FIRST SEMESTER
A. THEORY
1 BO-101 Geometrical Optics (Optics I)
2 BO-102 Physiology (General)
3 BO-103 Anatomy (General)
4 BO-104 Biochemistry (General & Ocular)
5 BO-105 Professional Communication in English

PRACTICAL
1 BO-192 Physiology (General)
2 BO-191 Geometrical Optics
3 BO-193 Anatomy

SECOND SEMESTER
A. THEORY

1 BO-201 Physical Optics (Optics II)
2 BO-202 Physiology (Ocular)
3 BO-203 Anatomy (Ocular)
4 BO-204 Environment & Ecology
5 BO-205 Computer Fundamentals & Programming

B. PRACTICAL
1 BO-291 Physical Optics II
2 BO-293 Anatomy (Ocular)
3 BO-295 Computer

THIRD SEMESTER
1 BO-301 Visual Optics (Optics III)
2 BO-302 Lighting & the Eye
3 BO-303 Medical pathology & Microbiology (General & Ocular)
4 BO-304 Pharmacology
5 BO-305 Ophthalmic & Optical Instrumentation & Procedure I
C. PRACTICAL
1 BO-393 Microbiology & Pathology
2 BO-395 Optical & Ophthalmic Instrumentation
3 BO-392 Lighting & the Eye

FOURTH SEMESTER
A. THEORY
1 BO-401 Visual Optics (Optics IV)
2 BO-402 Ophthalmic & Optical Instrumentation & Procedure II
3 BO-403 Clinical Refraction I
4 BO-404 Ocular Disease I (Anterior Segment Disease)
5 BO-405 Ophthalmic Lens & Dispensing Optics
B. PRACTICAL
1 BO-492 Optics & Ophthalmic instrumentation II
2 BO-493 Clinical Refraction Practical
3 BO-495 Ophthalmic Lens & Dispensing Optics Practical

FIFTH SEMESTER
A. THEORY
1 BO-501 Binocular Vision & Ocular Motality
2 BO-502 Contact Lens I
3 BO-503 Clinical Refraction II
4 BO-504 Ocular Disease II (Posterior & Neuro-eye Disease)
5 BO-505 Low Vision Aids & Visual Rehabilitation
B. PRACTICAL
1 BO-592 Contact Lens –
2 BO-593 Clinical Refraction II
3 BO-595 Low Vision Aids & Visual Rehabilitation

SIXTH SEMESTER
A. THEORY
1 BO-601 Systemic Condition & the eye
2 BO-602 Public Health & Community Optometry
3 BO-603 Biostatistics
4 BO-604 Contact Lens II
5 BO-605 Professional Practice Management
6 BO-606 Applied Optometry & Orthoptics

B. PRACTICAL
1 BO-694 Contact Lens-II
2 BO-696 Applied Optometry & Orthoptics
Bachelor of Science (Optometry)

DETAILED SYLLABUS

1ST YEAR 1ST SEMESTER

PROFESSIONAL COMMUNICATION IN ENGLISH  \hspace{1cm} \text{P.CODE: BO105}

• Grammar-structure of sentences etc.
• Essay- Descriptive-Comparative-Argumentative etc.
• Reading Comprehension from recommended text etc. biodata, Resume curriculum vitae etc.
• Report writing-structure, types of reports etc.
• Communication-public speaking skills, features of effective speech etc.
• Group discussions-principle-practice etc.

Reference books:

a. Communication (Mark McCormack)

b. How to write reports (John Metchell)


ANATOMY (General) \hspace{1cm} \text{P.CODE: BO103}

Introduction of anatomy – gross human anatomy & their relations:

• The skeleton – axial & appendicular (over view), Cavities of body- (cranial, thoracic, abdominal, pelvic). Structure of bone, Type & function of bone, Blood & nerve supply of the bone. Planes of the body. Anatomical terminology.
• Joints – classification, fibrous joints, cartilaginous joints, synovial joints( structure & types). Types of movement at sinovial joints.
• Anatomy of muscular system – Skeletal muscle structure. Important skeletal muscle ( muscles of facial expression, mastication. Muscle that move the head). Over view of Trunk muscles, upper limb muscles, lower limb muscles.
• Anatomy of nervous system – spinal cord anatomy (external & internal anatomy). Connection & distribution of spinal nerves-overview( Branches, plexuses. Intercostal nerves). Overview of brain organization & blood supply. Brief anatomical idea on –

Structure & chemical composition, types of chromosome. Chromosome aberration.
Tissues:- Structure, position and functions of epithelial, connective, muscular & nervous tissue.

PHYSIOLOGY P.CODEx: BO102 GENERAL PHYSIOLOGY


GEOMETRICAL OPTICS-I P.CODE: BO101

• What is light- dual nature- particle & wave nature, speed, wave length & frequency of light.
• Fermats’ principle- laws of relation & refraction at a plane surface using Fermats’ principle.
• Snells’ law, relative and absolute refractive indices, total internal reflection and Critical angle, refraction by plane parallel slab of glass; molecular basis of reflectively (basic index).
• Geometrical path length & optical path length of rays, Concept of wave fronts & rays, concept of vergence divergence, convergence.
• Refraction by spherical surfaces- convex & concave, Derivation of vergence equation, focal points, deportee power, image point, lateral & axial magnification, simple numerical.
• Thin Lens- shapes, derivation of lens makers’ formula, thin lens vergece equation, equivalent focal length of two thin lenses separated by a distance & placed in contact, lateral magnification of thin lenses in contact, simple numerical, concept of reduced systems.
• Thick Lens- Cardinal points & planes, front & back vertex power, matrix theory in paraxial Optics to locate positions of cardinal planes. Different types of aberrations & their effects.
• Prism- Dispersion of prism, reflecting prisms, prisms diopters.
• Geometrical theory of optical fibers. Uses of optical fibers.

2. Amino acids, protein structure
   a. Amino acids - Function, classification, properties
   b. Protein - Primary, secondary, tertiary & quaternary structures & the bond involves.


6. Basic outline of hormone action Physical & Chemical Characteristics of hormone. Types of hormone. General mechanism of hormone action via Messenger system. Source & importance of different hormones- STH, ACTH, GTH, T4, parathormone, Insulin, Glucagon, Glucocorticoid, Mineralocorticoid, Melatonin, Estrogen, Progesteron, Testosterone & HCG


PHYSIOLOGY (General) P.CODE: BO-192
1. Identification of fixed histological slides – nerve tissues (cerebellum, cerebral cortex, neurons, spinal cord, nodes of Ranvier, corneal cell space), renal tissues. Blood vessels (artery & vein), skin, Tongue, Liver.
2. Hemoglobin estimation
3. Determination of blood pressure
4. Determination of BT, CT, ESR
6. ECG wave identification
7. Measurement of TC of RBC & WBC & DC of WBC.
8. Determination of Blood Group (ABO; Rh).

PRACTICAL SYLLABUS

GEOMETRICAL OPTICS-1 P.CODE: BO-191

1. Determination of the focal length & hence the power of a convex lens by displacement method.
2. Determination of the refractive index of a transparent liquid by using a travelling microscope.
3. Determination of the refractive index of the material of a convex lens measuring its focal length, using the lens & a plane mirror.
4. Determination of the focal length of a concave mirror by graphical method.
5. Determination of refractive index of the material of a prism by minimum deviation method.
6. To draw i-δ curve of a prism by a spectrometer & hence to find out the angle of minimum deviation.

ANATOMY P.CODE: BO-193

1. Identification of skull & skeleton (bones)[Skull-bones comprising, base of skull orbits]
2. Identification of organs & viscera
3. Identification of histological tissues.
   a) Epithelial tissue-squamous, columnar, cuboidal
   b) Connective tissue-skeletal muscle, cardiac muscle, smooth muscle
   c) Cytology-mitosis.

1st YEAR 2nd SEMESTER

CODE-BO 202   PHYSIOLOGY (Ocular)
5. Vitreous Humour: Composition & distribution of vitreous humour, Physiology & function of vitreous humour, Optical role of vitreous humour.
9. Protective Mechanism of the eye –
   a. Blinking – muscles of lead closer & lid opening (orbicularis occuli, levator palpebre, Muller’s muscle, blinking reflexes.
   b. Lacration –
      i) Lacrimal glands
      ii) Pre corneal tear film
      iii) Chemistry of lachrymal secretion tear film
      iv) Tear film dynamics (secretion of tear, formation of tear, retention & redistribution of tear, displacement phenomena, evaporation from tear film, drying & breakup of tear film, dynamic events during blinking, and elimination of tear.)
10. The ocular motor system –
    a. Extra ocular muscles their function & nerve supply
    b. Mechanics of actions of extra ocular muscles -cross sectional area of muscle, length of muscle. Arc of contact, muscle plane, Muscle axis of rotation.
    c. Physiology of ocular movement – Basic Kinematics, ( position of gaze, Fick’s axes)
    d. Ocular Movement (monocular and Binocular). Supra nuclear control of eye movements.
    e. Ocular movements -
Monocular Movements (Adduction, Abduction, supraduction, Infraoduction, Inycycloduction, excycloduction)

Binocular Movements - VERSIONS - (saccadic & pursuit movement, position maintenance movements, stabilization movements & their characteristics). VERGENCES - (Convergence, divergence, vertical vengeance).

11. Intraocular pressure – Features of normal IOP, Factors influencing the IOP, Control of IOP, Measurement of IOP.


13. Accommodation –
   a. Far point, near point, range & amplitude of Accommodation
   b. Mechanism of accommodation – Increased tension theory, Relaxation theory, Role of lens capsule, Gullstrand mechanical model of accommodation,
   c. Stimulus for accommodation
   d. Ocular changes in accommodation.
   e. Changes in accommodation with arc (Presbyopia)
   f. Nervous mechanism for accommodation.

14. Color vision
   a. Physiological, Photochemical & neurological basis of color vision
   b. Electrophysiology of color vision
   c. Granit's modulator and dominator theory, Purkinje phenomenon. Young Helmoltz theory
   d. Types of color defects
   e. Color blindness
   f. Neural analysis

15. Geneculate cortex:
   a. Structure of geneculate cortex.
   b. Electrophysiology
   c. Projection – retinal projection
   d. Detail idea about visual cortex & function of visual cortex.

16. Visual perception –
   a. Higher integrative activity, Binocular perception, stereoscopic depth perception.
   b. Neurophysiology of perception – Higher visual pathways (primary visual Pathway to cerebral center, Lateral Geniculate body, non-geniculate targets for retinofugal input, visual center)
   c. Neurophysiology of perception – Spatial analysis, Double pathway to higher visual centers.

17. Physiology of vision –


d. Binocular vision – Grades of binocular vision (simultaneous, fusion & stereopsis), Advantages of binocular vision, visual direction & horopter, Binocular fusion, Dichoptic stimulation, Depth perception, Integration of motor & sensory system.

e. Electrodiagnostic tests – ERG, EOG, VER

**CODE: BO 203 ANATOMIES (Ocular)**


2. Orbit Bony orbit → Size, shape & relations, walls of the orbit, Apex of orbit. Orbital fascia → Fascial bulbi, Fascial sheaths of extraocular muscles, intermuscular septa. Spaces of orbit → Orbit fat & reticular tissue - Apertures at the base of orbit - Contents of the orbit – Orbital nerve → oculomotor, Trochler, Abducent, Trigeminal, facial nerves - their functional components, course & distribution, clinically applied aspects.

3. Cornea → (a) Layers & peculiarities, (b) Blood supply & nerve supply of cornea, (c) Corneal Transparency.

4. Lens, Zonules → (a) Structure. of lens →capsule, Ant. Epithelium, lens fibers (structured & zonal arrangement), (b) Ciliary zonules →structure gross appearance, (c) Arrangement of zonules fibers.

5. Uveal Tract & its vascular supply → (a) Iris macroscopic & microscopic appearance, (b) ciliary body – Macroscopic structure, (c) chloride - Macroscopic structure, (d) Blood supply to uveal structure- short & Long Posterior artery & Anterior Artery, (e) Venous drainage.
10. The Ocular motor system → Extraocular muscles, nerve supply, motor nuclei, supra nuclear motor centers.
11. The pupillary & ciliary muscle →Anatomy of sphincter & Dilator muscle. Ciliary muscle – Anatomy, types
12. The nerve supply of the eye ball.
13. The lachrymal appears → (a) Lachrymal gland, (b) Palpebral part, (c) Duets of lachrymal gland, (d) structure of the lachrymal gland, (e) Blood supply & nerve supply of the lachrymal gland, (f) lachrymal passages.

CODE-BO205 COMPUTER FUNDAMENTALS AND PROGRAMMING
Basic computer Architecture: Fundamentals of Computers, Block diagram of PC, peripheral devices of PC and their functions Number System & Data Representation: Decimal Number System, Binary number system, Decimal to Binary conversion, Binary operations. Octal number system & the conversion. Octal to Decimal. Binary to Octal & Vice Versa.
Precedence of operators. Boolean function & truth tables. The AND, OR, NOT gate.
DeMorgan's theorem. The NOR, NAND gate. The XOR & X-NOR gate. Conversion of
Boolean expression into logic diagram. Using AND, OR, AND, NOT gates.
Logic Circuits: Combinational logic circuit, Adder, Subtractor, Decoder, Encoder.
Operating System: Introduction & classification of software, working principle of MS
DOS (Some basic internal & external commands). Creating a file. Windows & its
components. Accessories, program manager, main, desktop icons.
MS- Office: Introduction of word processing-invoking MS-word – create, edit, save
document, cut & paste perform operations on blocks of text, header & footer, Mail
Merge, printer setup. Introduction of EXCEL. Concept of worksheet, making Charts
& graphs, perform calculations & re calculations.
C-Language: Overview of C, algorithm & flow chart, datatypes. Variables &
constants, operators, expressions & assignment statements, control statements,
arrays in C (One dimensional).
Introduction to Internet: Basic concepts of Internet.

PHYSICAL OPTICS  CODE: BO 201

- Dual nature of light- Simple harmonic motion- differential; Simple harmonic waves- mathematical representation; Super position of simple harmonic waves.
- HUYGENS’ principle – laws of reflection and refraction at plane and spherical surfaces. Wave velocity & group velocity; determination of velocity of light (any one method.)
- Interference: Coherence; path and phase difference; Theory of interference fringes intensity distribution infringes; Young’s double slit experiment- Fresnels’ biprism, Lloyds’ error experiments; visibility of fringes.
- Interference in thin films due to reflected and transmuted light- Interference in wedge Shaped films; Newton’s ring experiment ; Color of thin films; Thin film antireflection wating and filters.
- Diffraction: • Diffraction by single slit; double slit, multiple slit- grating, circular aperture – amplitude & intensity distribution (final expressions only)
- Circular aperture- airy pattern, resolution by circular apertures.
- Diffraction grating- reflection, traasnussion , amplitude & phase gratings(definitions in brief) Grating dispersion & dispersue power, spectral resolution; zone plates.

Polarization & Crystal Optics:
- Concept of polarization , linear , circular , elliptical polarization (qualitatively), Plane of polarization & vibration, degree of polarization, polarizes, analyzers, Production of polarized light, birefringence, calculate crystal , veal prism, Wallaston prism , retarders - full, half & quarter wave plates, analysis of light of unknown Polarization.
- Linear Scattering- Raleigh & Mce
- Principles of LASERS
- Holography – basic principle; simple experimental arrangement, some applications.

ENVIRONMENT & ECOLOGY Paper Code: BO-204

• Air Pollution and Control
Atmospheric composition, energy balance, climate, weather, dispersion, sources and effects of pollutants, primary and secondary pollutants, green house effect, depletion of ozone layer, standards and control measures.

• Water Pollution and Control
Hydrosphere, natural water, pollutants: their origin and effects, river/lake/ground water pollution, standards and control.

• Land Pollution
Lithosphere, pollution (municipal, industrial, commercial, agricultural, hazardous solid wastes); their origin and effects, collection and disposal of solid waste, recovery and conversion methods.

• Noise Pollution
Sources, effects, standards and control.

PRACTICAL

PHYSICAL OPTICS-II   PAPER CODE: BO-291

1. To determine the wavelength of a monochromatic light source with the help of Fresnel’s Biprism.
2. To determine the radius of curvature of convex surface of a lens by Newton’s ring method.
3. To determine Planck’s constant using photocell.
4. To study the diffraction through a single slit & to determine its width.
5. To determine the slit width & the separation between the slits of a double slit system from its Fraunhoffer diffraction pattern.
7. To calibrate a Polarimeter & hence to determine the unknown concentration of sugar solution.
8. To determine the wavelength of the Laser source by forming diffraction pattern with transmission grating.

ANATOMY (OCULAR)   PAPER CODE: BO-293

1. Identification of ocular histology slides.
2. Identification of projection slides of Ocular Anatomy.
3. Identification of structure & related viva.

COMPUTER   PAPER CODE: BO-295


C-Language: Overview of C, algorithm & flow chart, datatypes. Variables & constants, operators, expressions & assignment statements, control statements, arrays in C (One dimension).