SECOND YEAR B.Sc. OPTOMETRY SYLLABUS

- Clinical Refraction
- Clinical Examination of visual system & Optometric Instrument
- Basic Orthoptics
- Microbiology & Pathology
- Pharmacology
- Clinics

Clinical Refraction

OPTOMETRIC OPTICS (Sec A)

SLNO	TOPIC	HOURS
1.	Introduction – Light, Mirror, Reflection, Refraction and Absorption	01
2.	Prisms – Definition, properties, Refraction through prisms, Thickness difference, Base-apex notation, uses, nomenclature and units, Sign Conventions, Fresnel's prisms, rotary prism	05
3.	Lenses – Definition, units, terminology used to describe, form of lenses	03
4.	Vertex distance and vertex power, Effectivity calculations	03
5.	Lens shape, size and types i.e. spherical, cylindrical ,Sphero-cylindrical & Toric lenses Astigmatic lenses, Methods of writing prescriptions Axis Direction of astigmatic lenses Properties of crossed cylinders	02
6.	Transpositions – Simple, Toric and Spherical equivalent	02
7.	Prismatic effect, centration, decent ration and Prentice rule, Prismatic effect of Plano-cylinder and Spherocylinder lenses	06
8.	Spherometer & Sag formula, Edge thickness calculations	04

9	Magnification in high plus lenses, Minification in high minus lenses	03
10	Tilt induced power in spectacles	02
11	Aberration in Ophthalmic Lenses	02
12	Raw materials – History and General Outline, Manufacturing of Ophthalmic Blanks – Glass & Plastics, Terminology used in Lens Workshops, Surfacing process from Blanks to lenses	06
13	Definition & Materials (Glass, Plastics, Polycarbonate, Triology) types and characteristics	05
14	Properties (Refractive index, specific gravity, UV cut off, impact resistance – include drop ball test, abbe value, Center thickness)	03
15	Best form of lenses & Safety standards for Ophthalmic lenses (FDA, ANSI, ISI, Others)	03
16	Design of High Powered Lenses Hi-index lenses, Calculation of Refractive Index	03
17	Bifocal designs, their manufacturing & uses (Kryptok, Univis D, Executive, Invisible,	07

	Occupational)	
18	Progressive Addition Lenses, modified near vision lenses (designs, advantages,Limitations)	04
19	Lens enhancements (Scratch resistant coatings – spin/dip, Anti-reflection coating, UV coating, Hydrophobic coating, anti-static coating	05
20	Lens defects – Description and Detection	03
21	Glazing & edging (manual & automatic)	03
22	Special lenses ➢ Lenticulars ➢ Aspherics ➢ Fresnel lenses & Prisms ➢ Aniseikonic lenses ➢ Photochromics ➢ Polaroids ➢ Tinted lenses – Tints, filters	08
23	Project to ensure awareness on lens availability in Indian market	02
24	History of Spectacles, manufacturing overview, Definition, parts & measurements Classification of frames – Materials (cover in detail), Colours and Temple position (advantages & disadvantages, where to use)	06
25	Special purpose frames (sports, kids, reading)	02

DISPENSING OPTICS

SLNO	TOPIC	HOUR
1.	Components of spectacle prescription & interpretation, transposition, Add and near power relation	02
2.	Frame selection – based on spectacle prescription, professional requirements, age group, face shape	04
3.	Measuring Inter-pupillary distance (IPD) for distance & near, bifocal height	02
4.	Lens & Frame markings, Pupillary centers, bifocal heights, Progressive markings & adjustments – facial wrap, pantoscopic tilt	02
5.	Recording and ordering of lenses (power, add, diameter, base, material, type, lens enhancements)	02
6.	Neutralization – Hand & lensometer, axis marking, prism marking	04
7.	Faults in spectacles (lens fitting, frame fitting, patients complaints, description, detection and correction)	03
8.	Final checking & dispensing of spectacles to customers, counseling on wearing & maintaining of spectacles, Accessories – Bands, chains, boxes, slevets, cleaners, screwdriver kit	02

9.	Spectacle repairs – tools, methods, soldering, riveting, frame adjustments	02
10.	Special types of spectacle frames ➢ Monocles ➢ Ptosis crutches ➢ Industrial safety glasses ➢ Welding glasses	02
11.	Frame availability in Indian market	

RECOMMENDED BOOKS

1. Principles of Ophthalmic lenses M.O.Jalie – 2nd edition
2. System for ophthalmic dispensing Clifford.W.Brooks, Irwin.M.Borish
3. Clinical Optics Troy Fannin, Theodore Grosvenor – 2nd edition
4. Ophthalmic lenses & Dispensing M.O.Jalie – 2nd edition
5. Practical aspects of ophthalmic optics Margeret Dowaliby – 4th edition

SLNO	TOPIC	HOUR

1.	1.REVIEW OF GEOMETRIC OPTICS 1.1 Vergence and power 1.2 Conjugacy, Object space and image space 1.3 Sign convention 1.4 Spherical refracting surface 1.5 Spherical Mirror, catoptric power 1.6 Cardinal points 1.7 Magnification 1.8 Light and visual function , Clinical Relevance of: Fluorescence, Interference, Diffraction, Polarization, Birefringence, Dichroism 1.9 Aberration and application Spherical and Chromatin	05
2.	OPTICS OF OCULAR STRUCTURES 2.1 Cornea and aqueous 2.2 Crystalline lens 2.3 Vitreous 2.4 Schematic and reduced eye	03
3.	Basic Aspects of Vision. • Visual Acuity • Light and Dark Adaptation • Color Vision • Spatial and Temporal Resolution	05

	• Science of Measuring visual performance and Application to Clinical Optometry	
4.	REFRACTIVE ANOMALIES AND THEIR CAUSES 4.1 Etiology of refractive anomalies 4.2 Contributing variabilities and their ranges 4.3 Populating distributions of anomalies 4.4 Optical component measurement 4.5 Growth of eye in relation to refractive errors	05
5.	VISUAL ACUITY 5.1 Definition, specification, Conversion, measurement & Recording (Distance&Near) 5.2 Test types (Distance & Near) – standard, choice, types, construction 5.3 Illumination of consultation room 54 Contrast sensitivity– Definition, charts available, measurements and recordings 5.5 Trial set & Trial frame & Phoropter – advantages and disadvantages	05
6.	REFRACTIVECONDITIONS Aetiology, optical condition, types, clinical features and management 1.1 Emmetropia/Ametropia 1.2 Myopia 1.3 Hyperopia	18

	1.4 Astigmatism 1.5 Anisometropia And Aniseikonia 1.6 Presbyopia 1.7 Aphakia and pseudophakia, Biometry 1.8 Axial Vs Refractive Ametropia	
7.	ACCOMMODATION 7.1. Mechanism 7.2. Range & Amplitudes of accommodation 7.3. Anomalies of accommodation	03
8.	CONVERGENCE 8.1. Types, measurement & Anomalies 8.2. Relation between accommodation & convergence	03
9.	Retinoscopy (Static & Dynamic) 9.1. Principle, instrumentation & Types 9.2. Procedure & Interpretation of findings – Transposition & Spherical equivalent 9.3. Dynamic retinoscopy – various methods 9.4. Radical retinoscopy & Mohindra's near retinoscopy 9.5. Subjective refraction – Principle, astigmatic chart, binocular balancing & binocular refraction 9.6. Cycloplegic refraction	12
10.	EFFECTIVE POWER & MAGNIFICATION 10.1. Ocular refraction Vs Spectacle refraction	02

	10.2. Ocular accommodation Vs Spectacle accommodation 10.3. Spectacle magnification & Relative spectacle magnification 10.4. Retinal image blur – Depth of focus & Depth of field	

VISUAL OPTICS – PRACTICAL

SLNO	TOPIC	HOUR
1.	1. Study of purkinje images I & II, III & IV 2. Effect of trial lenses & accessories in front of the eye	20
2.	1.Visual acuity ✓ Measurement & recording (Distance & Near) 2.Retinoscopy – Practice of retinoscopy (Dry & wet) in ✓ Emmetropia, Myopia, Hypermetropia, Astigmatism, Anisometropia, Presbyopia, Aphakia, Pseudophakia, media opacities, strabismus & Eccentric fixation ✓ Interpretation of retinoscopic findings ✓ Subjective verification ✓ Prescription writing ✓ Methods of differentiating axial Vs Refractive ametropia	30

	✓ Dynamic retinoscopy – Methods 3.Accommodation & Convergence ✓ Measurement of range & Amplitude of accommodation ✓ Measurement of Near point of Convergence	

RECOMMENDED BOOKS

1. Duke Elder's practice of refraction David Abrams – 10th edition
2. Clinical refraction Irwin.M.Borish
3. Primary care Optometry Theodore Grosvenor – 4th edition
4. Clinical pearls in refractive care D.Leonard Werner, Leonard.J.Press

CLINICAL EXAMINATION OF VISUAL SYSTEM & OPTOMETRIC INSTRUMENT

CLINICAL EXAMINATION OF VISUAL SYSTEM

SLNO	TOPIC	HOUR
1.	History of the ophthalmic subject 1.1. Ocular history 1.2. Medical history	

	1.3. Family history 1.4. Systemic history	
2.	Assessment of visual acuity 2.1. Distance & Near visual acuity 2.2. Color vision & Contrast sensitivity	
3.	Examination of Extra Ocular Muscle balance	
4.	Assessment of accommodation & Convergence	
5.	Pupil evaluation & Measurement of Inter pupillary distance (IPD)	
6.	Slit Lamp examination 6.1. Examination of eye lids, conjunctiva & sclera 6.2. Examination of cornea & lens 6.3. Examination of iris, Ciliary body & pupil	
7.	Examination of Intra ocular pressure – Schiotz & Applanation	
8.	Assessment of angle of anterior chamber	
9.	Ophthalmoscopy – Direct & Indirect	
10.	Optic disc evaluation	
11.	Examination of Lacrimal system	
12.	Examination of orbit	
13.	Macular function tests	
14.	Visual field charting – Central & Peripheral	

OPTOMETRIC INSTRUMENTS

SLNO	TOPIC	HOUR
1.	Pre examination history	02
2.	Refractive Instruments 1.1 Visual acuity charts , Features, Advantages & disadvantages, newer developments 1.2 . Trial case lenses – best form lenses 1.3 . Trial frame design – Phoropter – Advantages & Difficulties 1.4 . Retinoscope – Optics, types, adjustments & special features 1.5 . Autorefractometer – Schenier's and other optical principles, Features, Advantages & disadvantages, newer developments 1.6 Vision analyzer 1.7 Potential Acuity Meter, 1.8 Pupilometer ,	10
3.	Corneal Diagnostics Keratometer 1.1. Keratometric principle 1.2. Types – Bausch & Lomb, Javal-Schiotz models 1.3. Measurement, Documentation & Interpretation of data Corneal topography 2.1. Placido's disc 2.2. Photokeratoscope 2.3. Topography Modelling System	18

	2.4. ORBSCAN & PENTACAM Aberrometer 3.1 Principle 3.2 Instrumentation, clinical procedure & Interpretation Pachymeter 4.1 Principle, Types 4.2 Instrumentation & Clinical procedure, Indications	
4.	Lens checking instruments 3.1. Optometer principle 3.2. Badal & non-badal principle – advantages & disadvantages 3.3. Lens gauge or clock 3.4. Hand neutralization	06
5.	Slit Lamp 4.1. Slit-lamp systems 4.2. Mechanical design 4.3. Illumination techniques 4.4. Accessories 4.5. Scanning laser devices	09
6.	Glaucoma Diagnostics Tonometer 1.1. Types, principle & standardization (Schiotz, Applanation & NCT) 1.2. Measurement, documentation & interpretation of results Field of Vision and Screening Devices	07 15 04

	2.1. Introduction – Visual fields & boundaries of visual fields 2.2. Visual field screening devices – Central & Peripheral 2.3. Quantitative perimetry – Manual & Automated 2.4. Results & Analysis of visual field examination Gonioscope 3.1. Principle & Instrumentation 3.2. Direct Gonioscope 3.3. Indirect Gonioscope Optical Coherence Tomography 4.1 Anterior and Posterior OCT 4.2 Principle & Instrumentation 4.3 Clinical Procedure & Interpretation Glaucoma imaging & newer developments	05
7.	Color vision testing devices 8.1. Color vision theories 8.2. Common color vision defects 8.3. Pseudoisochromatic test plates 8.4. Color arrangement tests 8.5. Interpretation & clinical significance of findings	09
8.	Ophthalmoscopes 10.1. Optical principle & Types 10.2. Direct ophthalmoscope – Instrumentation, Characteristics clinical procedure& Uses	08

	10.3. Indirect ophthalmoscope – Instrumentation, Characteristics , clinical procedure & Uses 10.4. Direct ophthalmoscope Vs Indirect ophthalmoscope\ 10.5 Fundus biomicroscope- Principle & Instrumentation, Characteristics clinical procedure& Uses	
9.	Ophthalmic Ultrasonography 14.1. Physics of Ultrasonography 14.2. A-scan – Procedure & clinical uses 14.3. B-Scan – Procedure & Clinical uses	06
10.	Electrophysiology – ERG, VEP & EOG Principle & Instrumentation, Characteristics clinical procedure& Uses,interpretation of report	04
11.	Fundus camera & Flourescine angiography	03

RECOMMENDED BOOKS

1. Optometric instrumentation David.B.Henson
2. Clinical ophthalmology (VOL-I) Thomas.D.Duane
3. Primary care Optometry Theodore Grosvenor – 4th edition
4. Clinical Procedures in Optometry J.Boyd Eskside, John.F.Amos, Jimmy.D.Bartlet – 1st edition
5. Automated static perimetry Anderson & Patella – 2ns edition
6. Investigative techniques & Ocular examination Sandip Doshi, William Harvey
7. Diagnosis of defective color vision Jennifer birch – 2nd edition

Pharmacology

SLNO	TOPIC	HOUR

1.	GENERAL PHARMACOLOGY	**05**
2.	1.1 Introduction and sources of drugs Routes of drug administration 1.2 PHARMACOKINETICS – Absorption and bioavailability Distribution Biotransformation Excretion 1.3 PHARMACODYNAMICSTypes and Mechanism of action Factors affecting Adverse drug reactions	**01** **02** **03**
3.	SYSTEMIC PHARMACOLOGY 2.1 ANS Introduction, neurotransmitters and mechanism of action 1 Ophthalmic Uses and adverse effects of drugs affecting autonomic nervous system. Skeletal muscle relaxants 2.2 CVS ANTIHYPERTENSIVES 1 ANTIANGINAL DRUGS 1 2.3 RENAL DIURETICS –EMPHASIS ON DRUGS USED IN OCCULAR DISORDER 1 2.4CNS SEDATIVE HYPNOTICS ALCOHOL	**24** **1** **4** **1**

	1 GENERAL ANDLOCAL ANESTHETICS 1 OPOIDS 1 NON STEROIDAL ATIINFLAMMAOTRY AGENTS 1 Antihistaminics mast cell stabilizers2.5	
4.	2.6 HORMONES Corticosteroids Anti diabetics	
5.	2.7 BLOOD Coagulants	
6.	OCCULAR PHARMACOLOGY 3.1 Ocular formulations and Ocular routes of administration drug delivery system and special ocular drug delivery system 3.2 Ocular pharmacokinetics Delivery methods of Ocular Medication: Residence in the conjunctival sac, drug vehicles affect drug delivery, advanced ocular delivery systems, 3.3drugs induced Ocular toxicity	**4** **2** **1** **1**
7.	DIAGNOSTIC AND THERAPEUTIC APPLICATIONS OF DRUGS IN OPHTHALMOLOGY	**11** **1**

	4.1 DRUGS USED TO ASSIST IN OCULAR DIAGNOSIS	**2**
	Anterior Segment and External Diagnostic Uses	
	Posterior Segment Diagnostic Uses	
	4.2 Drugs and biological agents used in ocular surgery	
	Anesthetics used in ophthalmic procedures	**1**
	Presurgical Antiseptics	
	Viscoelastic Substances	**1**
	Ophthalmic Glue	
	Anterior Segment Gases	**1**
	Vitreous Substitutes	
	Surgical Hemostasis and Thrombolytic Agents	**1**
	4.3 Drug s used in treatment of	**2**
	Glaucoma,	
	Esotropia	
	Ocular myasthenia	
	4.3 Pharmacotherapy of ocular infections-	
	Bacterial	**2**
	Viral	
	Fungal and	
	Chlamydial	
	Protozoal	
	4.4 Drugs used inallergic conditions, inflammatory	
	disorders and degenerative disorders of the eye	

	4.5 Immune modulators in ophthalmic practice 4.6 Other agents used in ophthalmic practice Mydriatics and Miotics Enzymes Trcae elements Antioxidants Wetting Agents, Tear Substitutes, Osmotic Agents 4.7 Miscellaneous Botulinum Toxin Type A in the Treatment of Strabismus, Blepharospasm, and Related Disorders Agents Used to Treat Blind and Painful Eye VITAMIN A	

RECOMMENDED BOOKS

1. The pharmacological basis of therapeutics goodmanGilman 13th edition
2. Essentials of Medical Pharmacology KD tripathi
3. Bartlett and Jaanus: Clinical Ocular Pharmacology
4. T S MAUGER & E L CRAIG - MOSBY'S - OCULAR DRUG HANDBOOK

MICROBIOLOGY & PATHOLOGY

MICROBIOLOGY Sec (A)

SLNO	TOPIC	HOUR
	1. Sterilization and Disinfection generally used in laboratory and hospital practice 2. Details of common bacteria, viruses and other organisms 3. Morphology and principles of cultivation of bacteria 4. Common bacterial infections of the eye 5. Common fungal infections of the eye	15

	6. Common viral infections of the eye 7. Common parasitic infections of the eye	

RECOMMENDED BOOKS

1. Text book of microbiology Ananth Narayan
2. Text book of microbiology- C.P baveja
3. Ocular Microbilogy- pk Mukherjee, preeti bandyopadya

PATHOLOGY

SLNO	TOPIC	HOUR

	1. General introduction 2. Inflammation and repair 3. Infections [Tuberculosis, Leprosy, Syphilis, Fungus, Virus, Chlamydiae] 4. Genetic abnormality 5. Hematology [Anemia, Leukemia, Bleeding disorders] 6. Circulatory disturbances [Shock, edema, Thrombosis, Infarction, Embolism] 7. Clinical pathology [Examination of urine and blood smears] 8. Ophthalmic wound healing 9. Eyelid [normal and pathology including inflammations and tumours] 10. Cornea [Normal and pathology in degeneration and dystrophies] 11. Lens [normal and pathology of cataract] 12. Retina [normal and pathology in inflammatory diseases, infections] 13. Intraocular tumours [Retinoblastoma and choroidal melanoma] 14. Orbit [inflammation and neoplasia] 15. Optic nerve [normal and tumours]	

RECOMMENDED BOOKS

1. General pathology Harsh Mohan
2. Text book of Pathology N.C.Dey

3. Basic Pathology Robbins

BASIC ORTHOPTICS

SLNO	TOPIC	HOURS
1.	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	08
2.	Binocular Vision and Space perception.	08

	➢ Relative subjective visual direction. ➢ Retino motor value ➢ Grades of BSV ➢ SMP and Cyclopean Eye ➢ Correspondence, ➢ Fusion, Diplopia, Retinal rivalry ➢ Horopter ➢ Physiological Diplopia and ➢ Suppression ➢ Stereopsis, Panum's area, BSV. ➢ Stereopsis and monocular clues -significance. ➢ Egocentric location, clinical applications. ➢ Theories of Binocular vision.	
3.	Near vision complex Accommodation ➢ Definition and mechanism (process). ➢ Methods of measurement. ➢ Stimulus and innervation. ➢ Types of accommodation. ➢ Anomalies of accommodation – aetiology and management	06
4.	Convergence ➢ Definition and mechanism. ➢ Methods of measurement.	

	➢ Types and components of convergence - Tonic, accommodative, fusional, proximal. ➢ Anomalies of Convergence – aetiology and management.	
5.	Asthenopia	02
6.	Sensory adaptations Confusion	02
7.	Suppression Investigations Management Blind spot syndrome	04
8.	Abnormal Retinal Correspondence Investigation and management Blind spot syndromeSurgical	02
9.	Eccentric Fixation Investigation and management	02
10	Amblyopia Classification Aeitiology Investigation Management	05
9.	Classification of neuro-muscular anomalies and their etiology	04

RECOMMENDED BOOKS

1. Binocular vision & Ocular motility Von Noorden – 6th edition
2. Clinical management of binocular vision M.Scheimann, Bruce Wick – 2nd edition
3. Binocular anomalies John.R.Griffin, J.David Grisham – 4th edition
4. Practical binocular vision assessment Frank Eperjesi, Michelle.M.Rundstorm
5. Binocular vision & Orthoptics Bruce Evans, Sandip Doshi
6. Theory and Practice of squint and orthoptics – A K Khurana