SYLLABUS PRIOR REVISION
FOR
BACHELOR OF SCIENCE
(OPTOMETRY)

SUSHIL KUMAR THAKUR
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BAREILLY INTERNATIONAL UNIVERSITY

FACULTY OF PARAMEDICAL SCIENCES

SYLLABUS

Course: - B.Sc. (Optometry)

Session-2019-2020

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First Semester

Total Hrs. 30

GENERAL ANATOMY

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

Unit-II Tissues of the Body: Epithelium, connective tissue, bone and cartilage, Embryology, histology, different types of each of them, types of cells, cellular differentiation and arrangements in different tissues, Muscles: Different types of muscles, their functional differentiation, their relationship with different structures, their neural supply.

Unit-III Blood vessels: Differentiation between arteries and veins, embryology, histology of both arteries and veins, Functional differences between the two, anatomical differences at different locations, Skin and appendages: Embryology, anatomical differences in different areas, functional and protective variations, innervations, relationship with muscles and nerves.

Unit-IV Glands: Embryology, different types of glands (exocrine and endocrine), functional differences, neural control of glands, Lymphatic system: Embryology, functions, relationship with blood vessels and organs.

Unit-V Nervous system: Parts of Nervous system, cell types of nervous system, Blood-brain barrier, Reflex arc, Peripheral Nerves, Spinal nerves, Nerve fibers, Autonomic Nervous system, Brain and Cranial nerves: Major parts of Brain, Protective coverings of the Brain, Cerebrospinal Fluid, Brain stem, Cerebellum, Diencephalon, Cerebrum, Cranial nerves.

Total Hrs. 15

PRACTICAL

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.

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Total Hrs. 30

GENERAL PHYSIOLOGY

Unit-I CELL STRUCTURE & ORGANIZATION, Tissue organization Epithelium, Connective tissue, Collagen fibers, Elastic fibers, Areolar fibers Cartilage, Bone, Contractile tissue, striated, skeletal, cardiac, non striated, plain, myoepithelial General principles of cell physiology, Physiology of skeletal muscle, BLOOD: Composition, Volume measurement & variations, Plasma proteins, classification & functions, Red blood cells, development, morphology & measurements , functions & dysfunctions, White blood cells, development, classification, morphology, functions & dysfunctions, Platelets, morphology, development, functions & dysfunctions Clotting, factors, mechanism, anti-coagulants dysfunctions, Blood grouping, classification, importance in transfusion, Rh factor & incompatibility, Suspension stability Osmotic stability, Reticulo endothelial system, Spleen, lymphatic tissue, Thymus, bone marrow immune system, cellular, Humoral, Autoimmune.

Unit-II DIGESTION: General arrangement, Salivary digestion –functions & regulations Gastric digestion, functions & regulations Pancreatic digestion, functions & regulations Intestinal, digestion, functions & regulations Liver & bile, Absorption Motility Deglutition Vomiting Defecation, Functions of large intestine, Neurohumoral regulations of alimentary functions, summary, 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-III 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, REPRODUCTION: Male reproductive system, control & regulation, Female reproductive system, uterus, ovaries, menstrual cycle, regulation, pregnancy & delivery, breast, family planning.

Unit-IV RESPIRATION: Mechanics of respiration, pulmonary function tests, transport of respiratory gases, neural and chemical regulation of respiration, hypoxia, cyanosis, dyspnoea, asphyxia. CIRCULATION: General principles, Heart: myocardium, innervations, transmission of cardiac impulse Events during cardiac cycle, cardiac output. Peripheral circulation: peripheral resistances, arterial blood pressure, measurements, factors regulation variations, capillary circulation, venous circulation. Special circulation: coronary cerebral, miscellaneous.

Unit-V ENVIRONMENTAL PHYSIOLOGY, Body temperature regulation (Thermal Physiology). Exposure to low and high atmospheric pressure, [illegible]

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

Total Hrs. 15

PRACTICAL

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

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Total Hrs. 30

GENERAL BIOCHEMISTRY

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)

Total Hrs. 15

PRACTICAL

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.

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Total Hrs. 45

GEOMETRICAL OPTICS-I

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

Wavefronts, spherical, elliptical and plane; Curvature and vergence; rays; convergence, and divergence in terms of rays and vergence; vergence at a distance,

Refractive index; its dependence on wavelength,

Fermat's and Huygen's Principle, Derivation of laws of reflection and refraction, (Snell's law) from these principles,

Plane mirrors, height of the mirror; rotation of the mirror.

Unit-II Reflection by a spherical mirror –paraxial approximation; sign convention; derivation of vergence equation,

Imaging by concave mirror, convex mirror,

Reflectivity; transmissivity; Snell's Law, Refraction at a plane surface,

Glass slab; displacement without deviation; displacement without dispersion,

Thick prisms; angle of prism; deviation produced by a prism; refractive index of the prism, Prisms; angular dispersion; dispersive power; Abbe's number.

Unit-III Definition of crown and flint glasses; materials of high refractive index,

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

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

Vergence at a distance formula; effectivity of a refracting surface.

Unit-IV Definition of a lens as a combination of two surfaces; different types of lens shapes, Image formation by a lens by application of vergence at a distance formula; definitions of front and back vertex powers; equivalent power;

Newton's formula; linear magnification; angular magnification,

Nodal Planes,

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

Imaging by a thin concave lens; image properties (real/virtual; erect/inv for various object positions,

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Prentice's Rule,

System of two thin lenses; review of front and back vertex powers and equivalent, power, review of six cardinal pointsm,

System of more than two thin lenses; calculation of equivalent power using, magnification formula.

Total Hrs. 15

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.

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Total Hrs. 15

NUTRITION

Unit-I Introduction, History of Nutrition, Nutrition as a science, Food groups, RDA, Balanced, diet, diet planning, Assessment of nutritional status, Energy, Units of energy, Measurements of energy and value of food, Energy expenditure, Total energy/calorie requirement for different age groups and diseases, Satiety value, Energy imbalance- obesity, starvation, Limitations of the daily food guide.

Unit-II Sources and functions, Essential and non- essential amino- acids, Incomplete and complete proteins, Supplementary foods, PEM and the eye, Nitrogen balance, Changes in protein requirement, Fats, Sources and functions, Essential fatty acids, Excess and deficiency, Lipids and the eye, Hyperlipidemia, heart diseases, atherosclerosis.

Unit-III Minerals, General functions and sources ,Macro and micro minerals associated with the eye, Deficiencies and excess ,ophthalmic complications (e.g. iron, calcium, iodine etc.)Vitamins General functions, and food sources,

Unit-IV Vitamin deficiencies and associated eye disorders with particular emphasis to Vitamin A promoting sound habits in pregnancy, lactation and infancy,Nutrient with antioxidant properties , Digestion of Proteins, carbohydrates & lipids.

Unit-V Essential amino acids, Miscellaneous, Measles and associated eye disorders, low birth weight.

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Total Hrs. 15

BASIC COMPUTERS AND INFORMATION SCIENCE

Unit-I Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages, Input output devices: Input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems).

Unit- II Processor and memory: The Central Processing Unit (CPU), main memory, Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

Unit- III Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.) 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.

Unit- IV Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs, Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.

Unit- V Introduction of Operating System: introduction, operating system concepts, types of operating system, Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.

Unit- VI Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW), www browsers, use of the internet. Application of Computers in clinical settings.

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ENGLISH AND COMMUNICATION:-

Total Hrs. 15

ENGLISH

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

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

Unit-II 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.

Unit-III Listening-Importance of listening, Self-assessment, Action plan execution, Barriers in listening, Good and persuasive listening.

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

Unit-V Non Verbal Communication-Basics of non-verbal communication, Rapport building skills using neuro- linguistic programming (NLP), Communication in Optometry practice.

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BASICS OF COMPUTER **Total Hrs. 15**

Unit-I Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages, Input output devices: Input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems).

Unit- II Processor and memory: The Central Processing Unit (CPU), main memory, Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

Unit- III Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.) 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.

Unit- IV Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs, Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.

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Second Semester

Total: 45 hours

OCULAR ANATOMY

Unit-I Central nervous system: Spinal cord and brain stem, Cerebellum, Cerebrum.

Unit-II Orbit, Eye, Sclera, Cornea, Choroid, Ciliary body, Iris, Retina

Unit-III Refractory media-Aqueous humor Anterior chamber, Posterior chamber, Lens, Vitreous body

Unit-IV Eyelids, Conjunctiva

Unit-V Embryology

Total: 15 hours

PRACTICAL

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

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Total: 45 hours

OCULAR PHYSIOLOGY

Unit-I 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, Cornea, Aqueous humor and vitreous: Intra ocular pressure

Unit-II Iris and pupil, Crystalline lens and accommodation – presbyopia, Retina – structure and functions, Vision – general aspects of sensation, Pigments of the eye and photochemistry

Unit-III The visual stimulus, refractive errors, Visual acuity, Vernier acuity and principle of measurement, Visual perception – Binocular vision, stereoscopic vision, optical illusions, Visual pathway, central and cerebral connections, Colour vision and colour defects. Theories and diagnostic tests

Unit-IV Introduction to electro physiology, Scotopic and Photopic vision, Color vision, Color mixing, Mechanism of accommodation, Retinal sensitivity and Visibility

Unit-V Receptive stimulation and flicker, Ocular, movements and saccades, Visual perception and adaptation, Introduction to visual psychology (Psychophysics)

Total: 15 hours.

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)

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Total: 15 hours

OCULAR BIOCHEMISTRY

Unit-I Hormones basic concepts in metabolic regulation with examples say insulin.

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

Unit-III 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

Unit-IV 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.

Unit-V Clinical Biochemistry: Blood sugar, urea, creatinine and bilirubin significance of their estimation.

Total: 15 hours

PRACTICAL

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)

5.4 Milk analysis.

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PHYSICAL OPTICS

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

Unit – III Intensity of polarized light; Malus'Law; polarizers and analyzers; Methods of producing polarized light; Brewster's angle, Birefringence; ordinary and extraordinary rays, Relationship between amplitude and intensity, Coherence; interference; constructive interference, destructive interference; fringes; fringe width, Double slits, multiple slits, gratings, Diffraction; diffraction by a circular aperture; Airy's disc, Resolution of an instrument (telescope, for example); Raleigh's criterion.

Unit – IV Scattering; Raleigh's scattering; Tyndall effect, Fluorescence and Phosphorescence, Basics of Lasers –coherence; population inversion; spontaneous emission; Einstein's theory of lasers.

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

Total Hrs. 15

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

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GEOMETRICAL OPTICS II

Unit-I Vergence and vergence techniques revised, Gullstrand's schematic eyes, visual acuity, Stile Crawford

Unit-II Emmetropia and ametropia, Blur retinal Imaginary

Unit-III 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, Thin lens model of the eye –angular magnification –spectacle and relative spectacle magnification, Aperture stops- entrance and exit pupils.

Unit-IV Astigmatism. - To calculate the position of the line image in a sphero-cylindrical lens, Accommodation –Accommodation formulae and calculations.

Unit-V Presbyopia- Spectacle magnification, angular magnification of spectacle lens, near point, calculation of add, depth of field, Spatial distribution of optical information- modulation transfer functions- Spatial filtering- applications, Visual optics of aphakia and pseudophakia.

Total: 15 hours

PRACTICAL:

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

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Total: 15 hours

CLINICAL OPTOMETRY I (STUDENTSHIP):

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.

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ENVIRONMENTAL SCIENCE S

Unit I

General

I:-Biotic and a biotic environment

II:-Adverse effects of Environment Pollution

III:-Control strategies

(B):-Water Pollution:

I-Water Quality standards for potable water

II-Impurities in water and their removal

III:Defluoridation

IV:Self purification of streams

(C):-Air pollution;

I-Source of air contaminants

II-Adverse effects on human health

III-Measures to check air pollution

IV-Greenhouse effect

V-Acid Rain

VI-Ozone depletion

Unit II

Biomedical Waste Management

I-Introduction to Bio-medical waste

II-Types of bio-medical waste

III-Collection of bio-medical waste

IV-Treatment and disposal of bio-medical waste

(B)Solid waste Management

I-Introduction to solid waste

II-Its collection and disposal

III-Sanitary land-filling

IV-Vermin-composting

V-Hazardous waste management

Unit III

Land Pollution

I-Soil conservation

II-Land erosion

(B)Ecology

I-Busies of species

II- Biodiversity

III-Population dynamics

IV-Energy flow

V-Ecosystems

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Third Semester

Total: 15 hours.

OCULAR MICROBIOLOGY

Unit-I Morphology and principles of cultivating bacteria, Sterilization and disinfections used in laboratory and hospital practice.

Unit-II Common bacterial infections of the eye.

Unit-III Common fungal infections of the eye.

Unit-IV Common viral infections of the eye.

Unit-V Common parasitic infections of the eye.

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Total: 15 hours.

VISUAL OPTICS I

Unit-I Review of Geometrical Optics: Vergence and power, Conjugacy, object space and image space, Sign convention, Spherical refracting surface, Spherical mirror; catoptric power, Cardinal points, Magnification, Light and visual function, Clinical Relevance of: Fluorescence, Interference, Diffraction, Polarization, Bi-refringence, Dichroism, Aberration and application Spherical and Chromatic.

Unit-II Optics of Ocular Structure, Cornea and aqueous, crystalline lens, Vitreous, Schematic and reduced eye

Unit-III Measurements of Optical Constants of the Eye, Corneal curvature and thickness, Keratometry

Curvature of the lens and ophthalmophakometry, Axial and axis of the eye, Basic Aspects of Vision, Visual Acuity, Light and Dark Adaptation, Color Vision, Spatial and Temporal Resolution, Science of Measuring visual performance and application to Clinical Optometry.

Unit-IV Refractive anomalies and their causes, Etiology of refractive anomalies, Contributing variability and their ranges, Populating distributions of anomalies, Optical component measurements, Growth of the eye in relation to refractive errors.

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Total: 45 hours.

OPTOMETRIC OPTICS I

Unit-I Introduction –Light, Mirror, Reflection, Refraction and Absorption, Prisms –Definition, properties, Refraction through prisms, Thickness difference, Base-apex notation, uses, nomenclature and units, Sign Conventions, Fresnel's prisms, rotary prisms

Unit-II Lenses –Definition, units, terminology used to describe, form of lenses, Vertex distance and vertex power, Effectivity calculations

Unit-III Lens shape, size and types i.e. Spherical, cylindrical and Sphero-cylindrical, Transpositions –Simple, Toric and Spherical equivalen.

Unit-IV Prismatic effect, centration, decentration and Prentice rule, Prismatic effect of Plano-cylinder and Spherocylinderlenses, Spherometer & Sag formula, Edge thickness calculations

Unit-V Magnification in high plus lenses, Minification in high minus lenses, Tilt induced power in spectacles, Aberration in Ophthalmic Lenses.

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Total: 30 hours

OPTOMETRIC INSTRUMENTS

Unit-I Refractive instruments, Optotypes and MTF, Spatial Frequency, Test charts standards, Choice of test charts, Trial case lenses, Refractor (phoropter) head units, Optical considerations of refractor units, Trial frame design, Near vision difficulties with units and trial frames, Retinoscope – types available, Adjustment of Retinoscopes- special features, Objective optometers, Infrared optometer devices, Projection charts, Illumination of the consulting room, Brightness acuity test, Vision analyzer, Pupilometer, Potential Acuity Meter, Abberometer.

Unit-II Ophthalmoscopes and related devices, Design of ophthalmoscopes – illumination, Design of ophthalmoscopes- viewing, Ophthalmoscope disc, Filters for ophthalmoscopy, Indirect ophthalmoscope.

Unit-III Lensometer, Lens gauges or clock, Slit lamp, Tonometers.

Unit-IV Keratometer and corneal topography, Refractometer, Orthoptic Instruments (Synaptophore Only). Color Vision Testing Devices

Unit-V Fields of Vision And Screening Devices, Scans, ERG, New Instruments.

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Total: 45 hours

OCULAR DISEASES I

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

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

Unit-III Lacrimal System-Applied Anatomy, Tear Film, The Dry Eye (Sjogren's Syndrome), The watering eye (Etiology, clinical evaluation). Dacryocystitis, Swelling of the Lacrimal gland (Dacryoadenitis). Conjunctiva-Applied Anatomy, Inflammations of conjunctiva (Infective conjunctivitis – bacterial, chlamydial, viral , Allergic conjunctivitis, Granulomatous conjunctivitis). Degenerative conditions(Pinguecula, Pterygium, Concretions). Symptomatic conditions(Hyperaemia, Chemosis, Ecchymosis, Xerosis, Discoloration). Cysts and Tumors.

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

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Keratoconus, Keratoglobus, Corneal oedema, Corneal opacity, Corneal vascularisation, Penetrating Keratoplasty.

Unit-V Uveal Tract and Sclera, Applied Anatomy, Classification of uveitis, Etiology, Pathology, Anterior Uveitis, Posterior Uveitis, Purulent Uveitis, Endophthalmitis, Panophthalmitis, Pars Planitis, Tumors of uveal tract(Melanoma). Episcleritis and scleritis, Clinical examination of Uveitis and Scleritis.

Total: 30 hours

CLINICAL EXAMINATION OF THE VISUAL SYSTEM

Unit-I History taking, Visual acuity estimation, Extraocular motility, Cover teat, Alternating cover test, Hirschberg test, Modified Krimsky.

Uint-II Pupils Examination, Maddox Rod, Van Herrick, External examination of the eye, Lid Eversion.

Unit-III Schirmer's, TBUT, tear meniscus level, NITBUT (keratometer), Color Vision, Stereopsis, Confrontation test

Unit-IV Photostress test, Slit lamp biomicroscopy, Ophthalmoscopy, Tonometry.

Unit-V ROPLAS, Amsler test, Contrast sensitivity function test, Saccades and pursuit test

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Total: 15 hours

INDIAN MEDICINE AND TELEMEDICINE

Unit-I Introduction to healthcare delivery system, Healthcare delivery system in India at primary, secondary and tertiary care, Community participation in healthcare delivery system, Health system in developed countries, Private Sector, National Health Mission, National Health Policy, Issues in Health Care Delivery System in India.

Uint-II National Health Programme-Background objectives, action plan, targets, operations, achievements and constraints in various National Heath Programme.

Unit-III Introduction to AYUSH system of medicine, Introduction to Ayurveda, Yoga and Naturopathy, Unani, Siddha, Homeopathy, Need for integration of various system of medicine, Health scenario of India- past, present and future

Unit-IV Demography & Vital Statistics-Demography – its concept, Vital events of life & its impact on demography, Significance and recording of vital statistics, Census & its impact on health policy.

Unit-V Epidemiology, Principles of Epidemiology, Natural History of disease, Methods of Epidemiological studies, Epidemiology of communicable & non-communicable diseases, disease transmission, host defense immunizing agents, cold chain, immunization, disease monitoring and surveillance.

Total: 45 hours

CLINICAL OPTOMETRY II (STUDENTSHIP)

Students will gain additional skills in clinical procedures, interaction with patients and professional personnel. Students apply knowledge from previous clinical learning experience under the supervision of a registered optometrist. Students are tested on intermediate clinical optometry skills. The practical aspects of the dispensing optics(hand-on in optical), optometric instruments, clinical examination of visual system(Hands-on under supervision) and ocular diseases (Slides and case discussion) will be given to the students during their clinical training.

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Fourth Semester

OPTOMETRIC OPTICS II& Dispensing Optics

Total: 25 hours

OPTOMETRIC OPTICS II

Unit-I 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).

Unit-II 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.

Unit-III Tinted & Protective Lenses-Characteristics of tinted lenses Absorptive Glasses, Polarizing Filters, Photochromic & Reflecting filters, Safety lenses-Toughened lenses, Laminated Lenses, CR 39, Polycarbonate lenses.Multifocal Lenses:-Introduction, history and development, types,Bifocal lenses, Trifocal & Progressive addition lenses.

Unit-IV 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.

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

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Total: 20 hours

DISPENSING OPTICS

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

Unit-II Measuring Inter-pupillary distance (IPD) for distance & near, bifocal height, Lens & Frame markings, Pupillary centers, bifocal heights, Progressive markings & adjustments –facial wrap, pantoscopic tilt, Recording and ordering of lenses (power, add, diameter, base, material, type, lens enhancements)

Unit-III Neutralization –Hand &lensometer, axis marking, prism marking, Faults in spectacles (lens fitting, frame fitting, patients complaints, description, detection and correction), Final checking & dispensing of spectacles to customers, counseling on wearing & maintaining of spectacles, Accessories –Bands, chains, boxes, slevets, cleaners, screwdriver kit.

Unit-IV Spectacle repairs –tools, methods, soldering, riveting, frame adjustments, Special types of spectacle frames-Monocles,Ptosis crutches,Industrial safety glasses,Welding glasses.

Unit-V Frame availability in Indian market, FAQ's by customers and their ideal answers.

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Total: 30 hours

VISUAL OPTICS II:

Unit-I 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

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

Unit-III 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

Unit-IV- 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

Unit-V 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

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Total: 45 hours

OCULAR DISEASE II & GLAUCOMA

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

Unit – II Ocular Injuries: Terminology : Closed globe injury (contusion, lamellar laceration) Open globe injury (rupture, laceration, penetrating injury, perforating injury), Mechanical injuries (Extraocular foreign body, blunt trauma, perforating injury, sympathetic ophthalmitis), Non Mechanical Injuries (Chemical injuries, Thermal, Electrical, Radiational), Clinical approach towards ocular injury patients.

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

Unit – IV Clinical Neuro-ophthalmology.

Unit – V 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.

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Total: 15 hours

PATHOLOGY

Unit-I Inflammation and repair, Infection in general

Unit-II Specific infections,Tuberculosis,Leprosy,Syphilis,Fungal infection,Viral chlamydial infection, Neoplasia.

Unit-III Haematology, Anemia, Leukemia, Bleeding disorders, Circulatory disturbances Thrombosis, Infarction Embolism.

Unit-IV Clinical pathology ,Interpretation of urine report, Interpretation of blood smears.Immune system.

Unit-V Shock, Anaphylaxis, Allergy.

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Total: 45 hours

BASIC AND OCULAR PHARMACOLOGY

Unit-I General 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; 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.

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Total: 15 hours

INTRODUCTION TO QUALITY AND PATIENT SAFETY

Unit-I Quality assurance and management.

Unit-II Basics of emergency care and life support skills.

Unit-III Biomedical waste management and environment safety.

Unit-IV. Infection and prevention control, Antibiotic resistance.

Unit-V Disaster preparedness and management.

Total: 15 hours

CLINICAL OPTOMETRY III (STUDENTSHIP)

Students will improve their skills in clinical procedures, and then progressive interactions with patients and professional personal are monitored as students practice optometry in supervised setting. Additional area includes problem solving and complications of various managements will be inculcated. Students should have exposure to eye bank facilities and must be made aware of eye donation, collection of eyes, preservation, pre and post-operative instructions and latest techniques for preservation of donor cornea. The students will get clinical training on the practical aspects of the following courses namely optometric optic –II & dispensing optics, visual optics – II and ocular disease -II.

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Total: 15 hours

MEDICAL PSYCHOLOGY

Unit-I Introduction to Psychology,Intelligence Learning, Memory, Personality, Motiviation.

Unit-II Body Integrity – one's body imageThe patient in his Milen.

Unit-III The self-concept of the therapist, Therapist-patient relationship – some guidelines, Illness, its impact on the patient.

Unit-IV Maladies of the age and their impact on the patient's own and others concept of his body image,Adapting changes in Vision.

Unit-V Why Medical Psychology demands commitment?

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FIFTH SEMESTER

Total: 30 hours

CONTACT LENSES I

Unit-I Introduction to Contact lenses-Definition,Classification / Types,History of Contact Lenses, Optics of Contact Lenses-Magnification & Visual field,Accommodation & Convergence, Back & Front Vertex Power / Vertex distance calculation,Review of Anatomy & Physiology- Tear film,Cornea,Lids & Conjunctiva.

Unit-II Introduction to CL materials-Monomers, Polymers,Properties of CL materials,Physiological (Dk, Ionicity, Water content),Physical (Elasticity, Tensile strength, Rigidity),Optical (Transmission, Refractive index),Indications and contraindications,Parameters / Designs of Contact Lenses & Terminology,RGP Contact Lens materials.

Unit-III Manufacturing Rigid and Soft Contact Lenses – various methods, 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.

Unit-IV Calculation and finalising Contact lens parameters,Ordering Rigid Contact Lenses – writing a prescription to the Laboratory,Checking and verifying Contact lenses from Laboratory,Modifications possible with Rigid lenses, Common Handling Instructions,Insertion & Removal Techniques,Do's and Dont's.

Unit-V 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.

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Total: 30 hours

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 flexu
17. Examination of old RGP Lens
18. RGP Lens parameters
19. Slit lamp examination of Contact Lens wearers

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Total: 15 hours

LOW VISION CARE

Unit-I Definitions & classification of Low vision, Epidemiology of low vision.

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

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

Unit-IV Low vision aids – dispensing & prescribing aspects,Visual rehabilitation &counseling.

Unit-V Legal aspects of Low vision in India, Case Analysis.

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Total: 15 hours

PRACTICALS

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

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Total: 20 hours

GERIATRIC OPTOMETRY & PAEDIATRIC OPTOMETRY

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

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

Unit-III Optometric Examination of the Older Adult, Ocular diseases common in old eye, with special reference to cataract, glaucoma, macular disorders, vascular diseases of the eye.

Unit-IV Contact lenses in elderly, Pharmacological aspects of aging.

Unit-V Low vision causes, management and rehabilitation in geriatrics, Spectacle dispensing in elderly – Considerations of spectacle lenses and frames.

Total: 25 hours

PEDIATRIC OPTOMETRY

Unit-I The Development of Eye and Vision, History taking Paediatric subjects, Assessment of visual acuity

Unit-II Normal appearance, pathology and structural anomalies of Orbit, Eye lids, Lacrimal system,Conjunctiva, Cornea, Sclera Anterior chamber, Uveal tract, Pupil, Lens, vitreous, Fundus Oculomotor system,Refractive Examination, Determining binocular status.

Unit-III Determining sensory motor adaptability, Compensatory treatment and remedial therapy for Myopia, Pseudomyopia, Hyperopia, Astigmatism, Anisometropia, Amblyopia, Remedial and Compensatory treatment of Strabismus and Nystagmus.

Unit-IV Paediatric eye disorders : Cataract, Retinopathy of Prematurity, Retinoblastoma, Neuromuscular conditions (myotonic dystrophy, mitochondrial cytopathy), and Genetics, Anterior segment dysgenesis, Aniridia, Microphthalmos, Coloboma, Albinism, Spectacle dispensing for children.

Unit-V Paediatric contact lenses, Low vision assessment in children.

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Total: 30 hours

BINOCULAR VISION I

Unit-I Binocular Vision and Space perception, Relative subjective visual direction.Retino motor value,Grades of BSV,SMP and Cyclopean Eye, Correspondence, Fusion, Diplopia, Retinal rivalry, Horopter-Physiological Diplopia and Suppression,Stereopsis, Panum's area, BSV,Stereopsis and monocular clues - significance.Egocentric location, clinical applications.Theories of Binocular vision, Anatomy of Extra Ocular Muscles.Rectii and Obliques, LPS.Innervation & Blood Supply.

Unit-II Physiology of Ocular movements. Center of rotation, Axes of Fick.Action of individual muscle.Laws of ocular motility, Donder's and Listing's law, Sherrington's law, Hering's law,Uniocular& Binocular movements - fixation, saccadic & pursuits.Version &Vergence.Fixation & field of fixation.

Unit-III Near Vision Complex Accommodation, Definition and mechanism (process). Methods of measurement. Stimulus and innervation. Types of accommodation, Anomalies of accommodation – aetiology and management. Convergence, Definition and mechanism. Methods of measurement. Types and components of convergence - Tonic, accommodative, fusional, proximal. Anomalies of Convergence – aetiology and management.Sensory adaptations, Confusion.

Unit-IV Suppression-Investigations, Management, Blind spot syndrome, Abnormal Retinal Correspondence, Investigation and management, Blind spot syndrome.

Unit-V Eccentric Fixation-Investigation and management, Amblyopia, Classsification, Aeitiology, Investigation, Management.

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Total: 45 hours

SYSTEMIC DISEASES

Unit-I Hypertension-Definition, classification, Epidemiology, clinical examination, complications, and management. Hypertensive retinopathy, Diabetes Mellitus-Classification, pathophysiology, clinical presentations, diagnosis, and management, Complications, Diabetic Retinopathy, Thyroid Disease, Physiology, testing for thyroid disease, Hyperthyroidism, Hypothroidism, Thyroiditis, Thyroid tumors, Grave's Ophthalmopathy.

Unit-II Acquired Heart Disease, Ischemic Heart Disease, Congestive heart failure, Disorders of cardiac rhythm, Ophthalmic considerations, Cancer : -Incidence, Etiology ,Therapy, Ophthalmologic considerations, Connective Tissue Disease, Rheumatic arthritis, Systemic lupus erythematosus, Scleroderma, Polymyositis and dermatomyositis, Sjogren syndrome, Behcet's syndrome, Eye and connective tissue disease.

Unit-III Tuberculosis-Aetiology, pathology, clinical features, pulmonary tuberculosis, diagnosis, complications, treatment tuberculosis and the eye. Herpes virus (Herepes simplex, Varicella Zoster, Cytomegalovirus, Epstein Barr Virus), Herpes and the eye, Hepatitis (Hepatitis A, B, C).

Unit-IV Acquired Immunodeficiency Syndrome,m Anemia (Diagnosis, clinical evaluation, consequences, Sickle cell disease, treatment, Ophthalmologic considerations), Common Tropical Medical Ailments, Malaria, Typhoid, Dengue, Filariases, Onchocerciasis, Cysticercosis, Leprosy, Nutritional and Metabolic disorders:- Obesity, Hyperlipidaemias, Kwashiorkor, Vitamin A Deficiency, Vitamin D Deficiency, Vitamin E Deficiency, Vitamin K Deficiency, Vitamin B1,B2, Deficiency, Vitamin C Deficiency.

Unit-V Myasthenia Gravis -First Aid , General Medical Emergencies, Preoperative precautions in ocular surgeries, Psychiatry, Basic knowledge of psychiatric condition and Patient Management, Genetics, Introduction to genetics, Organisation of the cell, Chromosome structure and cell division, Gene structure and basic principles of Genetics.Genetic disorders and their diagnosis.Genes and the eye, Genetic counseling and genetic engineering.

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RESEARCH METHODOLOGY AND BIOSTATISTICS

RESEARCH METHODOLOGY

Total: 30 hours

Unit-I Introduction to research methods, Identifying research problem.

Unit-II Ethical issues in research, Research design.

Unit-III Types of Data, Research tools and Data collection methods.

Unit-IV Sampling methods, Developing a research proposal.

Total: 30 hou

BIOSTATISTICS

Unit-I Basics of Biostatistics, Introduction of Biostatistics, Measures of Morality, Sampling, Statistical significance, Correlation, Sample size determination. Statistics –Collection of Data - presentation including classification and diagrammatic representation –frequency distribution. Measures of central tendency; measures of dispersion. Theoretical distributions. Binomial, Normal, Sampling –necessity of methods and techniques. Chi. Square test (2 x 2).

Unit-II Hospital Statistics, Use of computerized software for statistics.

Total: 45 hours

CLINICAL OPTOMETRY IV (STUDENTSHIP)

The course provides students the opportunity to continue to develop confidence and increased skill in diagnosis and treatment delivery. Students will demonstrate competence in basic, intermediate and advance procedure in those areas. Students will participate in advance and specialized diagnostic and management procedure. Students will get practical experience of the knowledge acquired from geriatric and paediatric optometry courses. Hands-on experience under supervision will be provided in various outreach programmes namely, school vision screening, glaucoma and diabetic retinopathy screening etc., Students also get hand-on practical sessions on the following courses namely, contact lens, low vision care, geriatric optometry and paediatric optometry.

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Sixth Semester

Total: 45 hours

CONTACT LENSES II

Unit-I SCL Materials & Review of manufacturing techniques, Comparison of RGP vs. SCL, Pre-fitting considerations for SCL.

Unit-II Fitting philosophies for SCL, Fit assessment in Soft Contact Lenses: Types of fit – Steep, Flat, Optimum-Calculation and finalising SCL parameters, Disposable lenses, Advantages and availability.

Unit-III Soft Toric CL, Stabilization techniques, Parameter selection, Fitting assessment, Common Handling Instructions, Insertion & Removal Techniques, Do's and Dont's, Care and Maintenance of Soft lenses, Cleaning agents & Importance, Rinsing agents & Importance, Disinfecting agents & importance, Lubricating & Enzymatic cleaners.

Unit-IV Follow up visit examination, Complications of Soft lenses, Therapeutic contact lenses, Indications, Fitting consideration.

Unit-V Specialty fitting-Aphakia, Pediatric, Post refractive surger, Management of Presbyopia with Contact lenses.

Total: 30 hours

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 at SN During Clinics
13. Specialty Contact Lens fitting (at SN during clinics)

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Total: 30 hours

BINOCULAR VISION II

Unit-I Neuro-muscular anomalies, Classification and etiological factors, History – recording and significance.

Unit-II Convergent strabismus-Accommodative convergent squint, Classification,Investigation and Management, Non accommodative Convergent squint, Classification-Investigation and Management, Divergent Strabismus, Classification, A& V phenomenon, Investigation and Management.

Unit-III Divergent Strabismus-Classification, A& V phenomenon, Investigation and Management, Vertical strabismus, Classification, Investigation and Management, Paralytic Strabismus, Acquired and Congenital, Clinical Characteristics.

Unit-IV Distinction from comitant and restrictive Squint, Investigations, History and symptoms, Head Posture, Diplopia Charting, Hess chart-PBCT, Nine directions, Binocular field of vision, Amblyopia and Treatment of Amblyopia, Nystagmus.

Unit-V Non-surgical Management of Squint, Restrictive Strabismus, Features, Musculo-fascical anomalies, Duane's Retraction syndrome, Clinical features and management, Brown's Superior oblique sheath syndrome, Strabismus fixus, Congenital muscle fibrosis, Surgical management.

Total: 15 hours

PRACTICAL

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

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Total: 30 hours

PUBLIC HEALTH AND COMMUNITY OPTOMETRY

Unit-I Public Health Optometry: Concepts and implementation, Stages of diseases, Dimensions, determinants and indicators of health, Levels of disease prevention and levels of health care pattern, Epidemiology of blindness – Defining blindness and visual impairment.

Unit-II Eye in primary health care, Contrasting between Clinical and community health programs, Community Eye Care Programs, Community based rehabilitation programs.

Unit-III Nutritional Blindness with reference to Vitamin A deficiency, Vision 2020: The Right to Sight, Screening for eye diseases, National and International health agencies, NPCB.

Unit-IV Role of an optometrist in Public Health, Organization and Management of Eye Care Programs – Service Delivery models, Health manpower and planning & Health Economics, Evaluation and assessment of health programes.

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

Total: 15 hours

PRACTICE MANAGEMENT

Unit-I Business Management:-Practice establishment and development, Stock control and costin,

Staffing and staff relations, Business computerization.

Unit-II Accounting Principles, Sources of finance, Bookkeeping and cash flow.

Unit-III Taxation and taxation planning

Unit-IV Professionalism and Values, Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality, Personal values- ethical or moral values, Attitude and behaviour- professional behaviour, treating people equally, Code of conduct , professional accountability and responsibility, misconduct, Differences between professions and importance of team efforts, Cultural issues in the healthcare environment.

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Total: 15 hours

OCCUPATIONAL OPTOMETRY

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

Unit-II Electromagnetic Radiation and its effects on Eye. Light – Definitions and units, Sources, advantages and disadvantages, standards

Unit-III Color – Definition, Color theory, Color coding, Color defects, Color Vision tests, Occupational hazards and preventive/protective methods , Task Analysis

Unit-IV Industrial Vision Screening – Modified clinical method and Industrial Vision test, Vision Standards – Railways, Roadways, Airlines.

Unit-V Visual Display Units, Contact lens and work.

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Total: 30 hours

RESEARCH PROJECT/DISSERTATION

Team of students will be doing a research project under the guidance of a supervisor (who could be optometrists/vision scientists/ ophthalmologist). Student will get the experience of doing a research in systematic approach – identifying the primary question, literature search, identifying the gaps in the literature, identifying the research question, writing up the research proposal, data collection, data analysis, thesis writing and presentation. Project is spread throughout the sixth semester.

Total: 15 hours

MEDICAL LAW AND ETHICS

Unit-I Medical ethics - Definition - Goal - Scope b. Introduction to Code of conduct, Basic principles of medical ethics –Confidentiality.

Unit-II Malpractice and negligence - Rational and irrational drug therapy, Autonomy and informed consent - Right of patients.

Unit-III Care of the terminally ill- Euthanasia, Organ transplantation.

Unit-IV 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.

Unit-V Professional Indemnity insurance policy, Development of standardized protocol to avoid near miss or sentinel events, Obtaining an informed consent.

Total: 45 hours

CLINICAL OPTOMETRY V (STUDENTSHIP)

The course is the final series of five directed clinical courses. The student will complete the clinical training by practicing all the skills learned in classroom and clinical instruction. Practical aspects of Binocular vision II, public health & community optometry, and occupational optometry will be covered under the studentship.

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Seventh and Eighth Semester

The internship time period provides the students the opportunity to continue to develop confidence and increased skill in diagnosis and management. The students are expected to work for minimum 6 hours per day and this may be more depending on the need and the healthcare setting. The students will participate in advanced and specialized treatment procedures.
Internships postings can be in the following locations: Eye Hospitals, Eye clinics in general hospital, independent eye clinics, Optometric clinics in eye hospitals, general hospitals or optical showrooms, optical showrooms and other relevant locations wherein the learning objective can be achieved. Short period of training to eye care (instruments, optical, contact lens) related manufacturing set-ups, corporates and nongovernmental organizations.

Skills based outcomes and monitorable indicators for Optometrist.

Internship:

1. Primary Eye Care 25 % – 3
2. Dispensing Optics 25 % – 3
3. Contact Lens 10% – 1
4. Low Vision Aids 10% – 1
5. Orthoptics 10% – 1
6. Diagnostics 10 % – 1
7. Anterior Segment clinic 5% – 1
8. Posterior Segment Clinic 5% – 1

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9.1 CLINICAL POSTING

Semester	Procedures	Minimum Number	Comments
I year (2nd Semester) CLINIC - I	Role Play (Patient- Optometrist)	3 cases	
	Clinical Observation and Report Writing	6 cases	
	Vision Check (Snellen's Chart) – Distance + Near	12 cases	
	Lensometry (Spherical lenses)		
II year (1st semester) CLINIC-II	History taking General Specific Conditions	9 cases	Can practice on the following complaints : Blurred Vision, Headache, Pain, redness, Watering, Flashes, Floaters, Blackspots
	Lensometry	100 cases	Simple Sphere, Simple cylinder, Spherocylinder (90, 180, Oblique degrees), Bifocals, PAL
	Vision Check (log MAR) Pinhole acuity	100 cases	Simulation, especially to show and ask the students to interpret the findings.
	Extraocular Motility	10 cases	
	Cover test	10 cases	Video output Simulation of various conditions
	Alternate Cover test	10 cases	Video output Simulation of various conditions
	Hirschberg test	10 cases	Video output Simulation of various conditions
	Modified Krimsky test	3 cases	Video output Simulation of various conditions
	Push up test (Amplitude of	10 cases	
	Accommodation	(1 case in presbyopic age)	
	Push up test (Near point of Convergence)	10 cases	
	Stereopsis test	10 cases	
	Tear Break up time	10 cases	
	Amsler's Grid test	10 cases (simulate)	Simulation of various Conditions
	Photostress test	10 cases (Normals)	
	Color vision test	10 cases	
	Schirmer's test	10 cases	
	Confrontation test	10 cases	

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	Slit lamp illumination	3 cases	
	Slit lamp examination	10 cases	
	Schiotz Tonometry	10 cases (Normals)	
	Applanation Tonometry	10 cases (Normals)	
	Negative Relative Accommodation	10 cases	
	Positive Relative Accommodation	10 cases	
	von Herick Grading of Anterior chamber depth	10 cases	
	Accommodative facility(+ 2.00 D)	10 cases	
	Corneal Sensitivity test	10 cases	
	IPD	10 cases	
	Proptosis evaluation	1 demo	Video demonstration of cases
	Ptosis evaluation	1 demo	Video demonstration of cases
	Pupillary evaluation -Direct -Consensual -RAPD	10 cases	
	HVID	10 cases	
	Maddox rod (Phoria)	10 cases	
	Negative Fusional vergence	10 cases	
	Positive Fusional Vergence	10 cases	

II year (2nd semester) CLINIC-III	Retinoscopy- Static, Dynamic and Cycloplegic Retinoscopy	25 + 25 +25 cases	Model eye for retinoscopy.
	Keratometry	25 cases	
	Subjective Refraction JCC Clock Dial Duochrome Borish Delayed	25 cases	
	Addition calculation	25 cases	Give more simulated problems and discuss on it

III year (1st semester) CLINIC IV	Direct ophthalmoscope	10 cases (Normals)	Show slides of various commonly seen retinal Conditions
	Visual Field chart interpretation	10 cases – discussion	Both kinetic and Static
	B scan Interpretation	10 cases – discussion	

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	A scan chart Interpretation	10 cases – discussion	Discussion having different types of wave patterns
	Case Analysis	10 cases	
	+90 D lens	10 cases (Normals)	Slides of various Cup: Disc ratios can be shown

III year (2nd semester) CLINIC V	Gonioscopy	5 cases (Normals)	Slides of abnormal angles
	Posting in optometry clinics	5+5+5+5+10 cases	Pediatric/contact lens/Low vision/ Orthoptics/ GOPD
	Camps	4 camps	School screening, Cataract
	IDO (on each other)	10 cases(Normals)	Slides of abnormal fundus
	Case Analysis -	5+ 5+ 5+ 5 cases	Pathology Binocular Vision Clinical Refraction Dispensing optics
IV year CLINICAL INTERNSHIP	General OPD (History taking –DO)	500 cases	Weekly 1 case report submission
	Contact Lens	20 cases (5 RGP+ 5 Soft + 5 toric)	Totally 3 different case reports submission at the end of the postings
	Opticals	100 cases	Weekly 1 case report submission
	Low Vision care Clinic	10 cases	Totally 3 different case reports submission at the end of the postings
	Binocular Vision clinic	10 cases	Totally 3 different case reports submission at the end of the postings
	Ophthalmology clinic (Common eye conditions)	50 cases	Totally 3 different case reports submission at the end of the postings
	Camps	10 camps	Camp report submission

Choice of Electives in the programs

Electives: The choice of electives and option to choose specialties like eye banking , ocular prosthesis , ocular imaging, electrophysiology , vision therapy , refractive surgery etc. will be time to time added as per the changing trends.

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