Blindness.
SECTION C – OCULAR BIOCHEMISTRY	
1	Ocular Bio-Chemistry: Introduction to various biochemical tests; Cornea – Biochemical composition of cornea; Sources of Nutrients - Oxygen, Glucose, Amino acid; Metabolic pathway in cornea – Glycolysis, HMP shunt.
2	Tear film: Functions of Tear film; Different layers of Tear film; Chemical composition of tears; Tear film abnormalities; Tests for film Adequacy.
3	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; Biochemistry of the visual process.
4	Photopigments: Rhodopsin & Iodopsin, Chemical nature of Rhodopsin, Visual cycle (Bleaching of Rhodopsin, Transducin cycle, Role of Phosphodiesterases).

OCULAR PATHOLOGY AND MICROBIOLOGY – OPH14104

UNIT	CONTENT
1.	General Pathology: Introduction and etiology; Degeneration, Apoptosis, Disturbances of metabolism; Inflammation and repair; Role of the mast cell in inflammation; Role of the platelets in inflammation; Chronic inflammation: cause, classification, general features; Infection Circulatory disturbances- Shock, Oedema, Thrombosis, Embolism, Infraction; Acute bacterial infection, Specific Infection, Tuberculosis, Leprosy, Fungal Infection,

	Viral, Chlamydial Infection; Neoplasia-definitions, classifications, behaviour of benign and Malignant Neoplasm; Spread of Tumours; Eteopathogenesis; Diagnostic methods; Disorder of growth – metaplasia, dysplasia, neoplasia; Circulatory disturbances – thrombosis, infarction, ischemia, embolism; Degeneration (calcification).
2.	Ocular Pathology: Degenerative conditions; Ocular manifestation in systemic disease; Cataract; Tumours; RBC disorders; WBC disorders; Plasma cell dyspraxia; Peripheral Blood Film (PBF)- staining & its significance.
3.	Clinical Pathology: Introduction; Functioning of laboratory; Collection of blood sample; Haematology Technique; Routine hematological examinations: Hb, BT, CT, TLC, DLC and ESR; Urine collection methods - Physical Examination of Urine, Chemical Examination of Urine; Microscopic Examination of Urine.
4.	Histopathology: Grossing of tissue; Tissue processing; Fixation of tissue; Section cutting; Staining- Haematoxylin, Eosin & Special stain.
5.	Introduction to General Microbiology: Morphology and physiology of Bacteria; Culture media and methods in identification of bacteria; Antibiotic sensitivity testing and rational of use; Sterilization and disinfection – Basic principles and application in optometry; Infection and epidemiology if infectious diseases.
6.	Normal flora of the eye: Introduction; Resident flora; Transient flora; Role of microbial flora; Predominant organisms of the eye; Factors determining the colonization of microbes.
7.	Bacteriology and Virology: All Gram positive cocci and gram- negative cocci; Gram-positive bacilli- Corynebacterium diphtheria, Clostridia, Bacillus, Actinomyces and Nocardia, gram-negative bacilli- Enterobacteriaceae, Pseudomonas, Hemophilus, Mycobacteria; Introduction with morphology and microscopy; Modes of transmission and cultivation; Herpes; Pox; Adeno; Papovavirus; Paramyxovirus; Picorna; HIV; Hepatitis, Applied virology.
8.	Applied Microbiology and Mycology: Specimen collection from eye; Lab diagnosis of common bacterial and viral infections of the eye, Lab diagnosis of fungal and parasitic diseases; Fungi that infect skin and superficial tissues; Subcutaneous mycoses; Opportunistic mycoses; Antifungal used in the eye.
9.	Parasitology and Entomology: Introduction and modes of spread; Amoebae with special reference to free living amoebae; Toxoplasmosis; Filariasis and Ocular filariasis; Scabies; Head and body lice.

OCULAR PATHOLOGY AND MICROBIOLOGY (P) – OPH14104P

1. Collection of Clinical Specimens and Their Processing In Laboratory.
2. Blood Samples Collection.
3. The Microscope.

PHYSICAL AND VISUAL OPTICS – OPH14105

UNIT	CONTENT
SECTION A: PHYSICAL OPTICS	
1	Nature of Light: Wave Nature of Light - Short coming of wave theory; Quantum Theory - Dual Nature of Light; Mathematical Representation of Wave – S.H.M. - energy composition of S.H.M. in a straight line and right angles; Huygens’s principle - Laws of reflection and refraction at spherical surfaces and lenses; Description of the phenomena of interference, Young’s experiment, coherent sources, phase and path difference, intensity, Theory of interference fringes; Interference in thin films - Interference due to reflected and transmitted light – Lloyd’s single mirror; Colours of thin films - wedge shaped thin films – testing of planeness of surface; Newton’s rings experiment - refractive index of liquid; Non-reflecting films; Visibility of fringes - contrast and contrast threshold.
2	Radiometry & Photometry: Radiant intensity; Irradiance; Lambert’s cosine Law; Basic concepts and definitions in Photometry; Reflection co-efficient, transmission co-efficient, power-transmitted and Reflected; Lummen Brodhun Photometer.
3	Diffraction and Scattering: Single slit, qualitative and quantitative; Circular aperture; Double slit pattern and Kirchoff’s integral; Multiple slits – grating; Reflection grating and the zone plate; Rayleigh’s scattering; Raman scattering.
4	Polarization: Polarization of transverse waves - light as transverse waves; Double refraction, principal plane, Nicole prism - plane polarization; Circular elliptic polarization production, detection and behavior; Optical activity - Fresnal’s half shade polarimeter; Polarization by selective absorption – dichorism.
5	Spectrum: Sources of spectrum – Bunsen, carbon, mercury, sodium; Emission and absorption spectra – classification, visible, ultra violet and infra spectra, electromagnetic spectrum.
SECTION B - VISUAL OPTICS	
6	Optics of Ocular Structures: Cornea and aqueous; Crystalline lens; Vitreous; Schematic and reduced eye; Sturm Conoid; Corneal curvature and thickness; Keratometry; Curvature of the lens and ophthalmophakometry; Axial and axis of the eye.
7	Refractive Anomalies and Their Causes: Etiology of refractive anomalies; Contributing variabilities and their ranges; Populating distributions and their ranges; Optical component measurement; Growth of eye in relation to refractive errors; Emmetropia; Myopia; Hyperopia; Astigmatism; Anisometropia And Aniseikonia; Presbyopia; Aphakia and pseadophakia; Correction and management of Amblyopia.
8	Accommodation and Convergence: Accommodation - Definition of Accommodation, Changes in the eye during Accommodation, Anomalies of accommodation; Convergence - Definition of Convergence, components of convergence, Anomalies of convergence; Relationship between Accommodation and convergence, A/C Ratio; Ocular refraction

	versus spectacle refraction; Ocular accommodation versus spectacle accommodation; spectacle magnification and relative spectacle magnification; Retinal image blur; Depth of focus and depth of field.
9	Objective and Subjective Refraction: Retinoscopy - procedure; Retinoscopy - speed of reflex and optimum condition; Retinoscopy - Dynamic and Static; Subjective Refraction - finding Best vision Sphere, determine axis and power of cylinder by JCC, refine sphere, duochrome test, binocular balancing; Fogging method; Difficulties in objective tests and their avoidance; Transposition of lenses; Spherical equivalent; Prescribing prism; Binocular Refraction.

HUMAN ANATOMY AND PHYSIOLOGY – ANT14105

UNIT	CONTENT
SECTION A – HUMAN ANATOMY	
1.	Introduction: Human body as a Whole: Brief introduction about living system; General Anatomy - Definition of anatomy, and its divisions; Terms of positions, planes relationship and movements; Body regions; Body cavities; Membranes –Cutaneous, Serous, Mucous And Synovial membranes; Some clinical terms used in anatomy; General

	histology: definition, Electron microscopic structure of Human cell; Tissues - Classification, functions and Microscopic Structures of Primary tissues -Epithelial tissue, connective tissue, muscular tissue & Nervous tissue; Glands- Classification, microanatomy of serous & mucous glands with examples.
2.	Locomotion and Support: Skeletal System - Brief introduction about skeletal system, Organizations of skeleton, classification of skeleton: Axial skeleton & appendicular skeleton; Functions of Skeleton; Bones: definition, Classification of bones, Bone growth; Brief study on individual bones: Clavicle, Scapula, Humerus, Radius, Ulna, carpals, metacarpals, phalanges, Hip bones, Sacrum, femur, tibia, fibula, tarsal, metatarsals and phalanges; ribs and sternum; Skull bones - Importance of sutures: coronal, saggital and lamboid, cranial fossae, Bones of Cranium, Mandible and Maxilla. Difference between foetal and adult skull, Structure of typical and atypical vertebrae; Cartilage: definition and its classifications, applied anatomy of cartilage; Joints: Definition, Classification of joints with examples, Synovial joint, Movements & mechanism of Joints, Joint positions, Applied aspects- Arthritis, Spondylitis, Neuropathic Joint, etc; Muscular system: Definition, Classification of muscular tissue, Characterization of – Skeletal, Smooth & Cardiac muscles, Names & action of Skeletal muscles of the body; Appendicular muscles: General overview about muscles that move -a) Pectoral Girdle b) Shoulder Joint c) Elbow Joint d) Wrist Joint e) Intrinsic Muscles of Hand f) Muscles of Hip, Thigh, Leg and Intrinsic Muscles of Foot; Axial muscles: General overview about muscles of-- a) Respiration-Diaphragm and Intercostal, b) Abdominal Muscles, c) Muscles of Facial Expression, d) Muscles of Mastication, e) Muscles of Head and Neck: Histology of- Compact bone (TS & LS), 3 types of cartilage & skeletal (TS & LS), smooth & cardiac muscle.
3.	The Cardiovascular System: General considerations about basics of Cardiovascular System; Gross anatomy & related applied aspects of – Heart: Location- Mediastinum; Shape and Size of Heart, Pericardium, Chambers, Exterior & Interior, Blood supply of heart, Systemic & pulmonary circulation, Conducting system of heart; Major arteries - Branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery, Peripheral pulse; Major veins - Inferior vena cava, portal vein, portosystemic anastomosis, cephalic vein, Great saphenous vein; Histology of – Elastic Artery, Muscular Artery & Vein. The Lymphatic system: General consideration of Lymphatic system, Gross anatomy of - Cisterna Chyli & Thoracic Duct, Brief discussion over names of regional lymphatics, axillary and inguinal lymph nodes; Histology of –Lymph Node, Spleen, Tonsil & Thymus.
4.	The Respiratory System: Definition and general consideration; Gross anatomy & related applied aspects of – Parts of Respiratory System- Nose, Nasal Cavity, Larynx, Trachea, Lungs, Bronchopulmonary Segments, Pleura; Histology of- trachea and lung.
5.	The Gastro-intestinal System: Definition and brief introduction; Gross anatomy & related applied aspects of – Parts of GIT, Oral cavity (Lip, Tongue, Tonsil, Dentition), Salivary glands- types, location, structure and function, Pharynx- muscles, action and their nerve supply, Oesophagus, Stomach, Small and Large Intestine, Liver, Gall Bladder and Pancreas; Histology of – Tongue, Oesophagus, Stomach, Small And Large Intestine, Liver, Gall Bladder & Pancreas.
6.	The Urinary System: Definition and brief introduction; Gross anatomy & related applied aspects of – Kidney, Ureter, Urinary Bladder, Male and Female Urethra; Histology of- Kidney, Ureter & Urinary Bladder.
7.	The Reproductive System: Definition and general consideration; Gross anatomy & related applied aspects of – Parts of male reproductive system, Testis, Epididymis, Vas Deferens, Seminal vesicles, Prostate and accessory organs, Parts of female reproductive system, Uterus, Fallopian Tubes, Ovary, Mammary Gland and accessory organs; Histology of –Testis, Prostate, Uterus, Fallopian Tubes and Ovary.
8.	The Nervous System: Definition and meaning; Structure of a Neuron; Classification of Nervous System; Gross anatomy & related applied aspects of – Central nervous system: Cerebrum- General consideration, layers of cerebrum, lobes, gyri, sulci, specialized areas, names of basal nuclei and their functions, lateralization of brain; Cerebellum- location, lobes, fissures, deep cerebellar nuclei, functions of cerebellum; Brainstem- location & brief

	discussion over nuclei of Midbrain, Pons & Medulla Oblongata; Spinal Cord – extension, diameter, organization of grey and white matter, pyramidal and extrapyramidal pathway, important ascending pathways , spinal cord trauma and disorders; Autonomic nervous system- definition, divisions of ANS, brief discussion over pre and post ganglionic nerve fibres; Peripheral nervous system- 1) Cranial nerves- names and functional components and nerve injuries; 2) Spinal nerves- structure of a typical spinal nerve and nerve plexus- Brachial and lumbar plexuses; Segmental innervations of skin; Neurotransmitters; Meninges; Dural venous sinuses; Ventricles; Cerebrospinal fluid; Blood supply of brain; Histology of - Cerebrum, cerebellum & spinal cord.
9.	The Endocrine System: Definition and general consideration of endocrine system; Gross anatomy & related applied aspects of – Pituitary Gland, Thyroid Gland, Parathyroid Gland, Suprarenal Gland and Pineal Gland; Histology of- Pituitary, Thyroid & Suprarenal Glands.
10.	The Sensory Organs: Introduction and brief discussion; Gross anatomy & related applied aspects of – i) Eye-Parts of eye & lacrimal apparatus, Extra-ocular muscles- their nerve supply & action, Visual pathways and related applied. ii) Ear- Parts of ear- external, middle and inner ear and their contents, Auditory pathway and related applied iii) Skin- layers of skin and types of skin; Histology of- Skin- thick and thin skin, Cornea & Retina.
11.	General Embryology: Definition and brief discussion of Embryology; Structure of Ovum & Sperm; Mechanism of Gametogenesis; Fertilization; Brief overview on – a) Cleavage of zygote; b) Blastocyst Formation; c) Implantation; d) Bilaminar Germ Disc; e) Gastrulation; f) Neurulation; g) Development of somites; h) Organogenesis. i) Folding of embryo; j) Germ layer derivatives; k) Placenta; l) Parturition; m) Amnion & amniotic fluid; n)Yolk sac; o) Allantois; p) Multiple pregnancies.
SECTION B – PHYSIOLOGY	
12	Introduction to Physiology: The Unit of Life - Description of a cell and its components; Ion channels, receptors and carriers; Intercellular connections; intercellular communications; Functions of a cell. Movement of substances and homeostasis – movement of substances within the body, homeostatic control systems; Basics about different organs and systems.
13	Blood: Composition and functions of blood; Plasma proteins – normal values, origin and functions; Brief idea on Bone Marrow; Formed elements of blood – origin, formation, functions and fate; Hemoglobin – functions, compounds and derivatives; Abnormal hemoglobin-overview; Thalassemia-brief idea; Different types of anemia and their causes- overview; Erythrocyte sedimentation rate (ESR) and its significance; Hematocrit; PCV; MCV; MCH; MCHC; Blood volume – normal values, regulation; Blood coagulation – factors, process; anticoagulants; Prothrombin time; Clotting time; Bleeding time; Blood groups – ABO systems and Rh factors; Blood transfusion.
14	Gastrointestinal System: Characteristics of G.I wall; Neural control of G.I function; G.I. Hormones; Saliva - Composition, Functions, control of secretion; Gastric juice - Composition, mechanism of secretion, functions, regulation of secretion, mucosal barrier; Pancreatic juice - Composition, functions, regulation; Liver & Gall Bladder: Composition & functions of bile, control of secretion, functions of gall bladder, gall stones, enterohepatic circulation, jaundice, functions of liver & L.F.T; Small intestine - Composition & regulation of secretion and functions of intestinal juice.
15	Respiratory System: Functions of respiratory system; Mechanics of respiration; Lung volumes and capacities - definition, normal values, their measurement and clinical importance; Pulmonary ventilation; alveolar ventilation; dead space; Diffusion of gases across alveocapillary membrane; diffusing capacity; Pulmonary circulation; Oxygen & carbon dioxide transport in blood; Pressure changes during ventilation, pressure volume relationship including surfactant and compliance, airway resistance; Control of respiration - neural control, chemical control, response to exercise, periodic breathing; Lung function tests.
16	Nerve Muscle Physiology: Electrical properties of cell membrane; Membrane Potential (MP) - Development and maintenance of MP, Action Potential (AP); Physiology of nerves and neuromuscular junction; Neuro muscular transmission; Functional anatomy of skeletal

	muscle; Mechanism of muscle contraction and relaxation; isotonic & isometric contraction; energy sources and metabolism; motor unit; Involuntary muscles - Cardiac and smooth muscles.
17	Cardiovascular System: Structure and properties of Heart muscles and nerve supply of Heart; Structure and functions of arteries, capillaries and veins; ECG - leads, principles of normal recording, normal waves & internal & their interpretations, clinical uses of ECG; Cardiac cycle and Heart sound; Factors affecting Heart Rate and its regulation; Cardio-vascular reflexes; Blood pressure and its regulation; physiological variation; peripheral resistance; Factors controlling Blood Pressure; Haemorrhage & Shock; Ultra structure & functions of blood vessels (artery & vein). Structure type and function of capillaries; Differences between artery & vein.
18	Excretory System: Functional anatomy of kidney; nephron-structure, parts, function, types; Juxtaglomerular apparatus; Glomerular filtration - filtration barrier, forces governing filtration, measurement; Tubular functions- reabsorption, secretion, Tm values; Regulation of ECF – volume; osmolarity and electrolytes; Acid base balance; Micturition, Renal function tests, renal clearance, abnormal constituents of urine.
19	Endocrine & Reproductive System: General considerations – Endocrine glands and hormones; Structure and function of pituitary (anterior and posterior) gland; Thyroid; Para-Thyroid; Adrenal Cortex, Adrenal Medulla; Thymus and Pancreas; Blood Sugar regulation; General consideration of Reproduction - Development of Puberty; Male Sex Hormones; Spermatogenesis; Female Sex Hormones; Menstrual cycle; Ovulation; Pregnancy and Lactation; Function of Placenta.
20	Nervous System and Special Senses: Electron microscopic structure of nerve cell or neurons; Neuroglia; Myelinated and unmyelinated nerve fibers; Conduction velocity of nerve impulse in relation to myelination and diameter of nerve fibers; Properties of nerve fibers – excitability, conductivity, all-or-none law, accommodation, adaptation, summation, refractory period; indefatigability; Synapses – types, structure, synaptic transmission of the impulse; synaptic potentials; neurotransmitters; Injury to peripheral nerves – degeneration and regeneration-brief idea; Brief about central nervous system and its function with special reference to cerebral and visual cortex; Automatic nervous system – Introduction, Comparison of autonomic & somatic nervous system, Anatomy of autonomic motor pathways – Pre-ganglionic neurons, autonomic ganglia, sympathetic ganglia, autonomic plexus, post-ganglionic neurons structure of sympathetic and parasympathetic division; ANS - neurotransmitter and receptors- cholinergic neurons & receptors; Receptor agonist & antagonist; Physiological effect of ANS sympathetic & parasympathetic response; Integration & control of autonomic function; autonomic Reflexes; autonomic control by higher centers; sensory physiology of taste and smell organ.

FUNDAMENTALS OF COMPUTER SCIENCE – CSC14105

UNIT	CONTENT
1	Computer Application: Introduction to Computer - Advantages of computers, Limitations of computers, Application of Computer in Different Fields of Life, Computer Generations, and Classification of Computers; Characteristics of computers; Computer System; Input Unit; Output Unit; Central Processing Unit; Storage or Memory Unit - Primary Storage or Main Memory (MM), Memory Unit – Secondary Storage.
2	Computer Organization: Overview of Computer Organization; Central Processing Unit; Control Unit; Arithmetic Unit; Instruction Set - Difference between RISC and CISC; Register; Processor Speed - Higher is not Always Better, Keep-up with Technology, Price is not Everything.
3	Memory: Overview of Storage Devices; Main Memory; Storage Evaluation Criteria - Access Time, Memory Cycle Time, Effective Access Time; Memory Organization - Addressing Strategies, Organization of Memory Units, Content-Addressable Memories; Memory Capacity; Random Access Memories; Read Only Memory; Secondary Storage Devices; Magnetic Disk; Floppy and Hard Disk - Floppy disk drive, Hard Disks; Optical Disks CD-ROM - Compact disk, DVD, Blu-Ray disk, HD-DVD; Mass Storage Devices; and Differences between the Primary and Secondary Memory.
4	Input Devices: Keyboard; Mouse; Trackball; Joystick - Joysticks in aviation, Joysticks in Gaming, Analog Joystick, Digital Joystick; Scanner - Characteristics of a scanner, Types of scanner; Optical Mark Reader; Bar-code reader - Types of barcode; Magnetic Ink Character Reader (MICR); Digitizer; Card reader; Voice recognition; Web Cam; and Video Cameras.
5	Output Devices: Monitors - Characteristics of VDU, Types of VDU; Printers; Dot Matrix Printers; Inkjet Printers; Laser Printers; Plotters; Computers Output Micro Files (Com) - COM to CD Service, What Are the Benefits of COM?; Multimedia Projector - Criteria to evaluate suitable Projector.
6	Operating System: Microsoft Windows - An Overview of different version of windows, Basic Windows Elements, File Management through Windows 7; Using Essential Accessories - Disk Cleanup and Disk Defragmenter, Entertainment, Calculator, Note pad, Paint, Wordpad, Recycle Bin, Windows Explorer, and Creating Folder Icons.
7	Word Processing: Word Processing Concepts; Working with Documents - Create a New Document, Opening an Existing Document, Saving a Document, Renaming Documents, Working on Multiple Documents, Document Views, and Close a Document; Working with Text in Word - Selecting text, Editing Text, Finding and replacing text; Printing Documents; Formatting - Bullets and Numbering in Word, Alignment, Page designs and Layout, Editing and Proofreading; Working With Graphics - Inserting Clip Art Images, Moving Images in Word, Deleting images in Word, Text wrapping in Word, Creating Lines and Arrows in Word, Drawing Shapes in Word, Adding a Text Box; Working with Tables.
8	Presentation Package: Creating a New and Opening an Existing Presentation; Creating the look of your Presentation; Working with Slides - Adding and formatting Text, Formatting PowerPoint; Printing Handouts with Notes making; Images and Clip Art; Slide Shows.
9	Internet and Email: Definition about the World wide web & brief History; Use of Internet and Email – Internet, Email; Internet – Terminology, Protocols, Routing; Websites; The Mail Protocol Suite; Using Search Engine and beginning Google search; Exploring the next using Internet Explorer and Navigator; Uploading and Downloading of Files and Images; E-mail ID creation - Opening the E-mailbox, Sending Messages, and Attaching Files in E-mails.
10	Hospital Information System: Hospital Information System; Architecture of a Hospital Information System; Aim and Uses of HIS - Aim of HIS, Uses of HIS; Types of HIS; Benefits of using a Hospital Information Systems; Advanced Hospital Management System - XO Hospital Management System, LCS Hospital Management Information System, NVISH Hospital Management System.

COMMUNICATION FOR PROFESSIONALS – ENG14102

UNIT	CONTENT
1	Essentials of Grammar: Parts of Speech; Vocabulary building; Sentence; Articles; Pronouns; Quantity; Adjectives; Adverbs; Prepositions, Adverb particles and phrasal verbs, Verb; Verb tenses; Imperatives; Active and passive voice; Direct and indirect speech; The infinitive; Conditional sentences; Synonyms and antonyms; Singular and Plural; Figures of Speech; Punctuation and Phonetics.
2	Nature, Scope and Process of Communication: Defining Communication; Nature of Communication; Objectives/Purpose of Communication; Functions of Communication; Process of Communication; Elements of Communication Process; Process of Communication: Models; Working of the Process of Communication; Forms of Communication.
3	Channels and Networks of Communication: Channels of Communication; Communication Flow in Organizations; Directions/Dimensions of Communication; Patterns of Flow of Communication or Networks; Factors Influencing Organizational Communication.
4	Principles of Effective Communication: Communication Effectiveness: Criteria of Evaluation; Seven Cs of Effective Communication; Four Ss of Communication.
5	Barriers in Communication: Categorisation of Barriers; Semantic Barriers; Organizational Barriers; Interpersonal Barriers (Relating to Superior-subordinate); Individual or Psychosociological Barriers; Cross-cultural/Geographic Barriers; Physical Barriers/Channel and Media Barriers; Technical Aspects in Communication Barriers; Overcoming the Barriers in Communication; Measures to Overcome Barriers in Communication.
6	Non-verbal Communication: Characteristics of Non-verbal Communication; Relationship of Non-verbal Message with Verbal Message; Classification of Non-verbal Communication.
7	Oral Communication: Informal Conversation: Oral Communication; Informal Conversation; Learning Informal Conversation; How to Go About Learning Other Tricks?; Learning Conversational Skills; Internet Chat.
8	Communication in Business Organizations: Meaning of Business Communication; Types of Information Exchanged in Business Organizations; Role of Communication in Business Organizations; Importance of Communication in Management of Business Organizations; Scope of Communication in Organizational Setting; Characteristics of Effective Business Communication; New Communication Environment; Ethical challenges and Traps in Business Communication; Role of Communication in Three Managerial Roles Defined by Henry Mintzberg.
9	Formal Conversations: Meetings, Interviews and Group Discussions: Meetings; Duties of Participants; Interviews; Group Discussions.
10	Greetings and Introduction: Basics of greetings and introduction; formal and informal introduction; Reading comprehension, Vocabulary; Pronunciation: Falling and rising tone; Speaking: Body language; Listening: body language.
11	Listening Skills: Importance of Listening; Listening versus the Sense of Hearing; Listening as Behaviour; Payoffs for Effective Listening; Actions Required for an Effective Listener; Approaches to Listening; Misconceptions and Barriers that Impair Listening; Planning for Effective Listening; How to be a Good Listener?; What Speakers can do to Ensure Better Listening?.
12	Formal and Informal Letters: Distinction between Formal and Informal Letters; Writing Formal Letters; Informal Letters.
13	Communication on the Net: E-Mail; Netiquettes; Blog Writing; Web Writing.

14	Report Writing: Business Reports: Significance; Types of Reports; Five Ws and one H; Report Planning; Report Writing Process; Outline of a Report; Guidelines for Writing Report; Technicalities of Report Writing; Visual Aids in Reports; Criteria used for Judging the Effectiveness of a Report; Illustrations.
15	Job Applications and Resume Writing: Job Application/Covering Letter; Resume/CV Writing.

BIostatistics AND OCCUPATIONAL OPTOMETRY – BOX14201

UNIT	CONTENT
1.	Statistics: Introduction of collection of data- presentation including classifications and diagrammatic representations – frequency distribution; Measures of central tendency; measures of dispersion; Correlation and regression (linear); Probability-simple ideas; Theoretical distributions – binomial, normal; Sampling – necessity of methods and techniques; Chi – square test (2x2).
2.	Hospital Statistics: Introduction to biostatistics epidemiology; Measures of morality; Descriptive epidemiology; Biological variability; Screening; Sampling; Statistical significance; Correlation; Retrospective studies; Prospective studies; Randomized clinical trials; Association and causation; Bias and confounding; Sample size determination; Survival analysis.
3.	Law and Optometry: Legal environment techniques – History, law and equity; History and theory of licensure; Licensure as a means of internal and external discipline-unprofessional conduct; Incompetence-gross immorality; International optometry - important foreign optometry law; Malpractice - theory of liability, damages, minimizing malpractice claims; Insurances; Negligence; Ethics- Professional ethics; Laws governing practice of medical and paramedical profession in India; Present rules and regulations - laws regarding optical product Manufacturers- Dispensing in India.
4.	Occupational Optometry: Introduction to occupational health, hygiene and safety; International bodies like ILO WHO; national bodies like labour institutes; National institutes of occupational health; National safety council etc; A historical perspective.
5.	Industrial Eye Problems and the Ophthalmologist: Analysis of the workplace vision requirements; visual requirements of jobs; visual ergonomics of the office workplace; ergonomic tactics to prevent visual fatigue and other visual disorders; contact lenses in the workplace.
6.	Occupational Diseases: Introduction; ocular diseases caused by physical agents, chemical agents and Biological agents; prevention of Occupational diseases.
7.	Toxicology of Metals and Chemical: Effects and injuries especially on the eye and visual system; Pesticides: general and ocular effects; Dermatitis and heat stress.
8.	Aspects of Vision Loss: Anatomical and structural changes; visual functions; functional vision; societal and economic consequences; impairment versus disability evaluations.
9.	Personal Protective Equipment: General discussion, eye - selection, use and testing for Standards; Medical monitoring.

CONTACT LENSES AND CLINICAL REFRACTION – OPH14203

UNIT	CONTENT
1.	Introduction to Contact Lenses: Definition; Classification/Types; History of Contact Lenses; Terminology of contact lenses.
2.	Optics of Contact Lenses: Magnification & Visual field; Accommodation & Convergence; Back & Front Vertex Power/Vertex distance calculation.
3.	Introduction to Contact Lenses Materials: Monomers, Polymers; Properties of Contact Lenses materials: Physiological (Dk, Ionicity, Water content); Physical (Elasticity, Tensile strength, Rigidity), Optical (Transmission, Refractive index); Indications and contraindications Parameters/Designs of Contact Lenses & Terminology RGP Contact Lens materials; Manufacturing Rigid and Soft Contact Lenses– various methods.
4.	Pre-Fitting Examination: Steps, significance, recording of results, Correction of Astigmatism with RGP lens; Types of fit – Steep, Flat, Optimum – on spherical cornea with spherical lenses; Types of fit – Steep, Flat, Optimum – on Toric cornea with spherical lenses; Calculation and finalizing; Contact lens parameters; Ordering Rigid Contact Lenses– writing a prescription to the Laboratory Checking and verifying Contact lenses from Laboratory; Modifications possible with Rigid lenses.
5.	Common Handling Instructions: Insertion & Removal Techniques; Do's and Don't's; Care and Maintenance of Rigid lenses; Cleaning agents & Importance; Rinsing agents & Importance; Disinfecting agents & importance; Lubricating & Enzymatic cleaners Follow up visit; examination Complications of RGP lenses.
6.	Soft Contact Lenses Fitting Assessment: Types of fit – Steep, Flat, Optimum; Calculation and finalizing SCL parameters; Disposable lenses- Advantages and availability.
7.	Soft Toric Contact Lenses: Stabilization techniques; Parameters election; Fitting assessment; Common Handling Instructions; Insertion & Removal Techniques; Do's and Don't's; Care and Maintenance of Soft lenses; Cleaning agents & Importance; Rinsing agents & Importance; Disinfecting agents & importance; Lubricating & Enzymatic cleaners; Follow up visit examination; Complications of Soft lenses, Therapeutic contact lenses; Indications; Fitting consideration.
8.	Specialty Fitting: Keratoconus; Aphakia; Pediatric; Post refractive surgery; Introduction to Bifocal CL.
9.	Adjunct Examinations: Ophthalmic Case Historian: Visual Acuity, Contrast Sensitivity and Glare Testing, Color Vision, Ocular Motility; Physical Examination: Anterior Segment Evaluation; Posterior Segment Evaluation.
10.	Analysis and Prescription of Optical Corrections: Analysis, Interpretation and Prescription for the Ametropias and Heterophorias; Correction with Single Vision; Correction with Multifocal Spectacle Lenses; Prescription of Absorptive Lenses; Applied Optics of Contact Lens Correction.
11.	Special Conditions: Cases of Infants, Toddlers, and Children: Patients with Amblyopia and Strabismus; Patients with Anisometropia and Aniseikonia; Patients with High Refractive Error; Patients with Irregular Corneal Astigmatism; Case of The Elderly: Patients with Low Vision; Patients with Ocular Pathology.

OCULAR DISEASES AND PHARMACOLOGY – OPH14204

UNIT	CONTENT
1.	Orbit & Ocular Injuries: Proptosis - classification, causes, investigations; Methods of orbital examinations; Congenital and developmental anomalies of orbit; Orbital tumours; Orbital trauma; Inflammation; Ocular therapeutic principles, specific inflammatory diseases; Tumors; Tumours of epithelial origin; Glandular and adenexal tumours; Tumours of neuroectodermal origin; Vascular tumours; Ocular injury: 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.
2.	Disorder of Lids, Lacrimal System and Lens: Eye lid anatomy; Congenital and developmental anomalies of eyelids; Blepharospasm; Ectropion and entropion; Trichiasis and symblepharon; Eyelid inflammations; Eyelid tumours; Ptosis; Eyelid retractions; Eyelid trauma; Lacrimal anatomy; Lacrimal pump; Methods of lacrimal evaluation; Congenital and developmental anomalies of lacrimal system; Lacrimal obstructions; Lacrimal sac tumours; Lacrimal trauma; Ectasia and staphyloma; Scleritis and episleritis; Lens Anatomy and pathophysiology; Normal anatomy and aging process; Developmental defects; Acquired lenticular defects; Management of lenticular defects.
3.	Uveal Tract, Vitreous and Retinal Disorder: Congenital anomalies; Primary and secondary diseases of iris and ciliary body; Tumours; Anomalies of pupillary reactions; Congenital anomalies of choroids; Diseases of choroids; Tumours; Vitreous developmental abnormalities; Hereditary hyaloid retinopathies; Juvenile retinoschisis; Asteroid hyalosis; Cholesterolosis; Vitreous haemorrhage; Blunt trauma and the vitreous; Inflammation and vitreous; Parasitic infestations; Pigment granules in vitreous; Vitreous complications in cataract surgery; Retinal vascular diseases; Diseases of choroidal vasculature, Bruch's membranes and retinal pigment; epithelium; Retinal tumours; Retinoblastoma; Phakomatoses; Retinal vascular anomalies; Retinal and optic nerve head astrocytomas;

	Other retinal disorders; Retinal inflammations; Metabolic diseases affecting the retina; Miscellaneous disorders; Electromagnetic radiation effects the retina; Retinal physiology and psychophysics; Hereditary macular disorders including albinism; Peripheral retinal Degenerations; Retinal holes and detachments; Intraocular foreign bodies; Photocoagulation.
4.	Corneal Disorder: Applied anatomy and physiology; Congenital anomalies - Megalocornea; microcornea; corneaplana, congenital cloudy cornea; Inflammations of the cornea; topographical classifications: ulcerative keratitis and non-ulcerative; Etiological classification: infective, allergic, trophic, traumatic, idiopathic; Degenerations: classifications, arcus senilis, vogt's white limbal girdle, hassall henle bodies, lipid keratopathy, band shaped keratopathy, Salzmann's nodular degeneration, droplet keratopathy, pellucid marginal degeneration; Dystrophies: Reis Buckler dystrophy, recurrent corneal erosion syndrome, Granular dystrophy, Lattice dystrophy, Macular dystrophy, cornea guttata, Fuch's epithelial endothelial dystrophy, congenital endothelial dystrophy, Keratoconus, keratoglobus; Corneal oedema, corneal opacity, corneal vascularisation; Penetrating keratoplasty; Sclera and Episclera - Episcleritis and scleritis.
5.	Glaucoma: Applied anatomy and physiology of anterior segment; Clinical Examination; Definitions and classification of glaucoma; Pathogenesis of glaucomatous ocular damage; Congenital glaucomas; Primary open angle glaucoma; Ocular hypertension; Normal Tension Glaucoma; Primary angle closure glaucoma (Primary angle closure suspect, Intermittent glaucoma, acute congestive, chronic angle closure); Secondary Glaucomas; Management: common medications, laser intervention and surgical techniques.
6.	General Pharmacology: Definitions and different branches of Pharmacology; Routes of drug administration; Absorption, Distribution, Metabolism and excretion of drugs; General mechanism of drug action; Bioassay procedures(specific); Instruments used in Pharmacology; Clinical trials-basic aspects.
7.	Drugs Acting on Nervous System: General anesthetics; Anxiolytic and hypnotic drugs; Psychotropic agents; Epilepsy and Anticonvulsant drugs; Narcotic analgesics and antagonists; Centrally acting muscle relaxation and antiparkinsonism agents; Analgesics, antipyretics, anti-inflammatory agents ant antirheumatic and antigou drugs; Central nervous system stimulant; Local anesthetics; Autonomic nervous system and neurohumoral transmission; Cholinergic or parasympatholytic drugs; Antinicholinergic or parasympathomimetic drugs; Adrenergic or sympathomimetic drugs; Anti adrenergic or sympatholytic drugs; Drugs acting on autonomic ganglion; Neuromuscular blockers.
8.	Drugs Acting on Respiratory System & Cardiovascular System: Bronchodilators and analeptics; Nasal decongestants, expectorants and antitussive agents. Antiarrhythmic drugs; Cardiotonics; Antianginal drugs; Antihypertensive drugs; Drugs used in atherosclerosis.
9.	Drugs Acting on Blood and Blood Forming Organs: Haematinics; Coagulants; Anticoagulants; Blood and plasma expanders.
10.	Hormones and Hormone Antagonists: Antithyroid drugs; Hypoglycaemic agents; Sex hormones and oral contraceptives; Corticosteroids.
11.	Opioid Analgesics: Endogenous opioid peptides; Opioid receptors; Effects of clinically used opioids; Morphine and related opioid agonists; Acute opioid toxicity; Opioid agonist & antagonist; Therapeutic uses of opioid analgesics.
12.	Ocular Pharmacology: Pharmacokinetics and toxicology of ocular therapeutic agents: Drug delivery strategies; Pharmacokinetics; Therapeutic and diagnostic applications of drugs in ophthalmology; Chemotherapy of Microbial Diseases in the Eye: Therapeutic uses of anti-bacterial, anti-viral, anti-fungal & anti-protozoal agents; Use of autonomic agents in the eye; use of immune modulatory drugs for ophthalmic therapy; Drugs and biological agents used in ophthalmic surgery; Agents used to assist in ocular diagnosis; Use of anesthetics in ophthalmic procedure; other agents in ophthalmic therapy.

UNIT	CONTENT
1.	Introduction to Optoelectronics: Nature of light; Maxwell's equations; Electromagnetic spectrum.
2.	Introduction to Geometric Optics: Laws; Postulates; reflection and refraction of light; total reflection.
3.	Luminescence and Associated Phenomena: Photoluminescence, catodo-luminescence, electroluminescence.
4.	Liquid Crystals: Properties; devices; applications; display systems.
5.	Light Emitting Diodes: Properties; devices; applications; display systems; Laser diode; Laser diode devices; applications.
6.	Photo-Detectors: Properties; photonic devices; applications.
7.	Optical Fibers: Classification; propagation of radiation; manufacturing technologies; coupling and joints, applications.
8.	Optic Fiber Communications: Fiber channel distribution information; optic modulation of information; modulation of circuits.
9.	Important Application of Optoelectronics: Opto-isolators; Optical fiber communications.

MATHEMATICAL ANALYSIS AND GEOMETRIC OPTICS – OPH14206

UNIT	CONTENT
1.	Mathematical Analysis: Set; Figures - Sequences and series of figures; Relations; Functions - sequences and series of functions; Limits; Continuity; Differentiation on R; Functional dependence; Extremum and conditioned extremum; Primitives of functions and Riemann integrals; Parameter integrals; Euler Functions; Multiple integrals; Line integrals and surface integrals.
2.	Descriptive Statistics: Tabular and graphic description of qualitative variables (categorical); Quantitative description of quantitative variables and positional parameters of dispersion; Relationship between two qualitative variables; Relationship between a qualitative variable and a quantitative variable; The description of the relationship between two quantitative variables; The regression line.
3.	Geometric Optics: Introduction; Principles and fundamental laws of geometric optics; Reflective optics - mirrors, blades dividers; Refracted optics- blade plane- parallel light, convergent lenses, divergent lens; Optical instruments; Light- dual nature- particle & wave nature, speed, wave length & frequency of light; Fermats' principle- laws of relation & refraction at a plane surface using Fermats' principle; Snells' law, relative and absolute refractive indices, total internal reflection and Critical angle, refraction by plane parallel slab of glass; molecular basis of reflectively.
4.	The Ray Model of Light: Geometrical path length & optical path length of rays, Concept of wave fronts & rays, concept of vergence, divergence, convergence, Refraction by spherical surfaces - convex & concave, Derivation of vergence equation, focal points, deportee power, image point, lateral & axial magnification, simple numerical; Total internal reflection- Fiber optics and its application.
5.	Thick and Thin Lens: Thin Lens – shapes; derivation of lens makers' formula; thin lens vergence equation; equivalent focal length of two thin lenses separated by a distance & placed in contact; lateral magnification of thin lenses in contact; simple numerical; concept of reduced systems.
6.	The Lens Equation: Thin lens equation and diverging lenses; Magnification equation; Magnification signs and measurement; Magnification of a converging lens and diversing lens; Maxwell's equation; Eikonal equation.
7.	Cylindrical and Sphero-cylindrical Lenses: Location of foci-image planes; principle meridians refraction by a cylindrical lens; calculation of power in different meridians; sphero-cylindrical lenses; circle of least confusion; refraction through a sphro-cylindrical lens; writing Rx indifferent forms (+cyl., -cyl., meridional); additional sphro-cylinders; oblique-cylinders.
8.	Stops, Pupils and Ports: Entrance pupil & exit pupil (size & location); Field stop; Entrance port & exit port; Field of view, Vignetting; Depth of field and depth of focus.
9.	Laser Optics: Basic laser principles – spontaneous and stimulated emission; Coherence – spatial, temporal, laser pumping - population inversion optical feedback; Gas lasers, solid lasers, helium-neon laser- Argon-ion laser-ruby laser; Monocular laser-carbon dioxide, eximer laser - Semiconductor lasers; Lasers in medicine ophthalmic applications.

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OPTOMETRIC INSTRUMENTS – OPH14207

UNIT	CONTENT
1.	Optical Instrument: Binocular Vision; Simple and compound microscope- Objective lens and eyepiece, oil immersion lens; Telescope; Astronomical telescope.
2.	Refractive Instruments: Test chart standards; Choice of test charts; Trial case lenses – best forms; Refractor (phoropter) head units –Auto refractors; Optical considerations of refractor units; Trial frame design; Near vision difficulties with units and trail frame; Retinoscope – types available; Adjustment of retinoscopes – special features; Cylinder retinoscopy; The interpretation of objective findings; Special subjective test – polarizing

	and displacement – etc., simultan test; Projection charts; Illumination of the consulting room; Special Instruments- Brightness acuity test; Vision analyzer; Pupilometer; Video acuity test; Nerve fiber analyzer.
3.	Ophthalmoscopes and Related Devices: Design of ophthalmoscopes- Illumination/viewing; Ophthalmoscope disc; Filters for ophthalmoscopy; Indirect ophthalmoscopes; The use of the ophthalmoscope in special cases.
4.	Slit Lamp and Tonometer: Slit lamp systems; Viewing microscope systems; Scanning laser devices, Slit lamp accessories, Mechanical design in instruments; Tonometer- Tonometer principles, Types of tonometer and standardization, Use and interpretation of tonometer.
5.	Orthoptic Instrument and Fundus Camera: The fundus camera – principles; The fundus camera – techniques; External eye photography – apparatus; Keratometer and corneal topography; Refractionometer; Orthoptic Instruments – haploscopes; Orthoptic Instruments – home devices; Orthoptic Instruments – pleoptics; Historical instruments.
6.	Fields of Vision and Screening Devices: Perimeter and the visual field; Illumination of field testing instruments; Projection perimeters; Screening devices for field defects; Results

	of field examination; Vision screeners – principles; Vision screeners – details; Analysis of screener results; Bowl perimeters; Goldmann and Humphery Vision Analyzer.
7.	Colour Vision Testing Devices: Colour confusion/Hue discrimination/Colour matching; FM-100 hue test; Ophthalmic Ultrasonography- Biometry/Ultrasound/'A' Scan/'B' Scan/UBM; Electro diagnostics- ERG/VEP/EOG.
8.	Instrument Used for Corneal Examination: Placido disc; Keratometer; Corneal topography; Specular Microscopy.
9.	Advanced Optometric Instrument: Retinal Camera; Photocoagulation Laser; Corneal Cell Counter; Wavefront Aberrometer; Laser Ophthalmoscope.

YEAR III

CLINICAL INVESTIGATIVE OPTOMETRY – OPH14306

UNIT	CONTENT
1.	Basic Investigative Optometry: Syringing and lacrimal function tests; Ophthalmoscopy: Direct & Indirect; slit-lamp biomicroscope; Tonometry: Schiottz, Applanation & Non-contact; Colour vision testing; Contrast sensitivity testing; Glare testing; Perimetry: Goldmann, Humphrey & FDT; Exophthalmometry; Pachymetry: Optical & Ultrasonic; Keratometry; Lensometry.
2.	Assessment of Sensory Status: Worth's Four Dot Test; Bagolini striated glasses test; 4Δ base out test; Stereopsis; Major Amblyoscope Test; Red Filter Test; Afterimage Test.
3.	Assessment of Accommodation and Convergence: Positive and Negative Accommodation; Near point of Accommodation; Near point of Convergence; Accommodative/convergence Ratios- gradient and heterophoria method; Accommodative facility.
4.	Assessment of Comitancy: Park-Helveston Three Step Test; Prism Reflex Test - 20Δ.
5.	Assessment of Binocular Vision: Motor tests – Hirschberg test; Krimsky test; Cover test; Prism cover test; Double Maddox Rod Test.
6.	Anterior Segment Assessment and Clinical Interpretation of Findings: Anterior segment optical coherence tomography (AS-OCT); Confocal microscopy; Gonioscopy; Corneal topography procedures; Anterior eye photography methods.
7.	Posterior Segment Assessment and Clinical Interpretation of Findings: Including: Ocular blood flow (POBF); retinal photography; posterior eye optical coherence tomography (OCT); scanning laser ophthalmoscopy; Optos.
8.	Electrophysiological Assessment and Clinical Interpretation of Findings: Electro-oculogram (EOG); Electroretinogram (ERG): multifocal electroretinogram (mfERG); visual evoked potentials (VEP); functional magnetic resonance imaging (fMRI); magneto-encephalography (MEG).
9.	Ocular Biometry: Use of biometric techniques and their utilisation in optometry and ophthalmology - Including Partial coherence interferometry (PCI); ophthalmophakometry; structural Magnetic Resonance Imaging (MRI); ultrasound biomicroscopy (UBM); Fluorescein angiography (FA).

ADVANCED CONTACT LENSES AND LOW VISION AIDS – OPH14307

UNIT	CONTENT
1.	Advanced Contact Lenses: Brief introduction; Historical development of Contact lenses: Design of CL & effect of parameter changes in the fitting; Cosmetic & Prosthetic Contact Lenses & their management; Ortho-Keratology.
2.	Advanced Contact Lens Materials: Brief description of properties of: p-GMA/HEMA, Hioxifilcon A, B, D and the hybrid GMA polymer; p-HEMA/MA, Methafilcon, Ocufilecon, Etafilecon; p-MMA/NVP, Lidofilcon A, B, C and modified Lidofilcons such as Acofilecon A and B; p-HEMA, Polymacon; p-HEMA/NVP, Hefilcon A, B and C; benefits and properties of Benz-G Materials; Different generations of silicon hydrogel materials.
3.	Advances in Soft Lens Fitting: Routine pre-fitting examinations; Fitting philosophies of Soft & RGP Contact Lenses; Description of new approach to Fitting Soft Contact Lenses: Toric Soft Lens Fitting; Advanced GP Lens Fitting; Advanced Soft Lens Fitting; Speciality Soft Lenses Fitting; Speciality GP Lenses Fitting; Scleral lens fitting.
4.	Realities of Presbyopia: Modern RGPs and semi-sclerals; Contact lenses for the presbyopic patient & their management; Contact lens complications and their management.
5.	Future Prospects of Contact Lenses: Introduction; Review of contact lenses available in India; Disease Monitoring; Drug Delivery; Stem Cell-Coated Lenses; Photochromic Contact Lenses; Electronic Viewing; Challenges in future.
6.	Low Vision Aids: Introduction and definition; identifying the low vision patients; history; diagnostic procedures in low vision case management.
	Optics of Low Vision Aids: Special charts; radical radiology; evaluating near vision-amsler grid and field defects; prismatic scanning; demonstrating aids-optical, non-optical,

7.	electronic; Teaching the patient to use aids including eccentric; spectacle mounted telescopes and microscopes; guidelines to determine magnification and selecting low vision aids for distance, intermediate and near vision.
8.	Children with Low Vision: Choice of tests, aids in different pathological conditions; light, glare and contract in low vision care and rehabilitation; bioptic telescope.
9.	Optical Devices to Help People with Field Defects: Contact lens combined system; rehabilitation of the visually handicapped.

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COMMUNITY OPTOMETRY AND EYE BANKING – OPH14308

UNIT	CONTENT
1.	Public Health Optometry: Concepts and implementation; Global medicine and evolution of public health in India; Health care delivery systems in India and determinants of health; Levels of prevention-optometrist's role in community; Concepts of national health programme; Screening in population.
2.	Eye Care Programme: School Eye screening programme; Primary eye care; Organization of Out-reach services; Organization of Reach-in programmes; Rehabilitation of the visually impaired; National programme for the control of Blindness (NPCB); Nutritional blindness with reference to vitamin A deficiency; Vision 2020: The right to sight.
3.	Eye Diseases and Care: Epidemiology of blindness-cataract, glaucoma, deficiency disorders; Scope of geriatric ophthalmology in preventive and rehabilitation care; Natural history of disease; transmission of disease; Basics in research methodology in populations.
4.	Specialized Public Relations: Demography and vital statistics; National and international agencies in health plan; Fundamentals of health economics, health plan; Quality assessment in health delivery programmes.
5.	Health Services: Principles of primary, secondary and tertiary care; Planning of health services; Health manpower planning and health economics; Health manpower development; Basic O.T Practices; Familiarity with use of Operating Microscope.
6.	Eye Problems: Role of an optometrist in Public Health; Health care's insurance including role of TPA; Ocular emergencies: Foreign body; Eye Pain; Watering; Injuries-perforating, non-perforating & chemical.
7.	Public Relation in Action: Organization and management of eye care programs – service delivery models; Contrasting between clinical and community health programmes; Optometrist role in school eye health programmes; Basis of Tele Optometry and its

	application in public health.
8.	Eye Banking: Publicity; How to donate your eyes; Collection of donor eyes; Preservation of eyes; General concepts about corneal transplantation.
9.	Facilities, Equipment & Maintenance: Facilities, Procedure manuals, Infrastructure, Eye bank maintenance, Equipment maintenance and cleaning, Instruments and reagents, Infection control and safety, Waste disposal; Donor Tissue Preservation Standards: In Situ and Laboratory Removal of Corneo-scleral Rim; Short Term Preservation; Long Term Preservation; Whole Globe Preservation; Sclera Preservation; Donor Blood Screening: HIV Screening; Hepatitis B & C Screening; HTLV-I and HTLV-II Screening; Syphilis Screening; Non-Required Laboratory Results; Quality assurance; Quality control; Non-surgical donor tissue; Storage; Labeling; Distribution of tissue.

GERIATRIC AND PEDIATRIC OPTOMETRY – OPH14309

UNIT	CONTENT
1.	History: Genetic factors; Prenatal factors; Perinatal factors; Postnatal factors; Measurement of visual acuity.
2.	Normal Appearance, Pathology and Structural Anomalies: Orbit; Eyelids; Lacrimal system; Conjunctiva; Cornea; Sclera; Anterior chamber; Uveal tract; pupils; Lens; Vitreous; Funds; Oculomotor system.
3.	Measurement and Determination: Refractive status; Determining binocular status; Determining sensory and motor adaptability.
4.	Compensatory Treatment and Remedial Therapy: Myopia; Pseudo myopia; Hyperopia; Astigmatism; Anisometropia; Strabismus; Amblyopia; Nystagmus
5.	Anomalies of Vergence and Accommodation: Anomalies of Accommodation; Anomalies of Vergence.
6.	Geriatric Optometry: Physiological changes in the eye; Optical and refractive changes in the eye.
7.	Structural Changes in the Eye and Old Eye Disorders: Aphakia; Ocular diseases common in old eye with special reference to cataract disorders; vascular diseases and degenerative conditions of the eye.
8.	Special Considerations in Ophthalmic Dispensing to the Elderly: Management of visual problems of aging; How to carry on one's visual tasks overcoming the problems of aging.
9.	Visual Disorder and Management: Visual Disorders in senior citizens; evaluation; diagnosis and management.

CLINICAL AND ADVANCED ORTHOPTICS – OPH14310

UNIT	CONTENT
1.	Clinical Orthoptics: General concept; Binocular vision & Space perception - Fusion, Diplopia, Correspondence, Stereopsis, Panum's area, Fixation disparity, Horopter, BSV, Retinal rivalry, Physiological diplopia, Stereopsis & monocular clues, Egocentric localization, Theories of Binocular vision.
2.	Ocular Muscles and Movements: Orbital muscles; Extraocular muscles- Voluntary and Involuntary; Eye movement- Smooth tracking, Saccades and Fixation; Reflex eye movement - VOR (vestibular ocular reflexes), Optokinetic reflex, Smooth pursuit.
3.	Laws of Ocular Motility: Introduction; Recti muscles, Oblique muscles, Yoke muscles; Duction; Fusion; Heterophoria; Heterotropia/Strabismus and Types; Sensory changes in strabismus; Orthophoria; Primary deviation, Secondary deviation; Synergistics and Antagonistics; Examination specific for ocular motility; Sherringtons; Law; Hering's Law.
4.	Uni-ocular & Binocular Movements : Version & Vergence; Fixation & field of fixation; Near vision complex (Accommodation, Convergence & Pupillary constriction); Confusion & Diplopia; Suppression; Stereopsis; Asthenopia & Diplopia.
5.	Visual Acuity Assessment in Children: Definition of visual acuity; Methods of testing visual acuity in infants- Fixation maintain, Fixation preference, Optokinetic Nystagmus (OKN), Force Choice Preferential Looking Test (FCPL), Visual Evoked potential (VEP);

	Methods of testing visual acuity in toddlers - Hundred & Thousand Sweet test, The Cardiff acuity test, Dott Visual acuity test; Methods of testing visual acuity in school going children - Tumbling E-chart, Landolt C-chart, Sjogren Hand chart, Snellen's chart, Log Mar chart; Pediatric Refraction.
6.	Investigations of Normal Binocular Function & Vision: Ocular examinations: History taking; Hirschberg test; Krimsky test; Cover, cover-uncover & alternate cover tests; Prism bar cover test; Maddox rod test; Maddox wing test; Heterophoria: Classification, examination & management; Amblyopia: Definition, types, examination & management; Anomalous retinal correspondence (ARC): types & examination; Pseudotropia & measurement of angle kappa; Measurement of ocular deviation: Objective & subjective methods; Exotropia: Classification, examination & management; Esotropia: Classification, examination & management; Alphabet Phenomena/ Pattern; Cyclo-vertical deviations: Classification, examination & management.
7.	Advanced Optics: Anisometropia; Aniseiconia; Accommodation & Convergence - Far point, near point, range, amplitude of accommodation; Accommodation & Convergence - Methods of measurements; NPA; AC I A ratio. Disorders of Human Eye Accommodation: Definition of eye accommodation;
8.	Theories of mechanism - Helmholtz, Schachar, Catenary; Induced effects of accommodation; Accommodative dysfunction - accommodative insufficiency, paralysis of accommodation, spasm of accommodation, accommodative esotropia, myopia, presbyopia, pseudomyopia.
9.	Neuro-Ophthalmology: Neuro-ophthalmic examination; History & Visual function test; Technique of pupillary examination; Ocular motility; Checklist for testing; Visual sensory system - The retina optic disc, optic nerve, optic chiasma, optic tracts; The lateral geniculate body, optic radiations, visual cortex; The visual field; Disorders of visual system; Ocular motor system - Supranuclear control of eye movements; Saccadic system - Clinical disorders of the saccadic system, Gaze palsies, Parkinson's disease; Smooth pursuit system and disorders; Non visual reflex system; Position maintenance system; Nystagmus; Ocular motor nerves and medial longitudinal fasciculus - The facial nerve, Pain and sensation from the eye, Autonomic nervous system, Selected system disorders with neuro-ophthalmologic signs.