STAREX UNIVERSITY

SCHOOL OF PARAMEDICAL SCIENCE

Bachelor in Optometry (1st to 8th semester)

Syllabus BOPT)

Instruction for paper setter:

Total marks: 75

Timing: 3 hrs.

The question paper will consist of four sections A, B, C & D or four units 1, 2, 3, 4 as the case may be. Paper-Setter will set nine questions in all, selecting two questions from each section/unit.
Question no. 1 will be of 15 marks and consists of short answer type questions of 2 to 3 marks each covering the entire syllabus e.g.
Q. 1 (a) Prove that a non-abelian simple group is not solvable.

(b) Give an example of a subnormal series which is not a normal series.

(c) Prove that every homomorphic image of a nilpotent group is also nilpotent.

(d) Define field extension and degree of extension.

(e) Show that C (field of complex no's) is a normal extension of R.

The duration of the examination will be of 3 hours.

Each question will carry equal marks i.e. 15

Attempt any five question out of nine question.

Question no.1st is compulsory.

SYLLABUS

Paper Code	Nomenclature of paper/course	Credit C(L-T-P)
	Semester 1st	
	General pathology (101)	6(3-1-2)
	UNIT I Introduction to Pathology & Hematology. Formation, Composition and function of Blood. Haemopoisis (Erythropoiesis, Leucopoiesis & Thrombopoisis), Anticoagulant, Mode of Action, Uses, Advantages & Disadvantages. Collection, Preservation, Transportation & Handling and disposable of Blood Sample. Standard& Universal Precautions in Hematology. Hematological Stain, Principle, Composition & procedure of Staining. Preparation of Blood Smear and their significance. Hem cytometer, principle, working procedure Care & Maintenance. **Unit-II** Haemoglobin, its synthesis and types, normal and abnormal hemoglobins, extravasccular and intravascular hemolysis. Anaemia and its classification, Morphological and etiological, pathogenesis, laboratory investigations and management, Iron deficiency anaemia, metabolism of iron, pathogenesis, laboratory investigations and management, principle and procedure of special test Megaloblastic anaemia, pernicious anaemia, pathogenesis, laboratory investigations Cell Injury and Cellular Adaptations- Normal Cell**,** Cell Injury- types of cell injury, etiology of cell injury, and morphology of cell injury, cellular swelling, and Cell death: types- autolysis, necrosis, and apoptosis. Inflammation- Acute inflammation - vascular event, cellular event, inflammatory cells Chronic Inflammation - general features, granulomatous inflammation **Unit III** Tissue Renewal and Repair, healing and fibrosis, cirrhosis, introduction of oedema, hyperaemia, congestion, haemorrhage, haemostasis, thrombosis, embolism, infarction, shock and hypertension. Neoplasia: Definition, how does it differ from hyperplasia, difference between benign tumor and malignant tumor. Healing-Definition, different phases of healing, factors influencing wound healing.	

Unit IV

Infectious Diseases: pathogenesis & overview of modes of infections, prevention and control with suitable examples like Typhoid, Dengue

Cancer: Definitions, nomenclature, characteristics of benign and malignant neoplasm, metastasis, Carcinogens and cancer, concept of oncogenes, tumour suppressor genes, DNA repair genes and cancers stem cells.

PRACTICALS

1. Collection of blood Sample by Venous & Capillary Method
2. Estimation of Hb By Sahli 's & CMG Method
3. Determination of RBC, WBC & Platelet Counts By Hem cytometer
4. Preparations of EDT & Sodium Citrate Vials
5. Preparation of thin & thick blood smear
6. Separation of Buffy Coat
7. Determination of ESR by Win Trobe& Western Green Method
8. Any other practical's based on theory paper
9. Blood group

RECOMMENDED BOOKS

1. Text Book of Pathology- Hares Mohan
2. Text Book of Pathology- Robbins
3. Practical Hematology- JV Decie & Lewis
4. Hematology- William J William, Ernest Butter
5. Lynch's MLT – Raphels
6. Atlus of Hematology – George, A Mcdolald, TC Codde
7. Blood & its Diseases- Chanari

Human Anatomy & Physiology-I (102)

6(3-1-2)

Unit I

Introduction to medical sciences. Organization of human body and integrated physiology:- Cell, Tissue, Organ, Organ system & body. Anatomical terms: - Body position, Section, Cavity & their related term.

Unit II

Respiratory system: - Anatomy & physiology of nose and nasal cavity, pharynx, larynx, trachea, lungs. Mechanism of respiration. Lungs capacity. Lobes of lungs, layers of lungs

Integumentary system: - Anatomy & physiology of skin & its layer, nails, hairs, structure and function of skin, care of skin.

Unit III

Digestive system: - Anatomy & physiology of mouths, pharynx, esophagus, stomach: parts, structure function, blood supply. intestine: parts, structure, function and blood supply. Pancreas: parts, structure, ducts, functions. Liver: structure, lobes, quadrants, blood supply and function .gall bladder: bile, duct, Mechanism of digestion.
Skeletal system:- Anatomy & physiology of bones, structure of bone, parts of bone, types of bone, blood supply of bone, Joints and its types with eg., .Upper limb, Lower limb, Vertebral column, Thorax/ chest, skull.

Unit IV

Muscular system:-skeletal muscle, cardiac muscle, smooth muscle, Physiology of muscular contraction and controlling them various types of Joints and their physiology, neuromuscular junction
Cardiovascular system: - Anatomy & physiology of blood vessels, heart structure, chambers of heart, function of heart, systematic circulation, valves, pressure, circulation in adults & fetal, blood, artery, vein, capillary.

PRACTICALS

1. Demonstration of Human cell, Cell division Mitosis & meiosis - from chart& slides.
2. Demonstration of various tissue- Epithelial, Connective.
3. Demonstration of Individual Bones & Respiratory System from Chart
4. Measurement of Blood Pressure, Respiration & Heart Beat
5. Demonstration of Body Organ like Eye, Nose, Tongue etc.
6. Any other practical's based on theory paper

RECOMMENDED BOOKS

1. Anatomy & physiology- Rose & Wilson
2. Anatomy & Physiology- Tortora
3. Text book of Anatomy & physiology- B D Chaurasia
4. Text book of Anatomy & physiology- CC Chaterjee
   Text book of physiology- K Sabuingum

	Basics of Biochemistry (103) **Unit I** Introduction to Clinical Biochemistry and role of Medical Lab Technologist, ethics, responsibility, safely measure and hazards in clinical biochemistry lab and first aid in laboratory accidents. Basic awareness of laboratory in respect to equipments & glassware (Unit of Measurements, and calibration of volumetric apparatus. Colorimetry, spectrophotometery , flame photometry , analytical balance etc, (principles instrumentations & applications) Preparation and storage of reagents standard solutions, buffer solutions and pH determination. Biophysics, techniques-osmosis, dialysis, surface tension, sedimentation and viscosity – principles &applicatons. **Unit II** Henderson – Hassalbach equation and it's clinical applications. Acid base disturbances and their clinical significance Acid –base –buffer and pH-simple calculations. Concept of clinical sensitivity and specificity and factors affecting the clinical results. Collection of blood specimens avoiding Haemolysis, de- proteinization& separation of serum/plasmas. **Unit-III** Preparation of solution and reagents, normal solution, molar solutions, percent solution, buffer solution, dilutions, w/v, v/v, standard solution, aqueous solutions, concepts of acid and base Units of measurement: SI unit, reference range, conversion factor, units for measurement of bio metabolite, enzymes, protein, drugs, hormones, vitamins **Unit-IV** Specimen collection and processing of blood, urine & CSF, separation of serum and plasma, deproteinization of sample, Handling of specimens for testing, preservation of specimen, transport of specimen, factors affecting the clinical results, effect of storage on sample Physical, chemical and microscopic examination of urine, Bence Jones Proteinuria and its clinical significance, qualitative test of urine for reducing sugars, protein, ketone bodies, bile Salt, bile pigments, urobilinogen, occult blood, uric acid, urea and Creatinine, quantitative estimation of 24 hrs urine for protein and their clinical significance. **PRACTICALS** 1. Cleaning of Laboratory Glass wares. 2. Preparation of distilled Water. 3. Preparation of 0.1N NaOH, 5M $\mathbf{H_2SO_4}$ &0.2N HCl Solution 4. Preparation of 0.2 Molar Sod Bicarbonate &70 % Ethanol Solution 5. Preparation of Hypertonic, Hypotonic & Norm tonic Solution & their Clinical Significance. 6. Collection of Blood Sample, serum & plasma separation 7. Any other practical's based on theory paper	6(3-1-2)

RECOMMENDED BOOKS

1. Practical Clinical chemistry- H Varley.
2. Lynch's MLT –Raphel
3. Clinical chemistry- Principle & technique- Henry
4. Practical biochemistry- HW Cole
5. Clinical biochemistry – teiz
6. Principal of Biochemistry by Lehninger

General Microbiology (104)

6(3-1-2)

Unit I

History & Introduction of Medical Microbiology. Importance of Medical Microbiology. Discovery of Microorganism. Contribution of Robert Koch, Bordet, Paul Ehrlich, Alexander Flaming, etc. Scope& Relevance of Safety Measures of Medical Microbiology. Bacterial Structure- Cell wall, Outer membrane, Lipopolysaccharide, Cytoplasmic membrane, Nucleus and Morphology - Shape, Capsule, Flagella, fimbriae, capsule, spore.

Unit II

Growth and Nutrition requirement (Oxygen, Carbon di-oxide, Temperature, Moisture and drying, Hydrogen Ion concentration and Light) of Bacteria, Autotrophs, Heterotrophs.Bacterial Growth (Lag phase, Log phase, Stationary phase and Phase of Decline) Curve. Products of Bacterial growth and Bacterial enzymes.

Different types of staining: Simple stains, Negative stain, Impregnation Method, Differential stain. Gram's stain- preparation of stain and staining methods. Ziehl–Neelsen stain.

Unit-III

General safety measures used in Microbiology laboratory, Sterilization and disinfection: Various physical methods of sterilization – heat, UV radiation, ionizing radiation, filtration, characters affecting sterilization, auto clave control and sterilization indicators.

Biomedical waste management in a Medical Microbiology laboratory: Types of the waste generated, Segregation, Treatment, Disposal

Unit-IV

Antiseptics & Disinfectants: Definition, types and properties, mode of action, use, qualities of good disinfectants. Chemical disinfectants – phenol and its compounds, alcohol, halogen, heavy metals and quaternary ammonium compounds, aldehyde, gaseous compound. use and abuse of disinfectants. precautions while using the disinfectants.

PRACTICALS

1. Preparation of smear.
2. Perform Ziehl-Neelsen staining.
3. Perform Gram's staining
4. Perform Negative staining
5. Perform capsule staining
6. Perform spore staining
7. Any other practical's based on theory paper

RECOMMENDED BOOKS

1. Practical Book of Medical Microbiology by Satish Gupta; JP Brothers, New Delhi
2. Text Book of Medical Microbilogy by Satish Gupta; JP Brothers, New Delhi
3. Text Book of Medical Laboratory Technology by Praful B Godkar; Bhalani Publishing House; Mumbai

Geometrical Optics-I
(105)

6(3-1-2)

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 **Unit III** Prisms; angular dispersion; dispersive power; Abbe's number. Definition of crown and flint glasses; materials of high refractive index Thin prism –definition; definition of Prism diopter; deviation produced by a thin prism; 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 Paraxial approximation; derivation of vergence equation Imaging by a positive powered surface and negative powered surface Vergence at a distance formula; effectivity of a refracting surface Definition of a lens as a combination of two surfaces; different types of lens shapes. Image formation by a lens by application of vergence at a distance formula; definitions of front and back vertex powers; equivalent power; first and second principal planes/points; primary and secondary focal planes/points; primary and secondary focal lengths **Unit IV** Newton's formula; linear magnification; angular magnification Nodal Planes Thin lens as a special case of thick lens; review of sign convention Imaging by a thin convex lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions Imaging by a thin concave lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions Prentice's Rule System of two thin lenses; review of front and back vertex powers and equivalent power, review of six cardinal points. System of more than two thin lenses; calculation of equivalent power using magnification formula	

RECOMMENDED BOOKS

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

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.

COMPUTER SCIENCE-I (106)

0(0-0-0)

Unit 1

Introduction to Computer**:** Meaning or Definition of Computer**,** Evolution of computer**,** Features of Computer**,** Main Operation of the Computer**,** Main Elements of Computer System**,** Bits, Bytes and Words**,** Device in Computer**,** Various Input & output Device.

Unit II

Applications of computer**:** advantages and limitations of computers.
Memory**:** overview of storage devices. main memory, storage evaluation criteria, random access memory, read only memory, secondary storage devices.

Unit-III

Generation of Computers and their Classification Generation of Computers**,** Classification of Computers.

Unit-IV

Operating System Meaning of Operating System**,** Function of Operating System**,** Language Translators

	Database Meaning Of Database**,** Data Processing System**,** Function of Data Processing**,** Objectives of Database**,** Type of Database**,** Functions of Database Management System(DBMS)**,**Advantages & Disadvantages of DBMS**,** Various Database Structures or database models. **Semester 2nd** **Human Anatomy & Physiology-II (201)** **Unit I** Lymphatic system: Lymphatic organs, lymphocytes, Spleen, Bone marrow etc. primary & secondary immune response, Immunity. Primary defense mechanism of human body against pathogenic microbes. Physiology of various body fluids: CSF, peritoneal, Pericardial, Pleural and synovial fluids. Cartilage, ligaments, tendons. **Unit II** Excretory system: Anatomy & physiology of Kidney, Ureters, Bladder & Urethra. Mechanism of urine formation, GFR, mechanism of GFR, Nephrons diagram and its function. Sense organ: Anatomy & physiology of eye, diagram of eye, diagram of ear, nose & tongue. **Unit-III** Nervous system: Anatomy& physiology of Neurons structure and function, Brain and its parts, Spinal cord, Central & Peripheral nervous system. Endocrine system: Anatomy & physiology of hormones, glands, Pituitary gland & hypothalamus, thyroid gland, parathyroid glands, adrenal glands, pancreas, pineal gland & mechanism of action. **Unit-IV** Reproductive system: Male- Anatomy & physiology of Primary & secondary reproductive organs, sperm diagram and its function, spermatogenesis, testis, prostate gland, Female-Anatomy & physiology of Primary & secondary reproductive organs, ovary, ovum, uterus, Oogenesis, mensuration cycle **PRACTICALS** 1. Collection of body Fluids 2. Estimation of sugar in CSF fluid 3. Demonstration of Semen 4. Analysis of Semen 5. Estimation of Insulin Hormone 6. Examination of Urine 7. Demonstration of Reproductive System by Chart	6(3-1-2)

8. Demonstration of Glands in chart in human body
9. Demonstration of Sense Organ
10. Demonstration of spinal & Cranial Nerve
11. Any other practical's based on theory paper

RECOMMENDED BOOKS

1. Anatomy & physiology- Rose & Wilson
2. Anatomy & Physiology- Tortora
3. Text book of Anatomy & physiology- B D Chaurasia
4. Text book of Anatomy & physiology -CC Chaterjee
5. Text book of physiology- K Sabuingum

Ocular Biochemistry
(202)

6(3-1-2)

Unit I

Structure, function and interrelationship of biomolecules and consequences of deviation from the normal.
Hormones basic concepts in metabolic regulation with examples say insulin.

Unit II

Integration of various aspects of metabolism and their regulatory pathways
Metabolism: General whole body metabolism(carbohydrates, proteins, lipids)

Unit III

Principles of various conventional and specialized laboratory investigations and instrumentation, analysis and interpretation of a given data
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

Understand metabolic processes taking place in different ocular structures.
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.
Clinical Biochemistry: Blood sugar, urea, creatinine and bilirubin significance of their estimation.

PRACTICAL

- Quantitative analysis
- Abnormal constituents in urine, sugar proteins, ketones, blood and bile salts.
- Techniques of detection of abnormal constituents of urine:
- Electrophoresis
    - Chromatography
    - Preparation of normal, molar and percentage solutions.
    - Preparation of buffers, pH determination
- Demonstration
    - Estimation of blood cholesterol
    - Estimation of alkaline phosphatase.
    - Salivary amylase (effect of ph, etc)
    - Milk analysis.

Recommended books;

1. Text book of biochemistry by Satyanaryan.
2. S. Ramakrishnan: Essentials of biochemistry and ocular biochemistry, Annamalai University Publications, Chidambaram, India, 1992

Physical Optics
(203)

6(3-1-2)

Unit I

Nature of light –light as electromagnetic oscillation –wave equation; ideas of sinusoidal oscillations –simple harmonic oscillation; transverse nature of oscillation;
concepts of frequency, wavelength, amplitude and phase.
Sources of light; Electromagnetic Spectrum
Polarized light; linearly polarized light; and circularly polarized light.

Unit II

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

Unit III

Resolution of an instrument (telescope, for example); Raleigh's criterion.
Scattering; Raleigh's scattering; Tyndall effect.
Fluorescence and Phosphorescence.
Basics of Lasers –coherence; population inversion; spontaneous emission; Einstein's
theory of lasers.

Unit IV

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

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

	Geometrical Optics-II **(204)** **Unit I** Vergence and vergence techniques revised Gullstrand's schematic eyes, visual acuity, Stile Crawford Emmetropia and ametropia **Unit II** Blur retinal Imaginary. Correction of spherical ammetropia, vertex distance and effective power, dioptric power of the spectacle, to calculate the dioptoric power, angular magnification of spectacles in aphakic **Unit III** Thin lens model of the eye –angular magnification –spectacle and relative spectacle magnification. Aperture stops- entrance and exit pupils. Astigmatism. - To calculate the position of the line image in a sphero-cylindrical lens. **Unit IV** Accommodation –Accommodation formulae and calculations. 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. **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	6(3-1-2)

	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 **Communication Skills and Personality Development (205) (Non credit)** **Unit I** Listening Comprehension • Speeches • Interviews • audio-video clippings followed by exercises • Introduction to Communication • Importance of Communication • Barriers to Communication and ways to overcome them **Unit II** Conversation Skills • Greetings and Introducing oneself • Framing questions and answers • Role play • Buying: asking details etc • Word formation strategies Vocabulary building: Antonyms, Synonyms, Affixation, Suffixation, One word substitution **Unit-III** Reading Comprehension • Simple narration and Stories • Newspaper and articles clippings • Sentence types • Note Making • Paragraph Writing • Comprehension • Report Writing: types, characteristics **Unit –-IV** Writing Comprehension • Letters: types, format, style • Précis Writing • Paragraph: Order, Topic sentence, consistency, coherence • Report and Proposal	0(0-0-0)

	• Project Writing: Features, Structure **Computer Science-II (subsidiary subject)** **(206)** **Unit I** Windows Graphical User Interface, Windows, Features of Windows, Control Button of windows, Various Icons on Desktop Microsoft Word(INTRODUCTION) **Unit II** Microsoft Excel (INTRODUCTION) Microsoft PowerPoint (INTRODUCTION) Internet – Features, Different type of network. **Unit-III** Patient Management Medical Establishments using Computer, Computer, Network, Software, Training, Service Operators of System Computerization in Hospitals and Nursing Homes, Features of a Hospital Software Packages, Password Protection ,Various Application of Different Medical ,Software and Support **Unit-IV** Picture archiving communicating system, DICOM,RIS,HIS, Uses of computer in hospitals in different department Online reporting system, different types of software used in medical fields. **Semester 3rd** **Visual Optics-I** **(301)** **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 **Unit II** Magnification Light and visual function	0(0-0-0) 4(3-1-0)

	Clinical Relevance of: Fluorescence, Interference, Diffraction, Polarization, Bi- refringence, Dichroism Aberration and application Spherical and Chromatic Aberration and application Spherical and Chromatic **Unit III** Cornea and aqueous Crystalline lens Vitreous Schematic and reduced eye 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 **Unit IV** Light and Dark Adaptation Color Vision Spatial and Temporal Resolution Science of Measuring visual performance and application to Clinical Optometry 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	

	Optometric Optics-I **(302)** **Unit I** Measurement of lens power , lens centration using conventional techniques Transposition of various types of lenses Knowledge to identify different forms of lenses (equi- convex, planoconvex, periscopic, etc.) **Unit II** Knowledge to select the tool power for grinding process. Measurement of surface powers using lens measure. Method of laying off the lens for glazing process. **Unit III** Ophthalmic prism knowledge –effects, units, base-apex notation, compounding and resolving prisms. Knowledge of prism and decentration in ophthalmic lenses Knowledge of different types of materials used to make lenses and its characteristics **Unit IV** Knowledge lens designs –single vision, bifocals, progressive lens Knowledge on tinted and protective lenses Knowledge on special lenses like iseikonic, spectacle magnifiers. Knowledge on spectacle frames –manufacture, materials **Practical** 1. Measurement of lens power 2. Transposition of various types of lenses 3. lens designs –single vision, bifocals, progressive lens	6(3-1-2) 0(0-0-0)

\

	Optometric Instruments **(303)** **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 **Unit II** 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 **Unit III** Pupilometer Potential Acuity Meter Abberometer Ophthalmoscopes and related devices Design of ophthalmoscopes – illumination Design of ophthalmoscopes- viewing Ophthalmoscope disc Filters for ophthalmoscopy Indirect ophthalmoscope **Unit IV** Lensometer, Lens gauges or clock Slit lamp Tonometers Keratometer and corneal topography Refractometer Orthoptic Instruments (Synaptophore Only) Color Vision Testing Devices Fields of Vision And Screening Devices Scans ERG	6(3-1-2) 0(0-0-0)

	New Instruments **Practical** **1.** Adjustment of Retinoscopes 2. Fields of Vision And Screening Devices Scans 3. Refractive instruments 4. Design of ophthalmoscopes- viewing **Ocular Anatomy (304)** **Unit I** Central nervous system: Spinal cord and brain stem Cerebellum Cerebrum. **Unit II** Orbit Eye Sclera Cornea Choroid Ciliary body Iris **Unit III** Retina Refractory media- Aqueous humor Anterior chamber Posterior chamber **Unit IV** Lens Vitreous body Eyelids Conjunctiva Embryology **Practical** Eye: Practical dissection of bull's eye Orbit: Practical demonstration of orbital structures	6(3-1-2)

		6(3-1-2)

Ocular physiology
(305)

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

Unit-II

Aqueous humor and vitreous: Intra ocular pressure
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
Introduction to electro physiology
Scotopic and Photopic vision
Color vision, Color mixing

Unit-IV

Mechanism of accommodation
Retinal sensitivity and Visibility
Receptive stimulation and flicker
Ocular, movements and saccades
Visual perception and adaptation
Introduction to visual psychology (Psychophysics)

Practical

1. Lid movements
2. Tests for lacrimation tests
3. Extra ocular movements
4. Break up time
5. Pupillary reflexes
6. Applanation tonometry

	7. Schiotz tonometry. 8. Measurement of accommodation and convergence 9. Visual acuity measurement. 10. Direct ophthalmoscopy 11. Indirect ophthalmoscopy 12. Retinoscopy 13. Light and dark adaptation. 14. Binocular vision(Stereopsis) **Ocular disease-I** **(306)** **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) Lacrimal System Applied Anatomy Tear Film The Dry Eye (Sjogren's Syndrome)	4(3-1-0)

	The watering eye (Etiology, clinical evaluation) Dacryocystitis Swelling of the Lacrimal gland(Dacryoadenitis) **Unit –III** 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))	
	Semester 4th **Clinical examination of visual system** **(401)** **Unit I** History taking Visual acuity estimation Extraocular motility, Cover teat, Alternating cover test Hirschberg test, Modified Krimsky Pupils Examination **Unit –II** Maddox Rod Van Herrick External examination of the eye, Lid Eversion Schirmer's, TBUT, tear meniscus level, NITBUT (keratometer), Color Vision **Unit –III**	6(3-1-2)

	Stereopsis Confrontation test Photostress test Slit lamp biomicroscopy **Unit –IV** Ophthalmoscopy Tonometry ROPLAS Amsler test Contrast sensitivity function test Saccades and pursuit test **Health care and medicine (402)** **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 **Unit II** National Health Mission National Health Policy Issues in Health Care Delivery System in India National Health Programme-Background objectives, action plan, targets, operations, achievements and constraints in various National Heath Programme. Introduction to Ayurveda. Introduction Yoga and Naturopathy **Unit III** Need for integration of various system of medicine Health scenario of India- past, present and future 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	4(3-1-0)

	Unit IV Epidemiology Principles of Epidemiology Natural History of disease Epidemiology of communicable & non-communicable diseases, disease transmission, host defense immunizing agents, cold chain, immunization, disease monitoring and surveillance. **Introduction To Quality and Patient Safety (403)** **Unit I** Quality assurance and management - The objective of the course is to help students understand the basic concepts of quality in health Care and develop skills to implement sustainable quality assurance program in the health system. Concepts of Quality of Care. Quality Improvement Approaches. Standards and Norms. Quality Improvement Tools. Introduction to NABH guidelines. **Unit II** Basics of emergency care and life support skills - Basic life support (BLS), sudden cardiac arrest (SCA) and activation of the emergency response system, cardiopulmonary resuscitation (CPR), Vital signs and primary assessment Basic emergency care – first aid Bio medical waste management and environment safety. Definition of Biomedical Waste, Waste minimization BMW – Segregation, collection, transportation, treatment and disposal (including color coding) Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste BMW Management & methods of disinfection Modern technology for handling BMW Use of Personal protective equipment (PPE) Monitoring & controlling of cross infection (Protective devices) **Unit III** HAI (hospital acquired infection) Prevention & control of common healthcare associated infections, Components of an effective infection control program, and Guidelines (NABH and JCI) for Hospital Infection Control Antibiotic Resistance-	6(3-1-2)

History of Antibiotics
How Resistance Happens and Spreads
Types of resistance- Intrinsic, Acquired, Passive
Trends in Drug Resistance
Actions to Fight Resistance
Bacterial persistence
Antibiotic sensitivity
Consequences of antibiotic resistance
Antimicrobial Stewardship- Barriers and opportunities, Tools and models in hospitals

Unit IV

Disaster preparedness and management.
Fundamentals of emergency management,
Psychological impact management,
Resource management,
Preparedness and risk reduction,
Key response functions (including public health, logistics and governance, recovery, rehabilitation and reconstruction), information management, incident command and institutional mechanisms.

Practical

- Basics of emergency care and life support skills - Basic life support (BLS),
- cardiopulmonary resuscitation (CPR), One- and Two-rescuer CPR
- Vital signs and primary assessment
- Basic emergency care – first aid and triage
- BMW – Segregation, collection, transportation, treatment and disposal (including color coding)
- Use of Personal protective equipment (PPE)
- Monitoring & controlling of cross infection (Protective devices)

	Optometric optics-II **(404)** **Unit I** Spectacle Lenses 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 **Unit II** Methods of Inspecting the quality of lenses Safety standards for ophthalmic lenses (FDA, ANSI, ISI, Others 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 Tinted & Protective Lenses **Unit III** 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 Reflection from spectacle lens surface & lens coatings: Reflection from spectacle lenses - ghost images -Reflections in bifocals at the dividing line **Unit IV** Antireflection coating, Mirror coating, Hard Multi Coating [HMC], Hydrophobic coating Miscellaneous Spectacle: Iseikonic lenses Spectacle magnifiers Recumbent prisms Fresnel prism and lenses	6(3-1-2)

	Lenticular &Aspherical lenses High Refractive index glasses **Practical** 1. Methods of Inspecting the quality of lenses 2. Antireflection coating, Mirror coating, Hard Multi Coating [HMC], 3. Frame construction 4. Size, shape, mounting and field of view of ophthalmic lenses **Ocular disease-II** **(405)** **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 **Unit-II** Macular disorders: Solar retinopathy, central serous retinopathy, cystoid macular edema, Age related macular degeneration. Retinal Detachement: Rhegmatogenous, Tractional, Exudative) Retinablastoma Diabetic retinopathy 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	4(3-1-0)

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

	Medical Psychology **(406)** **Unit –I** Introduction to Psychology Intelligence Learning, Memory, Personality, Motiviation **Unit –II** Body Integrity – one's body image The 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 Why Medical Psychology demands commitment?	4(3-1-0)
	Basic and Ocular Pharmacology **(407)** **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,	4(3-1-0)

	Unit III Antidiabetics; Blood Coagulants 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 **Visual optics-II** **(408)** **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 Objective Refraction (Static & Dynamic) Streak retinoscopy Principle, Procedure, Difficulties and interpretation of findings Transposition and spherical equivalent **Unit III** Dynamic retinoscopy various methods Radical retinoscopy and near retinoscopy Cycloplegic refraction Subjective Refraction: Principle and fogging	4(3-1-0)

	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 IV** 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 **Semester 5th** **Contact Lens-I** **(501)** **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 of 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	6(3-1-2)

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
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 IV

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

PRACTICAL

1. Measurement of Ocular dimensions
2. Pupillary diameter and lid characteristics
3. Blink rate and TBUT
4. Schrimers test, Slit lamp examination of tear layer
5. Keratometry
6. Placido's disc
7. Soft Contact Lens fitting – Aspherical
8. Soft Contact Lens fitting – Lathecut lenses
9. Soft Contact Lens over refraction
10. Lens insertion and removal
11. Lens handling and cleaning
12. Examination of old soft Lens
13. RGP Lens fitting
14. RGP Lens Fit Assessment and fluorescein pattern
15. Special RGP fitting (Aphakia, pseudo phakia & Keratoconus)
16. RGP over refraction and Lens flexure
17. Examination of old RGP Lens
18. RGP Lens parameters
19. Slit lamp examination of Contact Lens wearers

	Low Vision Care **(502)** **Unit I** Definitions & classification of Low vision Epidemiology of low vision Model of low vision service **Unit II** 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 Optics of low vision aids **Unit III** Clinical evaluation – assessment of visual acuity, visual field, selection of low vision aids, instruction & training Pediatric Low Vision care **Unit IV** Low vision aids – dispensing & prescribing aspects Visual rehabilitation &counseling Legal aspects of Low vision in India Case Analysis **Practical** 1. Attending in low vision care clinic and history taking. 2. Determining the type of telescope and its magnification (Direct comparison method & calculated method) 3. Determining the change in field of view with different magnification and different eye to lens distances with telescopes and magnifiers. 4. Inducing visual impairment and prescribing magnification. 5. Determining reading speed with different types of low vision aids with same magnification. 6. Determining reading speed with a low vision aid of different magnifications	6(3-1-2)

	Geriatric Optometry and Pediatric Optometry (503) **Unit I** Structural , and morphological changes of eye in elderly Physiological changes in eye in the course of aging. Introduction to geriatric medicine – epidemiology , need for optometry care, systemic diseases (Hypertension, Atherosclerosis, coronary heart disease, congestive Heart failure, Cerebrovascular disease, Diabetes, COPD) Optometric Examination of the Older Adult **Unit II** Ocular diseases common in old eye, with special reference to cataract, glaucoma, macular disorders, vascular diseases of the eye Contact lenses in elderly Pharmacological aspects of aging Low vision causes, management and rehabilitation in geriatrics. Spectacle dispensing in elderly – Considerations of spectacle lenses and frames **Unit III** The Development of Eye and Vision History taking Paediatric subjects Assessment of visual acuity 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 IV** Determining sensory motor adaptability Compensatory treatment and remedial therapy for : Myopia, Pseudomyopia, Hyperopia, Astigmatism, Anisometropia, Amblyopia Remedial and Compensatory treatment of Strabismus and Nystagmus Paediatric eye disorders: Cataract, Retinopathy of Prematurity,Retinoblastoma, Neuromuscular conditions (myotonic dystrophy, mitochondrial cytopathy), and Genetics Anterior segment dysgenesis, Aniridia, Microphthalmos, Coloboma, Albinism Spectacle dispensing for children Paediatric contact lenses Low vision assessment in children	4(3-1-0)

	Binocular Vision-I **(504)** **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. **Unit II** Theories of Binocular vision. Anatomy of Extra Ocular Muscles. Rectii and Obliques, LPS. Innervation & Blood Supply. Physiology of Ocular movements. Center of rotation, Axes of Fick. Action of individual muscle. Laws of ocular motility Donder's and Listing's law Sherrington's law Hering's law Uniocular& Binocular movements - fixation, saccadic & pursuits. Version &Vergence. **Unit III** Fixation & field of fixation Near Vision Complex Accommodation Definition and mechanism (process). Methods of measurement. Stimulus and innervation. Types of accommodation. Anomalies of accommodation – aetiology and management. Convergence Definition and mechanism. Methods of measurement. Types and components of convergence - Tonic, accommodative, fusional, proximal.	4(3-1-0)

	Anomalies of Convergence – etiology and management. Sensory adaptations Confusion Suppression Investigations Management **Unit IV** Blind spot syndrome Abnormal Retinal Correspondence Investigation and management Blind spot syndrome Eccentric Fixation Investigation and management Amblyopia Classsification Etiology Investigation Management **Systemic Diseases** **(505)** **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 Acquired Heart Disease Ischemic Heart Disease, Congestive heart failure, Disorders of cardiac rhythm Ophthalmic considerations **Unit II** Cancer : Incidence Etiology	4(3-1-0)

	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 Tuberculosis Aetiology, pathology, clinicalfeatures, pulmonary tuberculosis, diagnosis, complications, treatment tuberculosis and the eye. Herpes virus (Herepes simplex, Varicella Zoster, Cytomegalovirus, Epstein Barr Virus) Herpes and the eye **Unit III** Hepatitis (Hepatitis A, B, C) Acquired Immunodeficiency Syndrome Anemia (Diagnosis, clinical evaluation, consequences, Sickle cell disease, treatment, Ophthalmologic considerations) Common Tropical Medical Ailments Malaria Typhoid Dengue Filariases Onchocerciasis Cysticercosis Leprosy **Unit IV** Nutritional and Metabolic disorders: Obesity Hyperlipidaemias Kwashiorkor Vitamin A Deficiency Vitamin D Deficiency Vitamin E Deficiency Vitamin K Deficiency Vitamin B1,B2, Deficiency Vitamin C Deficiency Myasthenia Gravis First Aid General Medical Emergencies Preoperative precautions in ocular surgeries	

	Psychiatry Basic knowledge of psychiatric condition and Patient Management 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 **Research Methodology and Biostatistics (506)** **Unit I** **Research Methodology** 1. Introduction to research methods 2. Identifying research problem 3. Ethical issues in research 4. Research design 5. Types of Data 6. Research tools and Data collection methods 7. Sampling methods 8. Developing a research proposal **Biostatistics** 1. Basics of Biostatistics 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) 2. Hospital Statistics 3. Use of computerized software for statistics	4(3-1-0)

	Semester 6th **Contact Lens-II** **(601)** **Unit I** SCL Materials & Review of manufacturing techniques Comparison of RGP vs. SCL Pre-fitting considerations for SCL 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 Soft Toric CL **Unit II** Stabilization techniques Parameter selection Fitting assessment Common Handling Instructions Insertion & Removal Techniques Do's and Dont's **Unit III** Care and Maintenance of Soft lenses Cleaning agents & Importance Rinsing agents & Importance Disinfecting agents & importance Lubricating & Enzymatic cleaners Follow up visit examination **Unit IV** Complications of Soft lenses Therapeutic contact lenses Indications Fitting consideration Specialty fitting Aphakia Pediatric Post refractive surgery Management of Presbyopia with Contact lenses	6(3-1-2)

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)

Binocular Vision-II (602)

6(3-1-2)

Unit I

Neuro-muscular anomalies
Classification and etiological factors
History – recording and significance.
Convergent strabismus
Accommodative convergent squint
Classification
Investigation and Management
Non accommodative Convergent squint
Classification
Investigation and Management

Unit II

Divergent Strabismus
Classification
A& V phenomenon
Investigation and Management
Vertical strabismus
Classification
Investigation and Management
Paralytic Strabismus
Acquired and Congenital
Clinical Characteristics

	Unit III 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 IV** 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 **PRACTICAL:** Deals with hand-on session the basic binocular vision evaluation techniques.	
	Public Health and Community Optometry (603) **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 patterns Epidemiology of blindness – Defining blindness and visual impairment Eye in primary health care	4(3-1-0)

	Unit II Contrasting between Clinical and community health programs Community Eye Care Programs Community based rehabilitation programs Nutritional Blindness with reference to Vitamin A deficiency Vision 2020: The Right to Sight **Unit III** Screening for eye diseases National and International health agencies, NPCB Role of an optometrist in Public Health Organization and Management of Eye Care Programs – Service Delivery models **Unit IV** Health manpower and planning & Health Economics Evaluation and assessment of health programmes Optometrists role in school eye health programmes Basics of Tele Optometry and its application in Public Health Information, Education and Communication for Eye Care programs **Practice Management (604)** **Unit I** Business Management: Practice establishment and development Stock control and costing Staffing and staff relations Business computerization **Unit II** Accounting Principles Sources of finance Bookkeeping and cash flow **Unit III** Taxation and taxation planning	4(3-1-0)

	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 **Occupational Optometry (605)** **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. Electromagnetic Radiation and its effects on Eye **Unit II** Light – Definitions and units, Sources, advantages and disadvantages, standards Color – Definition, Color theory, Color coding, Color defects, Color Vision tests **Unit III** Occupational hazards and preventive/protective methods Task Analysis Industrial Vision Screening – Modified clinical method and Industrial Vision test **Unit IV** Vision Standards – Railways, Roadways, Airlines Visual Display Units Contact lens and work	4(3-1-0)

	Medical Law and Ethics **(606)** **Unit I** Medical ethics - Definition - Goal - Scope b Introduction to Code of conduct Basic principles of medical ethics –Confidentiality **Unit I** Malpractice and negligence - Rational and irrational drug therapy Autonomy and informed consent - Right of patients Care of the terminally ill- Euthanasia **Unit I** Organ transplantation 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 I** Professional Indemnity insurance policy Development of standardized protocol to avoid near miss or sentinel events Obtaining an informed consent. **Assignment (Project Work)** **607** **7th Semester** **Internship (Clinical Optometry-I)** **6 months** **8th Semester** **Internship (Clinical Optometry-II)** **6 months**	4(3-1-0) 4(4-0-0)