ALAGAPPA UNIVERSITY

(Accredited with A+ Grade by NAAC (CGPA : 3.64) in the Third Cycle)

DIRECTORATE OF COLLABORATIVE PROGRAMMES

B.Sc Optometry

Regulations and Syllabus

[For those who join the Course in July 2016 and after]

GENERAL INSTRUCTIONS AND REGULATIONS

B.Sc Optometry conducted by Alagappa University, Karaikudi, Tamil Nadu through its Collaborative Institution _____ at _____.

Applicable to all the candidates admitted from the academic year **2016** onwards.

1. **Eligibility:**

   A pass in Higher Secondary Examination (HSC) or Equivalent preferable with **Physics, Chemistry, Biology or Botany or Zoology** or an examination accepted as equivalent thereto by the Syndicate for admission to **B.Sc Optometry.**

2. **For the Degree:**

   The candidates shall have subsequently undergone the prescribed programme of study in a institute for not less than four academic years, passed the examinations prescribed and fulfill such conditions as have been prescribed therefore.

3. **Admission:**

   Admission is based on the marks in the qualifying examination.

4. **Duration of the course:**

   The course shall extend over a period of **Four years** under semester pattern accounting to eight semesters.

5. **Standard of Passing and Award of Division:**
   a. Students shall have a minimum of 40% of total marks of the University examinations in each subject. The overall passing minimum is 40% both in aggregate of Continuous Internal Assessment and external in each subject.
   b. The minimum marks for passing in each theory / Lab course shall be 40% of the marks prescribed for the paper / lab.
   c. A candidate who secures 40% or more marks but less than 50% of the aggregate marks prescribed for four years taken together, shall be awarded **THIRD CLASS.**
   d. A candidate who secures 40% or more marks but less than 60% of the aggregate marks prescribed for four years taken together, shall be awarded **SECOND CLASS.**
   e. A candidate who secures 60% or more of the aggregate marks prescribed for four years taken together, shall be awarded **FIRST CLASS.**
   f. Only Part-III subjects were considered for the ranking.
   g. The Practical / Project shall be assessed by the two examiners, by an internal examiner and an external examiner.

6. **Continuous internal Assessment:**
   a. Continuous Internal Assessment for each paper shall be by means of Written Tests, Assignments, Class tests and Seminars
   b. **25 marks** allotted for the Continuous Internal assessment is distributed for Written Test, Assignment, Class test and Seminars.

c. Two Internal Tests of 2 hours duration may be conducted during the semester for each course / subject and the best marks may be considered and one Model Examination will be conducted at the end of the semester prior to University examination. Students may be asked to submit at least five assignments in each subject. They should also participate in Seminars conducted for each subject and marks allocated accordingly.
d. Conduct of the continuous internal assessment shall be the responsibility of the concerned faculty.
e. The continuous internal assessment marks are to be submitted to the University at the end of every year.
f. The valued answer papers/assignments should be given to the students after the valuation is over and they should be asked to check up and satisfy themselves about the marks they have scored.
g. All mark lists and other records connected with the continuous internal assessments should be in the safe custody of the institution for at least one year after the assessment.

7. Attendance:

Students must have earned 75% of attendance in each course for appearing for the examination.

Students who have earned 74% to 70% of attendance to be applied for condonation in the prescribed form with the prescribed fee.

Students who have earned 69% to 60% of attendance to be applied for condonation in the prescribed form with the prescribed fee along with the medical certificate.

Students who have below 60% of attendance are not eligible to appear for the examination. They shall re-do the semester(s) after completion of the programme.

8. Examination:

Candidate must complete course duration to appear for the university examination. Examination will be conducted with concurrence of Controller of Examinations as per the Alagappa University regulations. **University may send the representatives as the observer during examinations.** University Examination will be held at the end of the each semester for duration of 3 hours for each subject. Certificate will be issued as per the AU regulations. **Hall ticket will be issued to the 1st year candidates and upon submission of the list of enrolled students along with the prescribed course fee subsequent 2nd, 3rd and 4th year hall tickets will be issued.**

9. Question Paper pattern:

Maximum: 75 Marks	Duration: 3Hours
Part A - Short answer questions with no choice	: 10 x 02=20
Part B – Brief answer with either or type	: 05 x 05=25
Part C- Essay – type questions of either / or type	: 03 x 10=30

10. Miscellaneous

a. Each student posses the prescribed text books for the subject and the workshop tools as required for theory and practical classes.
b. Each student is issued with an identity card by the University to identify his / her admission to the course
c. Students are provided library and internet facilities for development of their `studies.
d. Students are to maintain the record of practicals conducted in the respective laboratory in a separate Practical Record Book and the same will have to be presented for review by the University examiner.
e. Students who successful complete the course within the stipulated period will be awarded the degree by the University.

11. Fee structure

Course fee shall be as prescribed by the University and 50% of the course fee should be disbursed to University. Special fees and other fees shall be as prescribed by the Institution and the fees structure must intimated to the University. Course fees should be only by Demand draft / NEFT and AU has right to revise the fees accordingly.

Semester pattern

Course Fee payment deadline
Fee must be paid before 30th September of the academic year

12. Other Regulations:

Besides the above, the common regulation of the University shall also be applicable to this programme.

Semester	Subject Code	Subject	Int.,Max	Ext.,Max	Total
I	11	**Part- II-** English –I	25	75	100
	12	**General** Anatomy and Physiology	25	75	100
	13	General and ocular biochemistry	25	75	100
	14	Geometric optics	25	75	100
	15	Nutrition	25	75	100
	16	Computers	25	75	100
II	21	**Part-II-**English –II	25	75	100
	22	Ocular Anatomy	25	75	100
	23	Ocular Physiology	25	75	100
	24	Physical Optics	25	75	100
	25	Microbiology and Pathology	25	75	100
	26	**Environmental studies**	25	75	100
III	31	**Part-II-**English –III	25	75	100
	32	Visual Optics	25	75	100
	33	Ocular Diseases I	25	75	100
	34	Optometric Instrumentation I	25	75	100
	35	General and Ocular Pharmacology	25	75	100
	35	Clinical Examination of the Visual System	25	75	100
	36	Clinical – I - Practical	25	75	100
IV	41	**Part-II-**English –IV	25	75	100
	42	Optometric Optics	25	75	100
	43	Ocular Diseases II	25	75	100
	44	Optometric Instrumentation II	25	75	100
	45	**Value education**	25	75	100
	46	Clinical –II- Practical	25	75	100
V	51	Contact Lenses – I	25	75	100
	52	Binocular Vision - I	25	75	100
	53	Pediatric and Geriatric Optometry	25	75	100
	54	Dispensing Optics	25	75	100
	55	Public Health and Community Optometry	25	75	100
	56	Biostatistics	25	75	100
	57	Clinical – III-Practical	25	75	100
VI	61	Contact Lenses – II	25	75	100
	62	Binocular Vision - II	25	75	100
	63	Low Vision Aid	25	75	100
	64	Occupational Optometry	25	75	100
	65	Systemic Diseases Affecting the Eye	25	75	100
	66	Clinicals – IV-Practical	25	75	100
VII	71	Project/Internship-I	100	-	100
VIII	81	Project/Internship-II	100	-	100

			1150	2850	4000

I – Year Semester I

11 Part II - ENGLISH

Paper I

PROSE AND COMMUNICATION SKILLS

Unit – I

Essential of Education	-	Sir Richard Livingstone
On the Power of Youth	-	Indira Gandhi

Unit – II

On Habits	-	A.G.Gardiner
Crime and Punishment	-	R.K.Narayan

Unit – III

Survival	-	Margret Atwood
The Vision of Patriotism	-	Sarojini Naidu

Unit - IV

Tenses – Nouns – Verbs – Adjectives – Adverbs - Types of Sentences – Recognition and Usage.

Unit - V

Sentence Patterns - Using Articles: Definite and Indefinite - Using Prepositions - Modals and their Usage

Prescribed Texts:

1. Effective Communication to English Prose: An Anthology of Prose. Eds.S.Yusuf and P.C.James Daniel. Bangalore: Harrow Publications.
2. Active English Grammar and Composition. Ed. Board of Editors, Macmillan.

12 GENERAL ANATOMY & PHYSIOLOGY

Unit -1

General Anatomy

Introduction

• The body as a whole & Fundamental Tissues of human anatomy

Digestive System structure and function of

• Mouth, Esophagus, Stomach, Small Intestine, Large Intestine, Rectum, Anus, Liver, Spleen, Pancrease

Cardio Vascular System

• Heart, Arteries veins and capillaries

Respiratory System

• Nose, Bronchi, Lungs&Diaphragm

Unit -2

Skeleton System & Muscular System

• Skull bones, Bones and body, Joints, Voluntary and involuntary muscles

Muscular system

- Structure of skeletal muscle
- Structure of cardiac muscle
- Structure of smooth muscle
- Neuro muscular junction including Myasthenia gravis
- Difference between Skeletal, Cardiac and smooth muscles.

The Nervous system

• Brain structure and functions

• Spinal cord & nerve

• Autonomous nervous system

Unit -3

The Urinary System

• Kidneys, Urinary bladder structure and functions

Reproductive System

• Male Reproduction System, Female Reproduction System

• Pregnancy and child birth

Endocrine System
General Physiology
Unit – 4
Introduction
• Definitions
• Functions

- Central Nervous system
- CSF
- Function of Cerebellum, Thalamus, Hypothalamus & Cortex
- Cranial nerves
- Reflex action
- Cardio vascular System
- Conduction system
- ECG
- Heart Sounds
- Cardiac Output
- Blood Pressure
- Coronary Circulation
- Functions of Lymph
- Respiratory system
- Hypoxia
- Surfactant
- Mechanism of Respiration
- Transport of gases
- Regulation of respiration
- Lung volumes and capacities

Unit -5

- Gastro Intestinal system
- Salivary Secretion
- Gastric Juice

- Functions of Liver, Spleen & Gallbladder
- Bile
- Deglutition
- Intestinal movements (Brief)
- Excretory system
- Functions of kidney
- Structure of Nephron &Juxta glomerular apparatus
- Glomerular Filteration Rate (GFR)
- Micturition Reflex
- Temperature Regulation
- Functions of Skin
- Reproductive system
- Spermatogenesis briefly
- Endometrial cycle briefly
- Contraception
- Functions of placenta
- Blood
- Composition and functions of blood.
- Plasma Proteins.
- Erythropoiesis.
- Haemoglobin functions and types
- Anaemia and Polycythemia.
- Types and Functions of WBC
- Functions of Platelets
- Blood coagulation
- Hemophilia and purpura
- Sensory organs
- Taste, sensation and taste pathway
- Mechanism of hearing briefly

- Auditory pathway
- Blood grouping
- Landsteiner's law
- Cross matching
- ABO system
- Rh system
- Significance of blood grouping
- Erythroblastosisfoetalis

13 GENERAL AND OCULAR BIOCHEMISTRY

Unit -1

Introduction to biochemistry:- Chemical elements in biomolecules and biological macromolecules. Carbohydrates: – classification, structure and functions of Monosaccharides, disaccharides- maltose, lactose and sucrose; Polysaccharides-classifications, structure and properties of starch, Glycogen, Cellulose, Hyaluronic acid, Chontroidinsulphate and Keratonsulphate. Glycolysis and TCA cycle and its energetic. Diabetes Mellitus- Types and Management.

Lipids: - classification, importance of saturated, unsaturated and essential fatty acids, triglycerides; structure and function of phospholipids and cholesterol. B-Oxidation of saturated fatty acid and its energetic.Ketone Bodies.Atherosclerosis and its consequences.

Unit -2

Amino acids and Proteins: Classifications and structure of amino acids. Proteins:-classification, structure-primary, secondary, tertiary and quaternary structures (hemoglobin as example).

Enzymes: Properties, mode of action, classification, examples of coenzymes, factors affecting enzyme activity, MichaelisMenton equation (no derivation).

Vitamins:- Biological function and Disease manifestation of water and fat soluble vitamins (no structures)

Unit - 3
Ocular Biochemistry:
Tear film:- Formation and regulation (Hormonal and Nerves control), Layers, Structure, Biochemical composition, stability, functions and abnormalities. Changes in contact lens wearer.
Cornea:- Biochemical composition including protein and enzymes and electrolyte, specialty of protein arrangement, dehydration, Regulation of dehydration, transparency and refractive power. Abnormalities and Changes in contact lens wearer.

Unit – 4
Aqueous humour:- Formation and regulation, Biochemical composition, abnormalities and changes in Contact lens wearer.
Lens:- Structure and Functions of Lens. Zonules.Biochemistry, Protein fractions, Electrolytes, Dehydration and Transparency.Cataract-classifications, cataractogenic agents.Diabetic cataract.

Unit – 5
Posting Laboratory
Estimation and Interpretation of Hb, Blood Sugar, Serum Cholesterol, Blood Urea, Bleeding Time, Clotting time, Blood grouping ,Plasma Protein and Urine sugar.

14 GEOMETRIC OPTICS

UNIT – 1

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.

UNIT – 2

Snells' law, relative and absolute refractive indices, total internal reflection and Critical angle, refraction by plane parallel slab of glass; molecular basis of reflectively.Geometrical path length & optical path length of rays, Concept of wave fronts & rays, concept of vergence-divergence, convergence.

UNIT – 3

efraction by spherical surfaces- convex & concave, Derivation of vergence equation, focal points, dioptric power power, image point, lateral & axial magnification, simple numerical.

UNIT – 4

Thin Lens- shapes, derivation of lens makers' formula, thin lens vergence equation, equivalent focal length of two thin lenses separated by a distance & placed in contact, lateral magnification of thin lenses in contact, simple numerical, concept of reduced systems.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.

UNIT – 5

Prism- Dispersion of prism, reflecting prisms, prism diopters. Geometrical theory of optical fibers.Uses of optical fibers.

15 NUTRITION

Unit -1

Introduction

- History of nutrition
- Nutrition as science
- Food group, RDA
- Diet Planning
- Assessment of nutritional status.

Unit -2

Energy

- Units of Energy
- Measurement and energy value of food
- Energy expenditure,
- Total energy and calories requirement for different age groups and diseases
- Satiety value
- Energy unbalance- obesity, saturation limitation of the daily food guide.

Unit -3

Proteins

- Sources and functions
- Essential and non- essential amino acids
- Incomplete and complete protein supplement food.
- PEM (Protein energy malnutrition) & I
- Nitrogen balance
- Change in the protein requirement

Unit -4

FAT

- Functions and sources.
- Essential fatty acids.
- Excess and deficiency
- Lipids and eye
- Hyperlipidemia and heart disease
- Artherosclerosie

Minerals:

- General function and sources
- Macro and micro minerals associated with eye.
- Deficiency and excess ophthalmic complication e.g Iron, calcium, iodine etc.

Unit -5

Vitamins

- General function,foodsources,vitamins deficiency and associated eye disorders with particular emphasis on vitamin A, promotiny sound habit in pregnancy, lactation and infancy.
- Nutrients with anti oxidation properties.

Miscellaneous

- Measles and eye disorders
- Zero birth weight.

16 Computers

UNIT – 1
Basic computer Architecture:
Fundamentals of Computers, Block diagram of PC, peripheral devices of PC and their functions, Types of Computers
UNIT – 2
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.
UNIT – 3
Operating System: Introduction & classification of software, working principle of MS Windows, Windows & its components. Accessories, program manager, Control Panel, Main, desktop icons.
UNIT – 4
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, Introduction to MS Powerpoint – Creating and Editing Presentation, Animation, Transition.
UNIT – 5
Introduction to Internet: Basic concepts of Internet, Email, Sending and receiving mail, browsing, chat, .Introduction to Virus &Anti Virus, Types of Viruses, Prevention of Virus Infection.

I – Year Semester II

21 PART –II ENGLISH

Paper II

PROSE, EXTENSIVE READING AND COMMUNICATION SKILLS

Unit - I

My Vision for India	-	A.P.AbdulKalam
The Duty of Society to the Artist	-	E.M.Forster
The Scientific Point of View	-	J.B.S.Haldone

Unit – II

A Glory has Departed	-	Jawaharlal Nehru
Arguing	-	Robert Lynd
Discipline is a Great Teacher	-	John Holt

Unit – III

After Twenty Years	-	O'Henry
The Conjurer's Revenge	-	Stephen Leacock
An Astrologer's Day	-	R.K.Narayan
The Four Brothers	-	Walter de la Mare

Unit – IV

Clause: Adverbial and Adjective Clause – Main and Subordinate Clause – Conjunction: Subordinate and Co-ordinate Conjunctions – Pronoun: its Kinds.

Unit – V

Transformation of Direct to Indirect Speech and Indirect to Direct Speech – Degrees of Comparison.

Prescribed Texts:

1. Effective Communication to English Prose: An Anthology of Prose. Eds.S.Yusuf and P.C.James Daniel. Bangalore: Harrow Publications.
2. Active English Grammar and Composition. Ed. Board of Editors, Macmillan.
3. Twelve Tales – T.G.Seshadiri, Anuradha Publications.

22 Ocular Anatomy

UNIT - 1
Embryology –ocular
Formation of optic vesicle & optic stalk, formation of lens vesicle, formation of optic cup, changes in associated mesoderm, development of various structure of eye ball – retina, optic nerve, crystalline lens, cornea, sclera, choroid, cilliary body, iris, viterous. Development of accessory structures of eyeball – eyelids, lacrimal apparatus, extra-ocular muscles, orbit. Milestones in the development of the eye.
UNIT – 2
Orbit

Bony orbit Size, shape & relations, walls of the orbit, Base of the orbit, Apex of orbit.
Orbital fascia Fascialbulbi, 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.

UNIT – 3
Cornea (a)Layers & peculiarities,(b). Blood supply & nerve supply of cornea (c) Corneal Transparency, Lens ,Zonules (a) Structure. of lens capsule, Ant. Epithelium, lens fibers (structured & zonal arrangement), (b). Ciliaryzonules structure gross appearance,(c). Arrangement of zonulesfibers.UvealTract & 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 drainageAnterior chamber and its angle- angle of the anterior chamber. Trabecular meshwork.Canal of Schlemm.Schwalbe’s line.Drainage of aqueous humor.

UNIT - 4

Vitreous- main masses of vitreous.Base of the vitreous.Hyaloidean vitreous.Vitreous cells. Sclera – Anterior, posterior & middle apertures. Episclera.Sclera proper.Lamina fusca. Blood supply of the sclera. Nerve suply of the sclera.Retina & its vascular supply (a). Gross anatomy,(b). Microscopic structure of fovea centralize, (c). Blood retinal barrier.(d.) Anatomy of optic nerve, (e). Anatomy of optic nerve, (f.) optic chaisma optic tracts, (g) Lateral Geneculate body, (h). optic radicalism (i). visual cortex, (j). Arrangement of nerve fibers.(K). Blood supply of visual pathways (Arterial circle of willis& its branches). The Ocular motor system Extraocular muscles, nerve supply, motor nuclei, supra nuclear motor centers. The pupillary &ciliary muscle Anatomy of sphincter & Dilator muscle.Ciliary muscle – Anatomy, types

The nerve supply of the eye ball

UNIT – 5

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. Anatomy of the Ocular Adnexa & glands; Lids - a. Structures of the lids: - Skin, Subcutaneous Areolar Layer, Layer of Staiated muscle, Submuscular Areolar Tissue, Fibrous Layer, Conjunctiva.Glands of the Lids- Meibomaian Glands, Glands of Zela and Glands of Moll. Blood Supply of the Lids, Lymphatic Drainage of the Lids, Nerve Supply of the Lids.

Conjunctiva - Palpebral Conjunctiva, Bulbar Conjunctiva, Conjunctival Fornix, Microscopic Structure of the conjunctiva- Epithelium, SubstantiaPropria. Conjunctival Glands Krause's Glands, Wofring's Glands, Henley's Glands, Manz Glands. Blood Supply of the Conjunctiva, Nerve Supply of the Conjunctiva, Caruncle, PlicaSemilunaris.

23 Ocular Physiology

UNIT 1

Cornea: Brief idea about ultra & histological structure of cornea. Corneal transparency & hydration, Regulation of corneal transparency & hydration.Corneal vascularization. Maurice theory & Goldman's theory Uveal tissue: Brief idea about uvea. Uveal meshwork.Uveo-scleral drainage.Schlemm's canal switch3. Lens:

Basic idea about human lens. Function of lens. Lens transparency.Lens culture.Changes in ageing lens. Cataract – overview. Aqueous humour: Formation of Aqueous humour.Drainage & circulation of Aqueous Humor.Rates of production & flow. Functions of Aqueous humour. Vitreous Humour:

Composition & distribution of vitreous humour, Physiology & function of vitreous humour, Optical role of vitreous humour Retina Retinal structure-layers of retina.Brief idea about rod & cones.Organization of retina. Function of retinaOptic Nerve: Physiology of optic nerve. Papilledema of optic nerve.Optic atrophy.

UNIT – 2

Ocular Circulation Vascular structure of the eye – ocular circulation, blood-ocular barrier (Blood-retinal, blood Vitreous & blood aqueous barrier). Regulation of ocular circulation. Protective Mechanism of the eye –

- Blinking – muscles of lead closer & lid opening (orbicularis occulli, levatorpalpebrae, Muller's muscle, blinking reflexes.
- Lacrimation – Lacrimal glands, Pre corneal tear filmChemistry of lachrymal secretion tear film&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, elimination of tear

UNIT – 3

The ocular motor system –

- Extra ocular muscles their function & nerve supply

- Mechanics of actions of extra ocular muscles -cross sectional area of muscle, length of muscle. Arc of contact, muscle plane, Muscle axis of rotation.
- Physiology of ocular movement – Basic Kinematics, (position of gaze, Fick's axes)
- Ocular Movement (monocular and Binocular). Supra nuclear control of eye movements. Ocular movements
- Monocular Movements (Adduction, Abduction, supraduction, Infraduction, Incycloduction, excycloduction)
- Binocular Movements –VERSIONS- (saccadic & pursuit movement, position maintenance movements, stabilization movements & their characteristics). VERGENCES – (Convergence, divergence, vertical vengeance),

UNIT 4

Intraocular pressure

Features of normal IOP, Factors influencing the IOP,Control of IOP,Measurement of IOP. Pupil –Normal pupil, Physiological changes in pupil size – Isocoria, Pupillary unrest, Hippies. Pupillary reflex – Light reflex, Near reflex, Darkness reflex , Psycho sensory reflex, Lid closure reflex.

Accommodation –

- Far point , near point, range & amplitude of Accommodation
- Mechanism of accommodation – Increased tension theory, Relaxation theory, Role of lens capsule, Gullstrand mechanical model of accommodation,
- Stimulus for accommodation
- Ocular changes in accommodation.
- Changes in accommodation with age (Presbyopia)
- Nervous mechanism for accommodation

Color vision-

- Physiological, Photochemical & neurological basis of color vision
- Electrophysiology of color vision
- Granit's modulator and dominator theory, Purkinje phenomenon. Young-Helmholtz theory
- Types of color defects
- Color blindness
- Neural analysis Geneculate cortex:
- Structure of geneculate cortex.
- Electrophysiology
- Projection – retinal projection
- Detail idea about visual cortex & function of visual cortex.

UNIT - 5

Visual perception –

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

Visual acuity

visual angle, Components of Visual acuity (Minimum visible, Resolution , Recognition Hyperacidity), Factors affecting, Measurement of visual acuity.

Contrast Sensitivity

Types- (spatial & Temporal contrast sensitivity), Neural Mechanism, Measurement of contrast sensitivity (Arden gratings , Cambridge low contest gratings, Pelli – Robson chart)

Light & Dark adaptation

Dark adaptation curve, Mechanism of dark adaptation, Factors influencing dark adaptation, Time course of light adaptation, Mechanism

of light adaptation, Rod vs. cone light adaptation. Purkinje shift of spectral sensitivity.
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.
Electro diagnostic tests
ERG, EOG, VER

24 PHYSICAL OPTICS

UNIT – 1
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.)
UNIT – 2
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 coatings and filters.
UNIT – 3
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, transmission, amplitude & phase gratings (definitions in brief) Grating dispersion & dispersive power, spectral resolution; zone plates.Rayleigh's criterion.

UNIT – 4

Concept of polarization , linear , circular , elliptical polarization (qualitatively),Plane of polarization & vibration, degree of polarization, polarizes, analyzer.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. Holography – basic principle; simple experimental arrangement, some applications

UNIT – 5

Principles of Lasers

Holography – basic principle; simple experimental arrangement, some applications.

Spectrum

Sources of spectrum, Bunsen – carbon – mercury - sodium

Emission and absorption spectra - classification (visible, ultraviolet, infrared and

electromagnetic spectra)

Radiometry and spectroscopic instruments

Resolution of optometric instruments: Microscopes, Telescopes and binoculars

25 Microbiology and Pathology

Unit- 1

Introduction:- Classification. Normal Ocular Flora.General immune system, structure and function of immunoglobulins.Basic laboratory Techniques- Collection of specimens; Conjunctiva swab, Lacrimal sac, Scrapings from corneal ulcer and AC, Vitreous tapings. Analysis- Microscopy, Fixing of slides, Staining, Potassium Hydroxide mount, Gram's Staining, Acid-fast staining and Giemsa staining. Culture media (Introduction Only). Culture & Sensitivity test. Sterilization and disinfection – Physical and chemical methods.

Ocular Microbiology:-

Unit -2

Ocular Bacteriology- Clinical importance, ocular lesions, diagnosis and treatment of Gram positive cocci – Staphylococci, streptococci pneumococci; Gram negative cocci – Gonococci and Meningococci; Gram positive bacilli – Corynebacteriumdiphtheriae, c.Xerosis; Gram Negative bacilli – Enterobacteria, Pseudomonas, Maraxella, Haemophilus; Mycobacteria – M. Tuberculosis, M leprae; Spirochetes – Treponemapallidum, Leptospira.

Unit- 3

Ocular Virology:- Clinical importance, ocular lesions and treatment of Common virus – pox, Adeno, Picorna, Rubella and Retro virus.

Ocular Parastiology: Clinical importance, ocular lesions and treatment of Acanthameoba, Toxocara, Filaria, Echinecoccus,Phthirus.

Ocular Mycology:- Clinical importance, ocular lesions and treatment of Common fungi- Fusarium, Mucor, Candida, Histoplasma.

Hypersensitivity reaction - Type 1,2,3,4 & 5 Reaction.

Unit -4

General Pathology:- Tissue injury, vascular and cellular components involved in inflammation. Heating and Repair – Role of Vascular and Cellular component

Unit -5

Ocular pathology:-

Eye lids – Chalazion, Hordeoluminternum and Hordeolumexternum; Conjuctiva – onjunctivitis; Cornea - Ulcers and Keratoconnus; Lens - Pathology of cataract, types, Lens induced glaucoma & Uveitis and Diabetic cataract.

Tamours – Retinoblastoma, Malignant Melanoma, Squamous cell carcinoma, Lacrimal gland tumors and Orbital tumors & pseudo tumors.

26 ENVIRONMENTAL STUDIES

Unit I The Multidisciplinary Nature of Environmental Studies

Definition, Scope and importance
Need for public awareness

Unit II Natural Resources

Renewable and non-renewable resources

a) Forest Resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effect on forests and tribal people
b) Water Resources: Use and over-Utilization of surface and ground water, floods, drought, conflicts over water, dams- benefits and problems.
c) Mineral resources: Use and exploitation, experimental effects of extracting and using mineral resources, case studies.
d) Food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy resources, Case studies.
f) Land resources: Land as a resource, land degradation, main induced landsides, soil-erosion and desertification
    - Role of individual in conservation of natural resources
    - Equitable use of resources for sustainable lifestyle

Unit III Ecosystems, Bio-diversity and its conservation

Ecosystems

- ✓ Concept of an Ecosystem
- ✓ Structure and function of an Ecosystem
- ✓ Energy Flow in the Ecosystem
- ✓ Food Chains, Food Webs and Ecological Pyramids

Biodiversity and its conservation

- ✓ Introduction- Definition: Genetic, Species and Ecosystem Diversity
- ✓ Bio-Geographical Classification of India
- ✓ Value of Biodiversity: Consumptive Use, Productive Use, Social Ethical, Aesthetic and Option Values.
- ✓ Biodiversity at Global, National and Local Levels
- ✓ India as a Mega-Diversity Nation
- ✓ Hot Spots of Biodiversity
- ✓ Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts
- ✓ Endangered and Endemic Species of India
- ✓ Conservation of Biodiversity in-Situ and Ex-Situ Conservation of Biodiversity

Unit IV Environmental Pollution

- Causes, Effects and Control measures of:-
    a. Air Pollution
    b. Water pollution
    c. Soil pollution
    d. Marine pollution
    e. Noise pollution
    f. Thermal pollution

g. Nuclear hazards

Unit V Field Work

- Visit to a local area to document environmental assets–river/ forest/ grassland/ hill/ mountain
- Visit to a local polluted site- Urban/Rural/Industrial/Agricultural
- Study of common Plants, insects, birds
- Study of simple ecosystem-pond, River, Hill slopes, etc

References

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- Clark R.S. Marine Pollution, Clanderson Press Oxford(TB)
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- De.A.K.Environmental Chemistry, Wiley Eastern Ltd.
- Down to Earth, Centre for Science and Environment®
- Gleick H.P. 1993, Water in crisis, Pacific Instutue for studies in Dev, Environment & Security, Stockholm Env. Institute,Oxford Univ.Press,473p
- Hawlinks R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
- Heywood, V.H & Watson, R.T.1995, global biodiversity Assesment, Cambridge Univ.Press, 114op
- Jadhav, H&Bhosale V.M.1995, Environmental Protection and Laws, Himalaya Pub; House, Delhi 284p
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- Mhaskar A.K.Matter Hazardous, techno-Science Publications(TB)
- Miller T.G. Jr.Environmental Science wadsworth Publicing Co(TB)
- Odurm, E.P.1971 fudamentalof Ecology, W.B.Saunders Co. USA 584p
- Rao M.N & Datta, A.K., 1987, Tehchno-Science, Waste water Treatment. Oxford& IBH publ, Co.Pvt. Ltd.,345p
- Sharma B.K. 2001, environemtal chemistry Goel publ,House,Meerut
- Survey of the Environmental the Hindu(M)
- Townsend C., harper J, and Michael Degon,Essential of ecology,Blakewell Science (TB)
- Trivedi R.K., Hand book of Environmental laws, Rules, Guidelines, compliances and Standards, Vol I and II, Enviro Meida ®
- Trivedi R.K. & P.K.Goel Introduction to Air pollution,Techno-Science Publications (TB)

II Year Semester III

Part II - ENGLISH

31 COMMUNICATIVE SKILLS

Unit – I

Communication:

Communication – Definition - Types of Communication – Kinds of Verbal and Non-Verbal Communication – Barriers to Communication – Ways of Challenging the Barriers of Communication.

Unit – II

Recap of Grammar:

Phrasal Verbs and Prepositional Phrases - Relative Clauses - Conditional Clauses - Infinitives and Gerunds - Framing Questions - Question Tags – Homonyms and Homophones - Active and Passive Voice - Transformation: Simple - Compound - Complex.

Unit - III

Most Common Mistakes in English Usage:

Unnecessary Words: Unnecessary Prepositions - Unnecessary Articles - Use of the Infinitive - Misplaced Words: Wrong Position of Adverbs - Miscellaneous Examples - Confused Words: Prepositions Often Confused - Verbs Often Confused - Adverbs Often Confused - Adjectives Often Confused - Nouns Often Confused - Confusion of Number - Confusion of Parts of Speech.

Unit – IV

Listening and Speaking Skills:

Sounds: Vowels and Consonants – Stress: Primary and Secondary – Intonation: Falling and Rising.

Unit – V

Reading and Writing:

Importance of Reading – Loud Reading – Silent Reading – Skimming – Scanning – SQ3R (Survey, Question, Read, Recite and Recall) – Mechanics of Handwriting – Characteristics of Good Handwriting.

Prescribed Texts:

1. Fitikides.T.J. *Common Mistakes in English*. Edinburg Gate, England: Pearson Education Limited, 1936.Print.
2. Active English Grammar and Composition. Ed. Board of Editors, Macmillan.
3. Kelly, Gerald. Teach Pronunciation. Ed. Jermy Harmer. Edinburg Gate, England: Pearson Education Limited, 2000.Print.
4. Watkins, Peter. Learning to Teach English. New Delhi. Viva Books Pvt.Ltd., 2007. Print.

32 Visual Optics

Unit – 1

Optics of ocular structure: cornea and aqueous, crystalline lens, Vitreous Schematic and reduced eye

Measurement of optical constant of the eye: corneal curvature and thickness, keratometry, lens curvature, axial and axis of the eye

Basic aspects of vision: visual acuity, color vision, contrast sensitivity, light and dark adaptation, spatial and temporal resolution and science of measuring visual performance

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

Unit – 2

Refractive conditions: Myopia, Hyperopia, Astigmatism, Anisometropia, Anisiekonia, Aphakia and pseudophakia

Accomodation: Mechanism of accommodation, Schiener's disc experiment, changes in the lens during accommodation.

Amplitude of accommodation: Far point and near point of accommodation, range of accommodation and amplitude of accommodation and measurement of amplitude of accommodation

Presbyopia: etiology, types, sign, symptoms and management

Unit – 3

Ocular refraction (K), Spectacle refraction (F) and relationship between spectacle refraction (F) and ocular refraction (K).

Vertex distance and the effect of vertex distance change

Pupil: Blur disc diameter and pupil size. Depth of field and Depth of focus, retinal image size calculation.

Magnification: Spectacle magnification, ocular magnification and relative spectacle magnification

Unit – 4

Retinoscopy: Principle, procedures and clinical application of retinoscopy

Review of subjective refractive methods: Cross cylinder methods for astigmatism, Astigmatic Fan Test
Difficulties in subjective and objective tests and their avoidance.Binocular balancing and refraction.
Unit – 5
Aberration of the eye, contrast sensitivity and prisms

33 Ocular Diseases I

UNIT – 1

Anterior segment ocular diseases involving orbit, eyelids, adnexa, conjunctiva, cornea, urea, sclera, anterior chamber, iris and lens. Symptomatology, clinical signs, diagnosis, pathogenesis, pathophysiology , systemic disease relationships and treatment of degenerative, infections and inflammatory conditions affecting these structures.
Disease of the Lids – Congenital Deformities of the Lids .Oedema of the Lids.Inflammatory Conditions of the Lids.Deformities of the Lid Margins.Deranged Movement of the Eyelids. Neoplasm's of the Lids. Injuries of the Lids.
Diseases of the Lachrymal Apparatus-. Dry Eye. Disease of the Lachrymal Gland.Disease of the Lachrymal Passages.Operations for Chronic Dacryocystitis.

UNIT – 2
Disease of the Conjunctiva- SubconjunctivalHaemorrhage Infective Conjunctivitis.Follicular Conjunctivitis.Granulomatous Conjunctivitis.Allergic Conjunctivitis. Conjunctivitis Associated with Skin conditions. Degenerative conditions of the Conjunctiva. Vitamin-A Deficiency. Cysts and Tumours of the Conjunctiva.Conjunctival Pigmentation . Injuries of the Conjunctiva.

UNIT – 3
Disease of the Cornea –Congenital Anomalies.Inflammation of the Cornea (Keratitis).Superficial Keratitis.Deep Keratitis.Vascularisation of Cornea.Opacities of the Cornea.Keratoplasty.Corneal Degenerations.Corneal Dystrophy's.Corneal Pigmentation.Corneal Injuries.Refractive Corneal Surgery. Corneal Ulcer (Bacterial , Viral , Fungal)

Disease of the Sclera- Episcleritis.Scleritis.Staphyloma of the Sclera. Blue Sclerotic Scleromalacia Performs. Nanophthalmos.Injuries of the Sclera.

UNIT – 4

Disease of the Iris.-. Congenital Anomalies. Inflammations (Anterior Uveitis) . Specific Types of Iridocyclitis .Degenerations of the Iris. Cysts and Tumours of the Iris. Injuries of the Iris.

Disease of the Celery Body- Inflammations of the Ciliary Body. Purulent Iriodocyclitis(Panophthalmitis) . Evisceration .Sympathetic Ophthalmia.Vogt- Koyanagi – Harada Syndrome.Tumours of the Ciliary body. Injuries of the Ciliary body.

UNIT – 5

Glaucoma- .Formation of Aqueous Humor.Drainage of Aqueous. Intraocular Pressure(IOP) . Ocular Rigidity.

Tonography. .Developmental Glaucoma (Buphthalmas) . Primary Narrow Angle Glaucoma.Primary Open Angle Glaucoma.NormotensiveGlaucoma . Ocular Hypertension .Secondary Glaucoma. Surgical Procedures for Glaucoma(Steps Only) ,YAGPI ,trabeculectomy.Laser Procedure in Glaucoma . Artificial Drainage Devices in Glaucoma Surgery(Molteno).

Disease of the Lens- Congenital Malformations. Cataract .Congenital and Developmental Cataract . Senile Cataract.Traumatic Cataract.Complicated Cataract. Secondary Cataract .After Cataract.Dislocation of the Lens.SurgicalProcedures for Removal of the Lens(Operative Steps Only). Phacoemulsification(ICCE,ECCE,IOL) . Small Incision Cataract Surgery (Manual Phaco).Intra- ocular Lens Implantation-AC+PC, IOL.

34 Optometric Instrumentation - I

Unit – 1

Detailed study of the Principles of operation, types, optical properties, constructions, adjustments and applications of the following Instruments and Devices

Binoculars, Simple and Compound Microscopes (with Huygens and Ramsden Eye pieces and oil immersion objectives). Spectrometer and Radiuscope

Unit – 2

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

Abberometer

Unit – 3

Design of ophthalmoscopes – illumination, viewing, Ophthalmoscope disc and Filters for ophthalmoscopy

Indirect ophthalmoscope

Autorefractometer- subjective and objective types

Refractometers- Auto refractors

Unit – 4

Slit lamp biomicroscope

Keratometry and corneal topography (Orbscan, Cirrus, pentacam and etc)
Tonometery – Principles, types, clinical importance as a routine procedure (application)
Pachymetery – Principles, types, clinical importance
Devices for color vision testing – CS testing / Glare testing.
Unit – 5
PAM – Principles and importance.
Ophthalmic LASER application (Argon, Yag)

35 General and Ocular Pharmacology

UNIT – 1
Nature & Sources of drug.Routes of drug administration (general & Ocular). New drug delivery systems. Absorption & factors effecting drug absorption.Distribution & factors effecting drug distribution. Drug metabolisms – Liver first pass mechanism, Phase I and Phase II reaction. Factors effecting drug metabolism.Drug excretion & toxicity.

UNIT - 2
Classification of drugs. Drug action - site of drug action, structure activity relationship.Drug receptor. Mechanism of drug action. Dose response relationship. Adverse drugs reactions (ADR) in man, Manifestations of ADR. Treatment of Acute drug poisoning.

UNIT – 3
Drug action on the nervous system - General Considerations.Aliphatic Alcohol's. General Anesthetics.Sedatives, Hypnotics and Pharmacotherapy of Insomnia.Drugs Effective in Convulsive Disorders.Opioid Analgesics. Analgesic – Antipyretics and Nonsteroidal Anti- inflammatory Drugs(NSAID). Central Nervous System Stimulants. Local Anesthetics - Cocaine, Procaine and Other Synthetics Local Anesthetics.

UNIT - 4

Autonomic Nervous System - Types, Classification and functions of Adrenergic and Cholinergic receptors. Adrenergic and Adrenergic Blocking Drugs.Cholinergic and anticholinergic drugs.

UNIT - 5

Preparation and packaging of ophthalmic drugs, Drug action and effectiveness, Ocular penetration, Ophthalmic diagnostic drugs. Topical anesthetics.

Ophthalmic Drugs – antibiotics, corticosteroids, anesthetics, viscoelastics agents.Antiglaucomic drugs.

36 Clinical Examination of the visual system

Unit – 1
History taking
Visual acuity assessment (various charts available)
Extraocular motility, Cover test, Alternating cover test, Hirschberg test, Modified Krimsky, Pupils Examination, Maddox Rod and van Herric technique
External examination of the eye, Lid Eversion, Schirmer's, TBUT, tear meniscus level, NITBUT (keratometer), Color Vision, Stereopsis, Confrontation test and Photostress test
Unit – 2
Objective Refraction
Streak Retinoscopy – all procedures to use streak retinoscope; static and dynamic retinoscopy, different methods of dynamic retinoscopy – MEM, Sheard's, Low and high neutral, Bells Other methods of retinoscopy-Radical, Near(Mohindra), Chromoretinoscopy Other methods of retinoscopy (spot retinoscopy)
Autorefractor Principle, construction, uses, merits demerits, limitations
Unit – 3
Subjective Refraction
Monocular Distance – fogging, testing of astigmatism under fog, fixed astigmatic dial (clock dial), rotary astigmatic dial, combination of fixed and rotary dial (Fan and Block test), J.C.C. Duochrome or Bichrome
Binocular balancing – alternate occlusion, prism dissociation, dissociated duochrome balance, Borish dissociated fogging, equalization
Binocular Distance – T.I.B. (Turville Infinity Balance), Polarized – Target and polarized filter, fogging.
Near subjective refraction.
Cycloplegic refraction, cyclodemia, sudden unfogging ,Borish delayed spherical end point, pinhole estimation of refractive error
Unit – 5
Different methods of measuring amplitude of accommodation.

Correction of Presbyopia – Different methods of stimulation of tentative presbyopic addition – amplitude of accommodation, J.C.C., NRA-PRA balance, Bichrome, Plus Build-up, based on age, Dynamic retinoscopy Occupational consideration, finalization of add for near and intermediate-different options of correction
Measurement of IPD and significance.Final discussion with the patient. Writing prescription of power and counseling
Slitlampbiomicroscopy
Direct Ophthalmoscopy, Digital pressure, Schiotz Tonometry, Applanation Tonometry, Gonioscopy, Amsler test, Corneal Sensitivity, HVID, Saccades and Pursuits

1. Clinic I

- History taking
- Extraocular motility
- Cover test, Alternating cover test
- Hirschberg test, Modified Krimsky
- Pupils Examination
- Maddox Rod
- Van Herric technique
- External examination of the eye, Lid Eversion
- Schirmer's, TBUT, tear meniscus level, NITBUT (keratometer)
- Color Vision
- Stereopsis
- Confrontation test
- Accommodative facility(+ 2.00 D)
- Corneal Sensitivity test
- IPD
- Pupillary evaluation (Direct, Consensual and RAPD)
- HVID
- Maddox rod (Phoria)
- Negative Fusionalvergence

- Positive FusionalVergence
- Visual acuity assessment
- Retinoscopy

II – year Semester IV

41 Part II - ENGLISH

EMPLOYABILITY SKILLS

Unit – I

Skills for Employability:

Telephone Etiquettes – Describing People and Place – Expressing our Opinions – Time Management –Interview Skills: Kinds of Interview and its Techniques – Head to Foot Appearance: Preparation, Punctuality, Sincerity, Honesty, Boldness and Confidence – Common Interview Questions.

Unit – II

Business Correspondence:

Letter Writing: Formal and Informal – Resume Writing – Filling Applications: Bank Challan and Job Application.

Unit – III

Report Writing:

Different Types of Greetings - Drafting Telegrams / e-mails – Preparing Portfolios and its Various Types -Developing Topic Sentences into Paragraphs - Expansion of an Outline - Note-making & Note-taking - Report Writing - Reading Comprehension – Summarising – Writing Review for Two Books.

Unit – IV

Composition:

Composition: Oral and Written – Kinds of Composition: Controlled, Guided and Free Composition – Developing Creative Competency.

Unit – V

Non-Verbal Communication:

Non-Verbal Communication – Personal Appearance – Gesture – Posture – Body Language – Visual Aids: Charts, Diagrams & Tables – Audio & Video Aids for Communication.

Prescribed Texts:

1. Raisher. Business Communication.
2. Krishnamohan&Meera Banerjee. Developing Communication Skills.

3. Anderson & Others. Assignment and Thesis Writing.
4. Employability Skills. Chennai: National Media Institute.

42 Optometric Optics

Unit – 1
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 prims
Lenses – Definition, units, terminology used to describe, form of lenses
Lens shape, size and types i.e. spherical, cylindrical and Spherocylindrical
Unit – 2
Vertex distance and vertex power, Effectivity calculations
Transpositions – Simple, Toric and Spherical equivalent
Prismatic effect, centration, decentration and Prentice rule, Prismatic effect of Plano-cylinder and Spherocylinder lenses
Spherometer& Sag formula, Edge thickness calculations
Magnification in high plus lenses, Minification in high minus lenses
Tilt induced power in spectacles
Aberration in Ophthalmic Lenses
Unit – 3
Raw materials – History and General Outline, Manufacturing of Ophthalmic Blanks – Glass & Plastics, Terminology used in Lens Workshops, Surfacing process from Blanks to lenses
Definition & Materials (Glass, Plastics, Polycarbonate, Triology) types and Characteristics
Properties (Refractive index, specific gravity,UV cut off, impact resistance – include drop ball test, abbe value, Center thickness)
Unit – 4
Design of High Powered Lenses Hi-index lenses, Calculation of Refractive index
Bifocal designs, their manufacturing & uses (Kryptok, Univis D, Executive, Invisible, Occupational)
Progressive Addition Lenses, modified near vision lenses (designs, advantages, limitations)
Unit – 5

Lens enhancements (Scratch resistant coatings – spin/dip, Anti-reflection coating, UV coating, Hydrophobic coating, anti-static coating
Lens defects – Description and Detection
Glazing & edging (manual & automatic)
Project to ensure awareness on lens availability in Indian market

43 Ocular Disease II

UNIT – 1

Diseases of the Vitreous Humor- Congenital Anomalies.Vitreous Opacities. Hereditary Vitreo – Retinal Degeneration's. Vitreous Haemorrhage .Detachment of Vitreous Humor . Vitreous Surgery . Methods of clinically assessing the posterior segment (direct& indirect opthalmoscopy)

Disease of the Retina- Congenital & Dev. Defects.Inflammation of the Retina(Retinitis) . Retinal Vasculitis .Oedema of the Retina.Haemorrhage of the Retina. Vascular Occlusion .Retinal Arteriosclerosis.Retinopathies .Retinal Telangiectasis. Degeneration's of the Retina. Detachment of the Retina.Surgical Procedures for Retinal Detachment .Tumours of the Retina.Phakomatoses,.Injuries of the Retina.

Disease of the Optic Nerve- Congenital Anomalies.Papilloedema. Inflammation of the Optic Nerve(Optic- Neuritis). IschaemicOptic Neuropathy . Optic Atrophy.Tumours of the Optic Nerve.Injuries of the Optic Nerve.

Symptomatic Disturbances of Visual Function – Visual Field Defects .Amblyopia.Amaurosis.Night Blindness.Day Blindness.Defects in Color Vision.Congenital Word Blindness.Malingering.

UNIT – 2
Neuro –eye disease:
Evaluation of optic nerve disease
Clinical features of optic nerve dysfunction., Optic disc changes. Optic atrophy.Special investigation.
Classification of optic neuritis
Optic neuritis and demyelination
Systemic features of multiple sclerosis, Special investigation. Optic neuritis.
Other causes of optic neuritis
Parainfectious optic neuritis.Infectious optic neuritis.
Non-arteritic anterior ischaemic optic neuropathy
Arteritic anterior ischaemic optic neuropathy
Clinical features of giant cell arteritis. Special investigation.Arteritic anterior ischaemic optic neuropathy.
Leber hereditary optic neuropathy
UNIT – 3
Hereditary optic atrophies
Kjer syndrome.Behr syndrome.Wolfram syndrome.
Alcohol-tobacco amblyopia
Drug-induced optic neuropathies
PAPILLOEDEMA
Raised intracranial pressure - Causes.Hydrocephalus. Systemic features.
Clinical features of papilloedema Differential diagnosis.

CONGENITAL OPTIC NERVE ANOMALIES
Without neurological associations
Tilted disc.
Optic disc drusen.
Optic disc pit.
Myelinated nerve fibers.

With neurological associations
Optic disc coloboma.
Morning glory anomaly.

Optic nerve hypoplasia.
Aicardi syndrome.
Miscellaneous anomalies.

UNIT – 4

PUPILLARY REACTION

Applied anatomy.
Abnormal pupillary reactions
Afferent pupillary conduction defects
Argyll robertson pupils
Differential dignosis of light-near dissociation
Adie pupil
oculosympathetic palsy (horner syndrome)

NYSTAGMUS

Classifications
Causes
Physiological nystagmus.
Motor imbalance nystagmus.
Ocular nystagmus.
nystagmoid movements.

SUPRANUCLEAR DISORDER OF EYE MOVEMENTS

Conjugate eye movements
Saccadic movements.
Smooth pursuit movements.
Non-optical reflexes.
Supranuclear gaze palsies
Horizontal gaze palsies.
Vertical gazepalsies.

THIRD NERVE DISEASE

Applied anatomy
Clinical aspects
Clinical features.
Aberrant regeneration.
Causes isolated third nerve palsy.

FOURTH NERVE DISEASE

Applied anatomy
Clinical aspects
Clinical features.
Causes of isolated fourth nerve palsy.

SIXTH NERVE DISEASE
Applied anatomy
Clinical aspects
- Clinical features.
- Causes.

UNIT – 5
DISORDERS OF CHIASM
Classification
Applied anatomy
Applied physiology
- Hyperpituitarism.
- Hypopituitarism.

Pituitary adenoma
- Clinical features.
- Special investigation.
- Treatment.

Craniopharyngioma
Meningioma
DISORDERS OF RETROCHIASMAL PATHWAYS AND CORTEX
Clinical features of optic tract lesion
Lesions of optic radiations
- Applied anatomy.
- clinlcal features.

OCULAR MYOPATHIES AND RELATED DISORDERS
Myasthienia gravis
- Clinical features.
- Special investigations.

- Treatment.

Ocular myopathies

Myotonic dystrophy

- Systemic features.
- Ocular features.

Essential blepharospasm

- Clinical features.
- Treatment.

NEUROFIBROMATOSIS

Neurofibromatosis type-1(NF-1)

- Systemic features.
- Ocular features.

44 Optometric Instrumentation II

Unit – 1

Visual acuity testing & theory. Color vision testing & theory
ERG, EOG, EMG, ENG,
Scans Ultrasonography – (A scan, B scan) – Principles and application.
F.F.A – Principles and demonstration of film
Unit – 2
VER or VEP
Tonometer, tonometry &tonography
Fields Of Vision And Screening Devices
Perimeter – Basics of perimetry – Humphray instruments, Automated perimetry – basics, types(names) , interpretation of normal Glaucoma Field of Definition
Unit – 3
Adaptation &adaptometry, berman's locator, cryo technique, diathermy & photo-coagulation
Slit lamp examination
Unit – 4
Gonioscopy, pachymetry, ocular photography (Ant Seg)
pH testing &Schimer's test. Fluorescein staining & techniques syringing& lacrimal function test
Unit – 5
Ophthalmoscopy, Retinoscopy, Auto- refraction, Photorefraction, keratometry and ophthalmic lens measuring instruments.

45 VALUE EDUCATION

Definition

The learning and practice of facts which have eternal value is what is contemplated by value education. It can also be the process by which a good citizen is moulded out of a human being. The evolution of a good human being is when he realises that his conscience shows to him the rightness of his action.

Objective

To create an awareness to values among learners and help them adopt them in their lives.

Unit I

Definition – Need for value Education – How important human values are – humanism and humanistic movement in the world and in India – Literature on the teaching of values under various religions like Hinduism, Buddhism, Christianity, Jainism, Islam, etc. Agencies for teaching value education in India – National Resource Centre for Value Education – NCERT– IITs and IGNOU.

Unit II

Vedic Period – Influence of Buddhism and Jainism – Hindu Dynasties – Islam Invasion – Moghul invasion – British Rule – culture clash – Bhakti cult – social Reformers – Gandhi – Swami Vivekananda – Tagore – their role in value education.

Unit III

Value Crisis – After Independence

Independence – democracy – Equality – fundamental duties – Fall of standards in all fields – Social, Economic, Political, Religious and Environmental – corruption in society.

Politics without principle – Commerce without ethics – Education without Character – Science without humanism – Wealth without work – Pleasure without conscience – Prayer without sacrifice – steps taken by the Governments – Central and State – to remove disparities on the basis of class, creed, gender.

Unit IV

Value Education on College Campus

Transition from school to college – problems – Control – free atmosphere – freedom mistaken for license – need for value education – ways of inculcating it – Teaching of etiquettes – Extra-Curricular activities – N.S.S., N.C.C., Club activities – Relevance of Dr.A.P.J. Abdual Kalam's efforts to teach values – Mother Teresa.

Unit V

Project Work

1. Collecting details about value education from newspapers, journals and magazines.
2. Writing poems, skits, stories centering around value-erosion in society.
3. Presenting personal experience in teaching values.
4. Suggesting solutions to value – based problems on the campus.

Recommended Books

1. Satchidananda. M.K. (1991), “Ethics, Education, Indian unity and culture” – Delhi, Ajantha publications.
2. Saraswathi. T.S. (ed) 1999. Culture”, Socialisation and Human Development: Theory, Research and Application in India” – New Delhi Sage publications.
3. Venkataiah. N (ed) 1998, “Value Education” New Delhi Ph. Publishing Corporation.
4. Chakraborti, Mohit (1997) “Value Education: Changing Perspectives” New Delhi: Kanishka Publications.
5. “Value Education – Need of the hour” Talk delivered in the HTED Seminar – Govt. of Maharashtra, Mumbai on 1-11-2001 by N.Vittal, Central Vigilance Commissioner.
6. “Swami Vivekananda’s Rousing call to Hindu Nation”: EKnath Ranade (1991) Centenary Publication
7. Radhakrishnan, S. “Religion and culture” (1968), Orient Paperbacks, New Delhi.

46 Clinical II Practical

- Retinoscopy - Static, Dynamic and CycloplegicRetinoscopy
- Keratometry
- Subjective Refraction
- JCC
- Clock Dial
- Duochrome
- Borish Delayed
- Addition calculation

III – Year Semester V

51 Contact Lenses – I

Unit – 1

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

Unit – 2

Review of Anatomy & Physiology of

- Tear film
- Cornea
- Lids & Conjunctiva

Slit lamp Examination technique

Corneal topography- Keratometry& Extended Keratometry

Unit – 3

Introduction to CL materials (Monomers, Polymers)

Properties of CL materials

- Physiological (Dk, Ionicity, Water content)
- Physical (Elasticity, Tensile strength, Rigidity)
- Optical (Transmission, Refractive index)

Benefits of contact lens over spectacle

Indications and contraindications

FDA classification of contact lens material

Parameters / Designs of Contact Lenses & Terminology

Manufacturing Rigid and Soft Contact Lenses – various methods

RGP Contact Lens materials

Unit – 4

Patient selection & prescreening.Indications & contra indications of contact lens.

Pre-Fitting examination – steps, significance, recording of results

Correction of Astigmatism with RGP lens

Spherical RGP contact lens fitting & assessment

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 – 5
Care and Maintenance of Rigid lenses
Cleaning agents & Importance
Rinsing agents & Importance
Disinfecting agents & importance
Lubricating & Enzymatic cleaners
Complications of RGP lenses
Pre-fitting considerations for SCL
Fitting philosophies for SCL
SCL fitting assessment
Types of fit – Steep, Flat, Optimum
Calculation and finalising SCL parameters
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

52 Binocular Vision – I

UNIT – 1

Binocular Vision and Space perception.

- Relative subjective visual direction.
- Retino motor value
- Grades of BSV
- SMP and Cyclopean EyeCorrespondence,Fusion, Diplopia, Retinal rivalry
- Horopter
- Physiological Diplopia andSuppression
- Stereopsis, Panum's area, BSV.
- Stereopsis and monocular clues significance.
- Egocentric location, clinical applications.

UNIT – 2

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.
- Fixation & field of fixation

UNIT – 3

BINOCULAR VISION TEST

Test for simultaneous macular perception, test for fusion, test for stereopsis-synoptophore or stereoscope test, vectograph test, titmus stereo test,randomdotsterogramtest,simple motor task test based on stereopsis.

UNIT – 4

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 ofconvergence - Tonic, accommodative, fusional,proximal.

Anomalies of Convergence –aetiology and management

UNIT – 5

- Suppression Investigations & Management
- Abnormal Retinal Correspondence Investigation and management
- Amblyopia Classification, Aeitiology Investigation& Management

53 Pediatric & Geriatric optometry

Unit – 1
The Development of Eye and Vision
History taking Paediatric subjects
Assessment of visual acuity
Normal appearance, pathology and structural anomalies of
a) Orbit, Eye lids, Lacrimal system
b) Conjunctiva, Cornea, Sclera
Anterior chamber, Uveal tract, Pupil
c) Lens, vitreous, Fundus
Oculomotor system
Unit – 2
Refractive Examination
Compensatory treatments:

- Myopia
- Pseudo myopia
- Hyperopia
- Astigmatism
- Anisimetropia
- Amblyopia

Determining binocular status
Unit – 4
Determining sensory motor adaptability
Remedial and Compensatory treatment of Strabismus and Nystagmus
Vergence and accommodation
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

Unit – 5

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

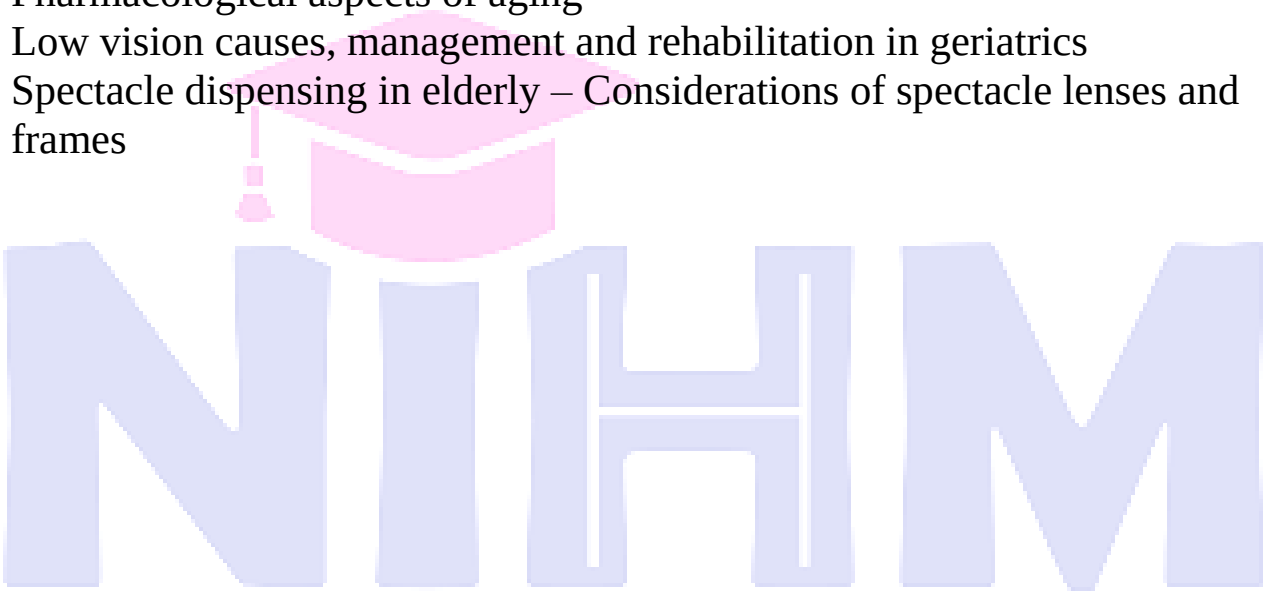
Ocular diseases common in old eye, with special reference to cataract, glaucoma, macular disorders, vascular diseases of the eye

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



54 Dispensing Optics

Unit – 1

Components of spectacle prescription & interpretation, transposition, Add and near power relation

Special lenses- Lenticulars, Aspherics, Fresnel lenses & Prisms

Aniseikonic lenses, Photochromics, Polaroid, Tinted lenses – Tints, filters

Unit – 2

History of Spectacles, manufacturing overview, Definition, parts & measurements

Classification of frames – Materials (cover in detail), Colours and Temple position (advantages & disadvantages, where to use)

Special purpose frames (sports, kids, reading)

Unit – 3

Frame selection – based on spectacle prescription, professional requirements, age group, face shape

Measuring Inter-pupillary distance (IPD) for distance & near, bifocal height

Lens & Frame markings, Pupillary centers, bifocal heights, Progressive markings & adjustments – facial wrap, pantoscopic tilt

Unit – 4

Recording and ordering of lenses (power, add, diameter, base, material, type, lens enhancements)

Neutralization – Hand &lensometer, axis marking,
prism marking

Faults in spectacles (lens fitting, frame fitting, patients complaints, description, detection and correction)

Unit – 5

Final checking & dispensing of spectacles to customers, counseling on wearing & maintaining of spectacles, Accessories – Bands, chains, boxes, slevets, cleaners, screwdriver kit

Spectacle repairs – tools, methods, soldering, riveting, frame adjustments

Special types of spectacle frames- Monocles, Ptosis crutches, Industrial safety glasses & Welding glasses
Frame availability in Indian market

55 Public Health and Community optometry

Unit – 1
Public Health Optometry: Concepts and implementation
Dimensions, determinants and indicators of healthLevels of disease prevention and levels of health care patterns
Unit – 2
Epidemiology of blindness – Defining blindness and visual impairment
Eye in primary health careContrasting between Clinical and community health programs
Unit – 3
Community Eye Care Programs
Community based rehabilitation programs
Nutritional Blindness with reference to Vitamin A deficiency
Vision 2020: The Right to Sight
Unit – 4
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 – 5
Health manpower and planning &Health Economics
Evaluation and assessment of health programmes
Optometrist role in school eye health programmes
Basics of Tele Optometry and its application in Public Health
Information, Education and Communication for Eye CarePrograms

56 Biostatistics

Unit -1

Introduction of Biostatistics

Measures of mortality

Unit – 2

Sampling

Sampling- necessity of methods and techniques

Statistical significance

Sample size determination

Unit -3

Statistics – Collection of data- Presentation including classification and diagramtic representation – frequency distribution. Measures of central tendency: measures of dispersion.

Correlation and regression (Linear)

Probability - sample ideas

Unit –4

Theoretical distribution

1.1 Binomial

1.2 Normal

1.3 Polynomial distribution

Chi-.Square test (2 * 2)

Unit –5

Hospital Statistics

Collection of hospital statistical – presentation – analysis of daily hospital services- Monthly and annual reports, computation of percentages in patient census, bed occupancy rate.

57 Clinical III Practical

- Direct ophthalmoscope
- Visual Field chart interpretation Both kinetic and Static
- B scan Interpretation
- A scan chart
- Contact lens insertion and removal
- Fitting assessment
- Synoptophore
- NPC

III – Year Semester VI

61 Contact lenses – II

Unit – 1
Overview of SCL
Comparison of RGP vs. SCL
Disposable lenses
• Advantages and availability
Soft Toric CL
• Stabilization techniques
• Parameter selection
• Fitting assessment
Unit – 2
Common Handling Instructions
• Insertion & Removal Techniques
• Do's and Dont's
Contact lens fitting in keratoconus
Unit – 3
Care and Maintenance of Soft lenses
• Cleaning agents & Importance
• Rinsing agents & Importance
• Disinfecting agents & importance
• Lubricating & Enzymatic cleaners
Complications of Soft lenses
Therapeutic contact lenses
• Indications
• Fitting consideration
Unit – 4
Specialty fitting
• Aphakia
• Post refractive surgery
Specialty fitting
• Pediatrics
Introduction to Bifocal CL
Recent advances in contact lenses

Unit – 5
Cosmetic and prosthetic contact lenses.
Prosthetic eye fitting procedures & conformers

62 Binocular Vision II

UNIT – 1

ORTHOPTIC INSTRUMENTS

- Prism Bar
- Synoptophore
- Maddox Wing
- Maddox Rod
- Red Green Goggles
- Hess Screen
- Risley Prisms

UNIT – 2

Investigative procedures

Motor signs in squint

- Head position: Face turn, chin position, Head tilt.
- Cover test & cover-uncover tests
- Maddox wing to assess heterophoria.

Assessment of degree of squint

- Hirschbag test.
- Prism bar test.
- Krimskey test
- Synoptophore test

Assessment of ocular motality status

- Hess chart
- Diplopia testing
- Bielschowskys Head tilt test

UNIT – 3

Convergent strabismus

Accommodative convergent squint

- Classification, Investigation andManagement

Non accommodativeConvergent squint

- Classification, Investigation andManagement

Divergent Strabismus

- Classification, A& V phenomenon, Investigation andManagement

Paralytic Strabismus

- Acquired and Congenital
- Clinical Characteristics

Unit – 4
Orthoptic Treatment Procedures
Management of –

- Convergence insufficiency

Use of prism -

- For Exercise & correction .

UNIT – 5
Vision therapy
Role of vision therapy in orthoptics management
VTPs for

- Amblyopia
- Suppression
- ARC
- C.I

63 Low Vision Aid

Unit – 1

Definitions & classification of Low vision, Grades of low vision, Statistics/ Epidemiology. Relation between disorder, impairment & handicapped.

Epidemiology of low vision Model of low vision service

Pre-clinical evaluation of low vision patients – prognostic & psychological factors; psycho-social impact of low vision

Unit – 2

Magnification-relative distance/ relative size/ approach/angular

Types of low vision aids – optical aids, non-optical aids & electronic devices

Optics of Galilian&Keplarian telescope- advantage/disadvantage, significance of exit & entrance pupil

Optics of spectacle magnifier/ determination/ calculation/ disadvantage/advantage.

Optics of stand magnifier, significance of equivalent viewing distance & calculations.

Telescope- distance/ near/ telemicroscope/ monocular/ binocular/ bioptic.

Determination of decentration of lenses /prism/calculation/Lebenson's formula/simple ditoric formula.

Hand held magnifier-illuminated/ non-illuminated.

Spectacle magnifier / half eye/ prism correction/ bar magnifier/ CCTV/ magni-cam/ low vision imaging system or V-max / contact lens & IOL telescope.

Unit – 3

Review of complete Optics of low vision aids

Clinical evaluation – assessment of visual acuity, visual field, selection of low vision aids, instruction & training

Pediatric Low Vision care

Low vision aids – dispensing & prescribing aspects

Assessment & prescription of low vision devices-optical/ non-optical/ rehabilitation services

Non- optical devices-pen/umbrella/ boldline note book/ illumination/ letter writer/ environmental modification/ signature guide/ needle threader/ eccentric viewing strategies Visual rehabilitation & counseling

Unit – 4

Overview of Rehabilitation Services:- definition/ implementation/ vocational guidance/ educational guidance/ mobility & orientation training / special teacher/ special school/ Braille system/ integrated system/referral center- activity/ support/ loan

Unit – 5

Overview of systematic / retinal diseases in relation to low vision:- acromatopsia/ LMBB syndrome/ labers congenital anomaly/ down syndrome/ retinitis pigmentosa/ diabetic retinopathy/ optic atrophy/ albinism/ aniridia.

Counseling of low vision patient/ parents/ guardians/relatives

Case Analysis

64 Occupational Optometry

Unit – 1

Introduction to Occupational health, hygiene and safety, international bodies like ILO, WHO, National bodies etc

Acts and Rules - Factories Act, WCA,ESI Act.

Occupational diseases/occupational related diseases caused by physical agents, chemical agents and biological agents

Unit – 2

Electromagnetic Radiation and its effects on Eye

Unit – 3

Light – Definitions and units, Sources, advantages and disadvantages,

Color – Definition, Color theory, Color coding, Color defects, Color Vision tests

Standards

Unit – 4

Occupational hazards and preventive/protective methods

Task Analysis

Industrial Vision Screening – Modified clinical method and Industrial Vision test

Vision Standards – Railways, Roadways, Airlines

Unit – 5

CVS and Visual Display Units

Contact lens and work

65 Systemic Diseases Affecting the Eye

UNIT – 1

Arterial Hypertension

- Pathophysiology, classification, clinical examination, diagnosis, complications, management.
- Hypertension and the eye.

Diabetes mellitus

- Pathophysiology, classification, clinical features, diagnosis, complications, management.
- Diabetes mellitus and the eye.

Acquired Heart Disease – Embolism

- Rheumatic heart disease
- Subacute bacterial endocarditis.
- Heart disease & the eye.

UNIT – 2

Malignancy

- Definitions, nomenclature, characteristics of benign & malignant neoplasms.
- Grading and staging of cancer, diagnosis, priniples of treatment.
- Neoplasia and the eye.

Connective Tissue Disease

- Anatomy and pathophysiology: Arthritis.
- Eye and connective tissue disease

UNIT – 3

Thyroid Disease

- Anatomy and physiology of the thyroid gland.
- Classification of thyroid disease

- Diagnosis, complications, clinical features, management of thyroid disease involving eye.

Tuberculosis
Etiology, pathology, clinical features, pulmonary TB, diagnosis, complications, treatment of tuberculosis involving the eye.

UNIT – 4
Tropical Disease and the Eye
Leprosy.
Syphilis.
Malaria.
Vitamin deficiency and the eye
UNIT – 5
10. Neurological disease and the eye
Classification of neurological diseases.
Demyelinating diseases
Visual pathway lesions
Papiloedema.
10. Genetic disorders and the eye

66 Clinical IV Practical

1. Slit lamp examination
2. IDO
3. IOP assessment with Schiotz and AT
4. Special Contact lenses
5. Low vision evaluation
6. VTPs