SHRI
DHARMASTHALA
MANJUNATHESHWARA
UNIVERSITY

ORDINANCE GOVERNING
B.SC. IN ALLIED HEALTH SCIENCES
BACHELOR OF SCIENCE IN OPTOMETRY
CURRICULUM 2020-21

SHRI DHARMASTHALA MANJUNATHESHWARA UNIVERSITY

(A State Private University established under the Shri Dharmasthala Manjunatheshwara University
Act No 19 of 2018 of Government of Karnataka and Notification No. ED 261 URC 2018 dated 19th December 2018)

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|| Om Shri Manjunathaya Namaha ||

Shree Kshethra Dharmasthala

Edition Year : 2020-21

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Published by
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THE LOGO

Poojya Dr D. Veerendra Heggade, Hon'ble Chancellor of the University, while searching for an appropriate Logo for the University, saw a photograph picked from Temple Architecture showing Wings of a Bird, sculpted in Indian style and wanted it to be incorporated in the logo for the University, as the Wings symbolize 'Spreading of Knowledge beyond Boundaries'. Further it was felt that the Central theme of the logo should be 'Rudra' (The Linga) with wings on each side. In this way, the logo of the University was conceptualized.

Hence:

1. The central part represents **Rudra** who Demolishes Darkness.
2. The Three **horizontal lines on The Linga** stand for Samyak Darshan (Right Belief), Samyak Gyan (Right Knowledge) and Samyak Charitra (Right Conduct).
3. The **Wings** symbolize spreading of Knowledge across the boundaries.
4. Base line **"Truth Liberates"** highlights the Purpose of Education: to liberate oneself unconditionally. It shows that it is not discipline, nor knowledge nor the efforts to freedom that liberate but Truth is what liberates you from all your conditioning and ignorance.

The overall significance of Shri Dharmasthala Manjunatheshwara University's Logo is:

Darkness of ignorance is destroyed by the flow of knowledge to bring Liberty to everyone, by realizing the truth. And, it should spread globally without the boundaries as hindrance.

SHRI
DHARMASTHALA
MANJUNATHESHWARA
UNIVERSITY

TRUTH LIBERATES

VISION

Shri Dharmasthala Manjunatheshwara University will set the highest standards of teaching and learning by awakening the intelligence of the students and nurturing the creativity hidden in them by creating an environment where the ancient wisdom blends with modern science, to transform them into whole human beings to face the challenges.

MISSION

- To ensure that the journey of education is inspiring, pleasant and enjoyable.
- Attract the best of teachers and students.
- Achieve high principles of trust, love and spirituality in the students.
- Create a collaborative, diverse and exclusive community.
- Transform the student of today to be a leader of tomorrow and a better human being.
- Produce passionate teachers.
- Evolve innovative teaching techniques.
- Create a peaceful environment.
- Prepare the student to face the social challenges.
- Create a University of which the Nation is proud of.
- Be an effective partner in Nation Building.
- Create an Eco-friendly University.
- Create a University based on the principles of beauty, love and justice.

||Om Shanti! Om Shanti! Om Shanti||

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SDMU/ACD/DEN/CRM/369A/2019 Date: 28-08-2019

NOTIFICATION

Ordinance governing Curricula of Medical Allied Sciences - 2019

Ref:
1. Minutes of the 1st Meeting of Academic Council held on 20th March 2019 (Letter No: SDMU/AC/M-01/093/2019; Dated:21-03-2019)
2. Minutes of the 1st Meeting of Joint Faculties held on 19th March 2019 (Letter No: SDMU/JF/85/2019; Dated:21-03-2019)
3. Minutes of the 1st Meeting of Board of Studies (Allied Health Sciences) held on 19th March 2019 (Letter dated:20-03-2019)

In exercise of the powers conferred under Statutes 1.4(Powers and functions - Para ix & x), 1.5b(Powers and functions - Para b & c) & 1.8(Powers and functions - Para i) of Shri Dharmasthala Manjunatheshwara University, the Academic Council is pleased to approve and notify the Ordinance governing Regulations and Curricula of the below listed Medical Allied Sciences as shown in the annexure appended herewith.

1	BSc Medical lab Technology
2	BSc Medical Imaging Technology
3	BSc in Renal Dialysis Technology
4	BSc Optometry

The ordinance shall be effective for the students joining the courses during the academic year 2019-20 and onwards.

REGISTRAR
REGISTRAR,
Shri Dharmasthala Manjunatheshwara
University, Dharwad

To: The Principal, SDM College of Medical Sciences & Hospital.

Copy for kind information to:
1. Hon'ble Vice Chancellor - Shri Dharmasthala Manjunatheshwara University.
2. Pro Vice Chancellor (Academics) - Shri Dharmasthala Manjunatheshwara University.
3. Controller of Examinations - Shri Dharmasthala Manjunatheshwara University.

B.Sc. OPTOMETRY COURSE

1. Title of the Courses offered in Optometry:
Bachelor of Science in Optometry [B.Sc. in Optometry]

2. Introduction:

Learning Objectives: At the completion of this course, the student should –

1. Be able to develop skills to provide comprehensive eye examination

   a) To acquire knowledge on ocular structures, its functions and pathological changes
   b) To carryout ophthalmic investigations
   c) To impart knowledge with regard to common eye diseases
   d) To impart knowledge on treatment modalities from the perspective of counseling
   e) To acquire knowledge about the referral guidelines for ocular and systemic conditions

2. Be able to correct refractive error and provide spectacle prescription

3. Be able to fit, evaluate, prescribe and dispense contact lenses for refractive correction and other ocular conditions

4. Be able to assess the low vision and provide comprehensive low vision care

5. Be able to have adequate knowledge to develop skill in manufacturing of spectacle lenses, contact lenses and low vision devices.

6. Be able to do complete binocular vision assessment, manage non-strabismic binocular vision anomalies and refer condition which warrants surgery

7. Be able to assess the visual demands for various occupations and match it to the visual capabilities. Also be able to advice on eye safety wear for various occupations.

8. Have knowledge and skill for early detection of various ocular conditions and pathologies –Refractive error, Strabismus, Cataract, Diabetic retinopathy, Glaucoma etc.

9. Have knowledge regarding organizations of eye banks and preservation of ocular tissues.
10. Have knowledge on sensory substitution and other rehabilitation measures for totally visually challenged.

11. Have knowledge of counselling on visual/ocular hygiene, nutritional and environmental Modifications.

12. Have knowledge to undertake public health optometry projects and vision screening eye camps in schools, colleges, urban slums, rural areas and also practice occupational optometry in industries.

3. Eligibility for admission:

3.1.

a. Candidate seeking admission to the Bachelor of Science Degree Courses in the Optometry courses should have studied English as one of the principal subject.

b. Two year Pre-University examination or equivalent as recognized by SDM University with, Physics, Chemistry and Biology as principle subjects of study.

OR

Any Equivalent examination recognized by the SDM University for the above purpose with Physics, Chemistry and Biology as principle subjects of study.

c. Candidates with two years or three years diploma in optometry from a recognized Government Board, shall have passed plus 12 [10+2] with Physics , Chemistry and Biology, as principle subjects.

d. Lateral entry to second year Optometry for candidates who have passed diploma optometry program from the Government Boards or recognized by SDM University, fulfilling the conditions specified above can also apply.

Note:

a. The candidate shall have passed individually in each of the principle subjects.
b. Candidate who has completed diploma or vocational course through correspondence shall not be eligible for B.Sc. Optometry course.

3.2. Selection criteria:

Selection of the candidates shall be based on the merit.

4. Duration of the course:

Duration shall be for a period four years, off which one year (fourth year) will be internship (3years +1 year of internship).

5. Medium of instruction:

The medium of instruction and examination shall be in English.

6. Internal Assessment (IA): Theory – 30 marks, Practical – 20 marks

There shall be a minimum of two periodical tests preferably one in each term in theory and practical of each subject in an academic year. The average marks of the two tests will be calculated and sent to the university. The marks of IA shall be communicated to the University at least 15 days before the commencement of the University examination. The University shall have access to the records of such periodical tests. The marks of the internal assessment must be displayed on the notice board of the department with in a fortnight from the date, test is held.

For eligibility to appear for university exams students should score 35% IA marks obtained in the average of two IA exams from the date of commencement of the term to the last working day as notified by university in each of the subjects prescribed for that year **separately in theory and practical**.

If a candidate is absent for any one of the tests due to genuine and satisfactory reasons, such a candidate may be given a re-test within a fortnight.

7. Subject and hours of teaching for theory and Practical's

First Year

Subjects	**Method / Number of Hours**	
	Theory	**Practical**
Anatomy: General Anatomy & Ocular Anatomy	35+35=70	15+15=30
Physiology : General physiology & Ocular Physiology	35+35=70	15+15=30
Biochemistry: General Biochemistry & Ocular biochemistry	35+35=70	15+15=30
Physical Optics & Geometric Optics	35+35=70	15+15=30

Subsidiary subjects		
Computer Basics &Computer Programming		
Functional English& Communications		
Kannada		

Second Year

Subjects	**Method / Number of Hours**	
	Theory	**Practical**
Pharmacology Pathology Microbiology	45 15 15	
Optometric Optics & Dispensing optometry	90	
Visual optics& Clinical Examination of Visual System	90	
Optomtric instruments & appliances	30	
Ocular diseases & systemic diseases	30	
Clinical posting		90
Subsidiary subjects		
1. Medical psychology 2.Constitution of India 3.Envisronmental science and health		

Third Year

Subject	**Method / Number of Hours**	
	Theory	**Practical**
Pediatric Optometry Binocular vision Community Ophthalmology (Occupational Optometry Research Methodology & Statistics)	15 30 15	30
Contact Lenses	60	30
Geriatric Optometry and low vision aids Practice management & law in optometry	50 10	30
Ocular diseases and systemic diseases	40 20	30 -
Clinics & Special Clinics (Part I & II)	--	270
Subsidiary subjects		

1. Ethics database management 2. Research and biostatistics 3. Computer application		

Fourth Year

Project	**--**	
Clinical posting & specialty postings		One year

8. Schedule of examination:

The university shall conduct annual examinations as notified by the university from time to time. A candidate who satisfies the requirement of attendance, progress and conduct as stipulated by the university shall be eligible to appear for the university examination. Certificate to that effect shall be produced from the Head of the institution along with the application for examination and the prescribed fee. The students who are failed in previous university examination can appear for the failed subjects after six months (Supplementary examination)

8.1 Formative assessment: Regular periodic assessment shall be conducted throughout the course.

8.2 University Examination: Subjects and Distribution of Marks

First Year Examination

Paper	**Subjects**	**Theory**		**Practical/Viva**		**Total**
		UE	**IA**	**UE**	**IA**	
1	General Anatomy Ocular anatomy	70	30	--	--	100
2	General Physiology, Ocular Physiology	70	30	--	--	100
3	General Biochemistry Ocular biochemistry	70	30	--	--	100
4	Physical Optics Geometric Optics	70	30	--	--	100
	Grand total					**400**

*there shall be no university practical examination in first year.

Marks Distribution: For 70 marks.

Long essay – 3 questions ---------- 2X10= 20 marks.

Short essay – 8 questions ---------- 6X5= 30 marks.

Short answer – 10 questions ---------- 10X2= 20 marks.

Blue print of question paper: **Annexure 1**

Second Year Examination

Papers	**Subjects**	**Theory**		**Practical/ Viva**		**Total**
		UE	**IA**	**UE**	**IA**	
1	Pharmacology Pathology Microbiology	30 20 20	10 10 10	--	--	100
2	Optometric Optics & Dispensing optometry	70	30	--	--	100
3	Visual optics& Clinical Examination Of Visual System	70	30	--	--	100
4	Optometric instruments and appliances	70	30	--	--	100
5	Clinical optometry			70	30	100
	Grand total					**500**

Marks Distribution:

EXAMINATION PATTERN

Section		Maximum marks	Duration
Pharmacology **Microbiology** **Pathology**	**Section A (30 Marks)** **Section B (20 Marks)** **Section C (20 Marks)**	70	3 hours
No University Practical examination		NIL	NIL
Internal Assessment- Theory		10+10+10=30	--
Internal Assessment- Practical		NIL	
Total marks -Theory + IA Theory		100	
Grand Total		**100**	

Pattern of theory question paper:

Section A (30 Marks)

Long essays (answer any 1 out of 2) 1x10 = 10 marks
Short essays (answer any 2 out of 3) 2x5 = 10 marks
Short answers (answer all) 5x2 = 10 marks

Section B (20 marks)

Short essays (answer any 2 out of 3) 2x5 = 10 marks
Short answers (answer all) 5x2 = 10 marks

Section C 30 marks)

Short essays (answer any 2 out of 3) 2x5 = 10 marks
Short answers (answer all) 5x2 = 10 marks

TOTAL **70 marks**

Third Year Examination

Subjects	Theory		Practical/ Viva		Total
	UE	IA	UE	IA	
Pediatric optometry, Binocular vision Research Methodology & Statistics	30 30 10	30			100
Contact lens	70	30			100
Geriatric Optometry and low vision law of optometry	60 10	30			100
Ocular diseases Systemic diseases	50 20	30			100
Clinical optometry			70	30	100
Grand Total					**500**

Marks Distribution:

Contact lens: Long essay – 3 questions ---------- 2X10= 20 marks.
Short essay – 7 questions ---------- 6X5= 30 marks.
Short answer – 11 questions ---------- 10X2= 20 marks.
Pediatric optometry: Long essay – 2 questions ---------- 1X10= 10 marks.
Short essay – 4 questions ---------- 2X5= 10 marks.
Short answer – 6 questions ---------- 5X2= 10 marks.
Binocular vision: Long essay – 2 questions ---------- 1X10= 10 marks.
Short essay – 4 questions ---------- 2X5= 10 marks.
Short answer – 6 questions ---------- 5X2= 10 marks.
Research methodology &Statistics:
Short essay – 5 questions ---------- 2X5= 10 marks.
Short answer – 6 questions ---------- 5X2= 10 marks.
Geriatric Optometry and Low visual care:
Long essay – 3 questions ---------- 2X10= 20 marks.
Short essay – 4 questions ---------- 5X4= 20 marks.
Short answer – 6 questions ---------- 5X4= 20 marks.
Law of Optometry: Short answer – 6 questions ---------- 5X2= 10 marks.
Ocular diseases: Long essay – 3 questions ---------- 2X10= 20 marks.

Short essay – 3 questions ---------- 4X5= 20 marks.
Short answer – 6 questions ---------- 5X2= 10 marks.

Systemic diseases: Short essay – 3 questions ---------- 2X5= 10 marks.
Short answer – 6 questions ---------- 5X2= 10 marks.

8.3 Fourth Year Assessment

Subject	University Examination				Total
	Theory	Internal	Practical	Viva voce	
Project	-	-	80	20	100
Clinical Examination	-	-	80	20	100

9. Attendance & Eligibility to appear final exam

Every candidate should have attended at least **80%** of the total number of classes conducted in an academic year and **35% IA marks** obtained in the average of Two IA exams from the date of commencement of the term to the last working day as notified by university in each of the subjects prescribed for that year **separately in theory and practical**. Only such candidates are eligible to appear for the university examinations in their first attempt. Special classes conducted for any purpose shall not be considered for the calculation of percentage of attendance for eligibility. A candidate lacking in prescribed percentage of attendance in any subjects either in theory or practical in the first appearance will not be eligible to appear for the University Examination in that subject

10. Pass criteria

A candidate is declared to have passed the Examination in a subject if he/she secures 40% of the marks in theory and 40% in practical separately. For a pass in theory & Practical, a candidate has to secure a minimum of 50% marks in the University conducted written examination in aggregate including internal assessment and Viva-Voce.

11. Carry over benefit

Students who appear for annual examination and failed will be promoted to the next year, irrespective of results, up to supplementary exam results. The candidate should clear all the remaining failed subjects of the previous year in forth coming supplementary exam. If candidate is failing to clear all the failed subjects of previous year in the supplementary exam, He/she will not be allowed for 2nd year annual examination. Supplementary exam for failed candidates shall be conducted within 60 days after the announcement of annual examination results. The candidates who all are unable to pass in all subjects of the previous year, He/ She will not be promoted to the next year.

12. Eligibility for the award of Degree

A candidate shall have passed in all the subjects of first, second and third year to be eligible for award of degree.

13. Subject-wise and year-wise content, Scheme of Examination, Recommended books.

FIRST YEAR B.Sc. OPTOMETRY

- **1. Anatomy (General& Ocular)**
- **2.Physiology (General& Ocular)**
- **3. Biochemistry (General& Ocular)**
- **4.Optics [Physical Optics & principle of lighting (Sec A)**

  Geometric Optics (Sec B)]

FIRST YEAR

BACHALORE OF SCIENCE

IN

OPTOMETRY

(1ST B. Sc. OPTOMETRY)

SUBJECT- ANATOMY

GENERAL ANATOMY (GA) - Theory 35 hours,

Practical 15 hours

COURSE PLAN:

S.N	Topic	Theory (Hours)	Practical (Hours)
1	**Introduction to Human Anatomy:** Definition and its relevance in medicine and optometry, Planes of the body, relationship of structures, organ system	2	1
2	**Skeleton System**	3	1
3	**Tissues of the Body:** Epithelium, connective tissue, bone and cartilage, Embryology, histology, different types of each of them, types of cells, cellular differentiation and arrangements in different tissues	4	2
4	**Muscles:** Different types of muscles, their functional differentiation, their relationship with different structures, their neural supply	4	2
5	**Blood vessels:** Differentiation between arteries and veins, embryology, histology of both arteries and veins, Functional differences between the two, anatomical differences at different locations	4	1
6	**Skin and appendages:** Embryology, anatomical differences in different areas, functional and protective variations, innervations, relationship with muscles and nerves	4	1

7	**Lymphatic system:** Embryology, functions, relationship with blood vessels and organs	2	1
8	**Glands:** Embryology, different types of glands (exocrine and endocrine), functional differences, neural control of glands	4	2
9	**Nervous system**: Parts of Nervous system, cell types of nervous system, Blood-brain barrier, Reflex arc, Peripheral Nerves, Spinal nerves, Nerve fibers, Autonomic Nervous system	3	2
10	**Brain and Cranial nerves:** Major parts of Brain, Protective coverings of the Brain, Cerebrospinal Fluid, Brain stem, Cerebellum, Diencephalon, Cerebrum, Cranial nerves	5	2

OCULAR ANATOMY (OA) - Theory 35 hours,

- Practical-15 hours

S No	Topic	Theory (Hours)	Practical (Hours)
1	**1.1 Introduction to anatomical terminologies –** cross section of eyeball **1.2 Ocular Adnexa** a. Eye Brows b. Eyelids – Structure, Facial spaces, Arterial supply, nerve supply, venous & lymphatic drainage c. Conjunctiva – general arrangements, structure, glands, arteries, veins, caruncle, plica semilunaris **1.3 Lacrimal System** – Lacrimal Gland, Drainage, Tear film	6	2

	1.4 Extraocular Muscles - anatomy, innervations, actions		
2	**Cornea:** layers, cellular structures, refractive properties	2	1
3	**Coats of eye ball** **Sclera** (Episclera & Sclera) **Choroid**, Ciliary body, Iris **Retina** (Detailed anatomy, cellular structure, blood supply and nerve supply)	4	2
4	**Aqueous, anterior chamber, Intraocular pressure, vitreous body**	2	1
5	**Pupil & Pupillary pathway and its lesions**	2	1
6	**Crystalline lens –** structure, suspension, accommodation	2	1
7	**Orbit** Orbital margin, Walls of orbital cavity Orbital structure & Foramen Surface anatomy, Relations of bony orbit, Orbital Muscles	5	2
8	**Cranial Nerves** 1. Optic nerve 2. Oculomotor nerve 3. Trochlear Nerve 4. Trigeminal nerve 5. Abducent nerve 6. Facial Nerve (Nuclei, course, relationship with brain, ocular contribution in detail)	6	3
9	**Visual Pathway –** Definition, anatomy of visual pathway, visual reflexes, Lesions of visual pathway	3	1
10	**Ocular Embryology**	3	1

Practicals: 15 hours of practical demonstration of each organ using specimen. If specimens are not available then videos can be shown with explanation.

Reference books

1. Text book of Anatomy & Physiology for nurses – P. R. Asha Lata & G Deepa, 3rd edition

2. Inderbir Singh's Text book of Human Histology with colour atlas and Practical Guide, 2016

3. B.D. Chaurasia's Handbook of General Anatomy, 6th edition, edited by Krishna Garg, CBS Publishers and Distributors, New Delhi

4. B. D. Chaurasia's Human Anatomy, volume 3, Head and neck, 8th edition, edited by Krishna Garg, CBS Publishers and Distributors, New Delhi

5. Textbook of Clinical Embryology, Vishram Singh, Elsevier 2nd edition

PHYSIOLOGY

TEACHING HOURS: 100 hours

Theory - 70 hours
Practical - 30 hours

THEORY: Course content

HUMAN PHYSIOLOGY

SL.NO	TOPICS
1	**General and Skeletal Muscle Physiology** 1.1. Cell structure and organization 1.2. Contractile tissue- striated – skeletal –cardiac- non striated – smooth 1.3. General principles of cell physiology 1.4. Electrophysiology of cells- Resting Membrane Potential, Action Potential 1.5.Physiology of skeletal muscles
2	**Blood** 2.1 Composition 2.2 Volume measurement and variations 2.3 Plasma proteins- classification and functions 2.4 RBC's- development, morphology and measurement- functions and dysfunctions 2.5 WBC's- development – classifications - morphology–functions and dysfunctions, Immune system - cellular - humoral- autoimmune 2.6. Platelets –morphology-development, functions and dysfunctions 2.7 Clotting- factors- mechanism- anticoagulants- dysfunctions 2.8. Blood grouping –classifications- importance in transfusion, Rh factor & incompatibility 2.9. Osmotic fragility
3	**Gastro-Intestinal Tract** 3.1. General arrangement 3.2. Salivary digestion – functions and regulations 3.3. Gastric digestion –functions and regulations 3.4. Pancreatic digestion- functions and regulations

	3.5. Intestinal digestion – functions and regulations 3.6. Liver and Bile 3.7. Motility-Deglutition-Gastric-Intestinal-Vomiting-Defecation 3.8. Functions of large intestine
4	**Renal System** 4.1. Body fluids – distribution, measurement and exchange 4.2. Kidney –structure of nephron – mechanism of urine formation-composition of urine and 4.3. Abnormal constituents- urinary bladder and micturition
5	**Endocrine system** 5.1. Hormone mechanism – negative feedbacks- tropic action – Permissive action – cellular actions 5.2. Hypothalamic regulation 5.3. Hormones, Actions & Regulations of Hypophysis Thyroid Adrenal Cortex & medulla Parathyroid Islets of pancreas Miscellaneous 5.4. Common clinical disorders
6	**Reproductive System** 6.1. Male reproductive system- control and regulation-semen analysis 6.2. Female Reproductive system- Uterus -ovaries- menstrual cycle-Regulation 6.3. Pregnancy and delivery, Family planning
7	**Respiratory System** 7.1. Mechanics of respiration 7.2. pulmonary function tests 7.3. Transport of respiratory gases 7.4. neural and chemical regulation of respiration 7.5.hypoxia cyanosis- dyspnoea- asphyxia
8	**Cardiovascular System** 8.1. Heart: myocardium- innervation- transmission of cardiac Impulse-Events during cardiac cycle-cardiac output 8.2. Peripheral circulation: Peripheral resistance- Arterial blood pressure measurements- factors regulating variation – capillary circulation-venous circulation 8.3. Special circulation: coronary – cerebral 8.4.miscellaneous

9	**Central Nervous System** 9.1. Neuron – conduction of impulse – synapse – receptor 9.2. Sensory organization- pathways and perception. Reflexes 9.3. cerebral cortex – functions 9.4. Thalamus- basal ganglia – Cerebellum – Hypothalamus- functions 9.5. Autonomic nervous system
10	**Environmental Physiology** 10.1. Skin, Body temperature regulation.
11	**Special senses** 11.1. Olfaction- Taste- Hearing- vision

OCULAR PHYSIOLOGY

SL.NO	**TOPICS**
1	Protective mechanisms in the eye: Eye lids and lacrimation, description of the globe
2	Extrinsic eye muscles, their actions and control of their movements
3	Coats of the eye ball
4	Cornea
5	Aqueous humor and vitreous: Intra ocular pressure
6	Iris and pupil
7	Crystalline lens – presbyopia
8	Retina – structure and functions
9	Vision – general aspects of sensation
10	Pigments of the eye and photochemistry
11	The visual stimulus, refractive errors
12	Visual acuity and principle of measurement
13	Visual perception – Binocular vision, stereoscopic vision, optical illusions
14	Visual pathway
15	Colour vision and colour defects. Theories and diagnostic tests
16	Scotopic and Photopic vision
17	Mechanism of accommodation
18	Ocular movements and saccades
19	Visual perception and adaptation

PHYSIOLOGY – PRACTICALS DEMONSTRATION - 30 hours

1	Microscope & Haemocytometer
2	Blood 2.1. RBC count 2.2. Haemoglobin estimation 2.3.WBC count 2.4. Differential count 2.5. Haematocrit Demonstration 2.6.ESR 2.7. Blood group and Rh type 2.8.Bleeding time and clotting time
3	Endocrinology & Reproduction 3.1. Dry experiments in the form of cases showing different endocrine Disorders
4	Cardiovascular system 4.1. Measurement of blood pressure and pulse rate. 4.2. Auscultation of Heart Sounds
5	Central Nervous System 5.1. Sensory system 5.2. Motor system 5.3. Cranial system- 2,3,4,6

TEXT BOOKS RECOMMENDED (LATEST EDITIONS)

1. Text book of Medical Physiology- Guyton
2. Human physiology - Choudhary
3. Human physiology- Chatterjee
4. Adler's physiology of the eye- Robert.A.Moses, William.M.Hart.

SUBJECT: BIOCHEMISTRY

TEACHING HOURS: 100 hours

Theory - 70 hours
Practical - 30 hours

SECTION A: GENERAL BIOCHEMISTRY & NUTRITION
Theory - 45 hours
Practical - 20 hours

THEORY: Course content

Sl No	Topics
TOPIC GB1: Chemistry of carbohydrate, lipids, amino acids, proteins, nucleic acids, Enzymes	
1	**Carbohydrate Chemistry:** Definition, classification with examples, Composition, sources, functions of Monosaccharides, Disaccharides, and Polysaccharides, Glycosaminoglycans
2	**Lipid Chemistry :** Definition, classification of lipids and Fatty acids Essential fatty acids- Definition, example, functions, deficiency features; Functions of Cholesterol, Phospholipids and their importance
3	**Amino-acid Chemistry:** Definition, Classification based on side chain properties, nutritional requirement, Peptide bonds, Biologically important peptides. **Protein chemistry:** Definition, Classification based on chemical nature and solubility, Functions of proteins Structure and functions of Collagen, Elastin List of important Plasma proteins with their functions Muscle proteins with their functions
4	**Enzymes:** Definition, Classification with examples, Active site, Coenzyme, Proenzyme, Isoenzyme with examples Factors effecting enzyme activity briefly Mechanism of enzyme action. Diagnostic enzymology (clinical significance of enzymes - CK, CK-MB, LDH, AST, ALT, ALP)
5	**Nucleotide and Nucleic Acid Chemistry:** Nucleosides and Nucleotide

	composition with examples, Nucleic acid (DNA and RNA) chemistry, types and functions
TOPIC GB2: Metabolism of carbohydrates, lipids, proteins	
6	**ATP formation:** Fundamentals of Biological oxidative reactions-
7	**Carbohydrate Metabolism:** Digestion and absorption Outline and significance of Glycolysis – Aerobic, Anaerobic, Citric acid cycle, Significance of Glycogen metabolism, HMP shunt pathway. Role of Insulin in regulating blood glucose levels, Hyperglycemic and hypoglycemic hormones Diabetes mellitus (definition, classification, signs and symptoms, diagnosis)
8	**Lipid Metabolism:** Digestion and absorption Lipolysis, Outline and significance of β-oxidation of fatty acids, Ketone body metabolism: Ketone body formation (ketogenesis), utilization (ketolysis), ketosis, Lipoproteins - Types and functions, Hypercholesterolemia and its effects (atherosclerosis and coronary heart diseases).
9	**Amino acid and Protein Metabolism:** Digestion and absorption Catabolism of amino acids - Transamination, deamination, Fate of ammonia, transport of ammonia, Urea cycle Specialized products formed from amino acids - glycine, arginine, methionine, phenylalanine and tyrosine.
TOPIC GB3: Nutrition, Vitamins, Minerals	
10	**Vitamins:** Definition, classification according to solubility Individual vitamins (Water soluble & fat soluble) - Sources, Coenzyme forms, functions, RDA, digestion, absorption and transport, deficiency and toxicity with emphasis on A,B2,C,E,inositol
11	**Minerals:** Micro and macro minerals Sources, RDA, Digestion, absorption, transport, excretion, functions, disorders of Individual minerals - Calcium, Phosphorous, Iron - in detail Functions and deficiency features of Copper, Zinc, Selenium, Iodine, Na, K, Cl
12	**Nutrition:** Introduction, Importance of nutrition Calorific values of foodstuffs

	Respiratory quotient – Definition, and its significance Energy requirement of a person - Basal metabolic rate: Definition, Normal values, Factors affecting BMR Special dynamic action of food Physical activities - Energy expenditure for various activities. Calculation of energy requirement of a person Balanced Diet: Definition, Components, Recommended dietary allowances Role of carbohydrates in diet: Digestible carbohydrates and dietary fibers, Role of lipids in diet: Saturated and unsaturated fatty acids, PUFA, Essential faaty acids Role of proteins in diet: Quality of proteins - Biological value, net protein utilization, Nutritional aspects of proteins-essential and non-essential amino acids. Nitrogen balance Nutritional disorders - Malnutrition, Obesity
TOPIC GB4: Acid-Base balance, Clinical Biochemistry	
13	**Acid-Base balance:** Acids, bases and buffers, pH. Buffer systems of the body, blood buffers, mechanism of buffer action. H+ and pH measurements Distribution of Water and electrolytes in body fluids
14	**Clinical Biochemistry**: Reference values and clinical significance of Serum Glucose, Urea, Creatinine, Total protein, Albumin, Bilirubin, Cholesterol, Calcium, Na, K, Cl, AST, ALT, ALP, TSH, T3, T4

PRACTICAL: Course content

Sl No	Topic
1	General reactions of Monosaccharides, disaccharides and starch
2	General Reactions of Proteins/Amino Acids
3	Biofluids- blood, serum, plasma, urine, CSF, ascetic/pleural fluid, tear etc
4	Analysis of urine (physical, Chemical tests and dipsticks)
5	Photometry - Colorimeter/spectrophotometer
6	Estimation of Plasma Glucose, Glucometer
7	Estimation of Serum and urine Creatinine
8	Estimation of Serum Total Protein

SECTION B: OCULAR BIOCHEMISTRY
Theory - 25 hours
Practical - 10 hours

THEORY: Course content

Sl No	Topic
TOPIC OB1: Cell biology, Hormone action, Extracellular matrix, Biochemical basis of ocular features in clinical conditions	
1	Importance of Ocular Biochemistry in clinical optometric practice
2	**Cell Biology:** Cell structure, Cell membrane structure and function, Transport across membrane, Intracellular organelles and their functions, briefly on cytoskeleton
3	**Mechanism of hormone action:** Signal transduction - cAMP, cGMP, Calcium and Phosphatidyl inositol mediated
4	**Extracellular matrix:** Structure and function of Collagen Basal Lamina (Basement Membrane): Type IV Collagen, Laminin, Fibronectin Glycosaminoglycans and Proteoglycans. Collagen and other proteins with special reference to different structures of eye Rhodoposin and cone pigment proteins
5	Biochemical basis of ocular features in Galactosemia, mucopolysaccharidosis, lysosomal storage disorders, Wilsons disease.
TOPIC OB2: Tears, Aqueous humour, Vitreous humour	
6	**Tears:** Chemical composition, Bactericidal properties, lysozyme Tear Secretion Tear film- Lipid layer, Aqueous layer, Mucoid layer Tear - Functions & dysfunction, Diagnostic tests, Tear substitutes
7	**Aqueous humour:** Composition, function, Ciliary body-aqueous humour production Biochemical changes in aging and glaucoma
8	**Vitreous humour:** Chemical composition, functions and changes in aging
TOPIC OB3: Cornea, Lens, Retina	
9	**Cornea:** Structural composition and functions of - Epithelium, Basal lamina, stroma, Descemet's layer, endothelium, ion transport.

	Corneal metabolism –nutrient uptake, energy, transparency, barrier mechanism, irrigating solutions
10	**Lens:** Composition (chemical and structural), lens proteins - Crystallins, Basis of transparency, changes in cataract formation, role of glutathione and ascorbic acid, Changes with aging, photo oxidation, Glycation Metabolism-glucose utilization, sorbitol pathway, lactate dehydrogenase, Cataract formation in diabetics
11	**Retina:** Pigment epithelium-structure and composition Photoreceptor cells, rhodopsin, conopsin Lipids in retina. Vitamin A- retinal function and metabolism, deficiency features, dark adaptation time, night blindness Visual excitation - cGMP cascade and phototransduction Photoreceptor cells - Lipid Peroxidation, Free Radicals, Light Damage, and Protective Mechanisms Metabolism - Glucose Transport, Insulin, and Aldose Reductase Retinoid binding proteins Advanced glycation end products and retinal changes
TOPIC OB4: Free Radicals and Antioxidants, Oxidative stress, Immunoglobulins, Radioisotopes	
12	**Free Radicals and Antioxidants, Oxidative stress:** Free radicals, Reactive oxygen species (ROS) – Definition, examples, generation of free radicals, Damaging effects of ROS on biomolecules. Antioxidants - Anti-oxidant defence system of our body – enzymes, vitamins, metabolites as antioxidants Mechanism of Lipid Peroxidation Oxidative stress -oxidative damage to the lens, vulnerability of the Retina to Free Radicals, Antioxidants in the Retina and RPE (Vitamin E, Ascorbate, Carotenoids) Dietary antioxidants and therapeutic uses of antioxidants
13	**Immunoglobulins** - Types, functions Ocular Immunoglobulins and complements of the eye
14	**Radioisotopes**: Application in medicine and research

PRACTICAL: Course content

Sl No	Topic
1	Preparation of Normal, molar, percentage solutions, buffers and pH determination
2	Electrophoresis
3	Chromatography
4	Estimation of Vitamin A
5	Estimation of Vitamin C

Recommended Text books:

1. Text book of Biochemistry Rafi
2. Text book of Biochemistry. DM Vasudevan
3. Text book of Biochemistry U. Sathyanarayana
4. Text book of Biochemistry S.K Gupta
5. Biochemistry of the eye David. R. Whilehart
6. Biochemistry of the Eye Elaine R. Berman

4. OPTICS:
(A) PHYSICAL OPTICS (THEORY)

SL. NO	TOPICS
1	Nature of light: light as electromagnetic oscillation –wave equation; ideas of sinusoidal oscillations –simple harmonic oscillation; transverse nature of oscillation; concepts of frequency, wavelength, amplitude and phase An overview Corpuscular Theory, Wave Theory, quantum theory and dual nature
	Simple Harmonic Motion Definition, Mathematical representation, energy in SHM, combination of two SHMs (along a line and at right angles). Waves: Transverse and Longitudinal, mathematical representation of a wave, wave fronts, path difference and phase difference, coherent waves, Numerical.
	Interference of light Theory of interference-Conditions for interference, Young's double slit experiment, Expression for fringe width, Intensity distribution of the double slit interference pattern, condition for good contrast.
	Interference in thin films: Reflection phase shifts, optical path length. Interference in thin parallel films of uniform thickness, variable thickness (air wedge, Newton's rings), their applications to antireflection coatings, optical flatness of reflecting surfaces, determination of : wavelength, refractive index, thickness of thin films, radius of curvature, Michelson interferometer, Numerical
2	Diffraction – Introduction, Fresnel and Fraunhofer diffraction. Fresnel diffraction: Rectilinear propagation of light, Zone plate, Theory of Fresnel's half period zone. Numerical. Fraunhofer Diffraction: Diffraction pattern from single slit, Double slit. Diffraction patterndue to N Slits-Theory of plane transmission grating. Resolving power of the diffraction grating. Numerical.
3	Polarization – Review of light as a transverse wave. Polarization phenomenon due to reflection, refraction and scattering Brewster's and Malus' laws. Polaroids. Double refraction, retardation plates, Nicol prism as a device to produce polarized light, dichroism, equation to polarization ellipse, elliptical, circular and linear polarizations, their production and detection Optical activity, Lorentz half shade polarimeter, determination of specific rotation

4	Absorption and scattering: General and selective absorption, Distinction between absorption and scattering, absorption by solids, liquids and gases, scattering: Rayleigh, Mie and Raman scattering.
5	Radiometry and Photometry – Electromagnetic spectrum, Radiometry, Photometry, sources of optical radiation and detectors of radiation.
6	Laser basics: Introduction, Einstein quantum theory of radiation, Essentials of a laser, Ruby laser, Holography, Numerical.
7	Fiber Optics: Structure, Optics of propagation, Attenuation, Distortion, Numerical.
8	The particle nature of radiation :Photoelectric effect, Compton effect(no derivation of Compton shift equation), Numerical

PHYSICAL OPTICS - PRACTICALS

Any 10 of the following experiments

SL. NO	**TOPICS**
	EXPERIMENTS 1. Air wedge 2. Newton's rings 3. Bi prism 4. Michelson's interferometer 5. Refractive index of a liquid using a hollow prism 6. Refractive indices of an anisotropic crystal Variation of refractive index with wavelength Diffraction grating – minimum deviation/normal incidence method 7. Resolving power of a telescope 8. Polarimeter 9. Photo diode characteristics 10. Ultrasonic interferometer 11. Numerical aperture of optical fibres 12. Wave length of a laser light using grating. 13. Photoelectric effect. **14.** Planck's constant

PRINCIPLES OF LIGHTING

SL. NO	TOPICS
1	Visual tasks: factors affecting visual tasks
2	Modern theory on light & colour: synthesis of light
3	Additive & subtractive synthesis of colour
4	Light sources: Modern light sources – spectral energy distribution – luminous efficiency – colour temperature – colour rendering]
5	Illumination: Luminous flux, candela, solid angle, illumination, utilization factor, depreciation factors, illumination laws
6	Lighting installation: glare, luminaries, lighting fixtures, types of lighting
7	Photometry: measurement of illumination, photometers and filters
8	Eye care and lighting – special care with VDU.

RECOMMENDED BOOKS

1. Fundamentals of Optics – 4th edition – Francis.A.Jenskins and Harvey.E.White.
2. 2. A textbook of Optics – N.Subrahmanyam and Brij Lal.
3. 3. Introduction to optics – Frank.L.Pedrotti and Leno.S.Pedrotti.
4. 4. Physics for scientists and Engineers with modern Physics, Vol 2, 6th Edition, Serway and Jewett

(B) GEOMETRICAL OPTICS – THEORY

SL.N	TOPICS
1	Properties of light: Classification of optics based on the nature and properties of light. The rectilinear propagation of light, Umbra and Penumbra, Speed of light in vacuum and in a stationary media, Beam, pencil and ray of light, Laws of reflection and refraction, Refractive index, Optical path, Graphical construction for refraction, Principle of reversibility, Fermat's principle (only qualitative discussion), Color dispersion. Numerical
2	Plane surfaces and Prisms: Parallel beam, the critical angle and total reflection, Plane parallel plate, Refraction by a prism, Minimum deviation, Thin prisms, Graphical method of ray tracing, Direct vision prisms, Reflection of divergent rays, Refraction of divergent rays, Images formed by paraxial rays. ophthalmic prisms Numerical.
3	Spherical surfaces: Introduction, Focal points and focal lengths, Image formation, Virtual images, conjugate points and planes, Convention of signs, Graphical constructions (parallel ray method only), Magnification, Vergence and reduced vergence, Gaussian formula. Numerical.
4	Spherical mirrors – focal points, focal lengths, image formation, mirrors and vergence, reflection matrix, aspheric mirrors
5	Thin lenses: Lenses, Focal points and focal lengths, Image formation: graphical method (parallel ray and oblique ray methods) and derivation of lens formula, conjugate points and planes. Lateral magnification, Virtual images, Lens makers' formula, Power of a thin lens, Thin lenses in contact, without contact. Numerical.
6	Thick lenses: Image formation: graphical method (both parallel ray and oblique ray methods), Focal points, principal points, nodal points and optical center, thick lens formulas (no derivation). Numerical
7	Matrix methods in paraxial optics: Introduction, Translation matrix, Refraction matrix, Reflection matrix and Thick lens and thin lens matrices. Numerical.
8	Aberration theory: Spherical (coma, astigmatism, curvature of field and distortion) and chromatic aberrations and their minimization including GRIN systems (qualitative description only).
9	Optics of the Eye: Biological structure of the eye, Optical representation of the eye, Functions of the eye, Errors of refraction and their correction, Laser therapy for ocular defects. Depth of focus
10	Aperture and stops :Field stop and Aperture stop, Entrance and exit pupils, chief ray, Front stop, stop between two lenses, two lenses with no stop, field of view
11	Optical Instruments – The Camera, eye and its refractive anomalies, simple magnifier, compound microscope and telescopes. 4 Hours

GEOMETRIC OPTICS – PRACTICALS

Practical: 3 Hours/week

Any 10 of the following experiments

SL. NO	TOPICS
1	1. Law of reflection 2. Law of refraction 3. Critical angle of glass 4. Angle of minimum deviation using I-d curve 5. f &□ of convex lens 6. f &□ of concave lens 7. f of convex mirror 8. f of concave mirror 9. □ of solid 10. □ of liquid 11. Angle of the prism – using spectrometer 12. Determination of Cauchy's constant 13. □ of the material of the crown and flint glasses for Na light 14. Dispersive power of a prism 15. Verification of inverse square law of radiation using a photometer 16. Photometer - determination of transmission coefficient

Recommended books

1. Fundamentals of Optics – 4th edition – Francis.A.Jenskins and Harvey.E.White.
2. A textbook of Optics – N.Subrahmanyam and Brij Lal.
3. Introduction to optics – Frank.L.Pedrotti and Leno.S.Pedrotti.
4. Physics for scientists and Engineers with modern Physics, Vol 2, 6th Edition, Serway and Jewett
5. Introductory lighting (Illuminating engineering society of North America)
6. Environmental vision (Pitts)

Subsidiary Subjects

FIRST YEAR

Sl No	Subject	Teaching hours
1	Computer basics	20
2	English and Communication Skills	20
3	Health care	20
4	Basic Science with Skill Development Training and Hospital Procedure and Records	40

FIRST YEAR

I. COMPUTER BASICS

Teaching Hours: 20

1. Introduction to Computers
2. Definition: Input. Output & CPU
3. Input and output devices: types
4. Basis of computer system: Switching on & off, what is Bias? And computer generations
5. Keyboard practices
6. Definitions of terms: Desktop & Software
7. Computer systems: Hardware & software definitions
8. Windows operating system (win7, 8, 10 etc): Definition & Why, Calculator - Word pad - Short cuts - Start menu - Media player - Note pad - Win amp – Paint - Control panel
9. Microsoft word: Opening, saving, deleting, typing, print , Page border, spelling, table, grammar, margin, Clip art, BIU, word art, Colour text &background, Picture drawing using word
10. Excel: Formulas - Design charts- Format tables
11. PowerPoint: Designing a presentation - Inserting some animation with sound
12. Internet &its applications: Interconnection to HTML, E- mailing – Browsing - Chatting

II. ENGLISH AND COMMUNICATION SKILLS

Teaching Hours: 20

ENGLISH

1. Functional English –Grammar: Components of a sentence – Verb - Transformation of sentences – Voice - Reported speech - Positive/ negative -Statement/ Interrogative - Subject verb agreement - Common errors – Exercises
2. Vocabulary: Synonyms and antonyms - Idioms and phrases – Similies - Words denoting assemblage
3. Writing skills: Note making – Summarizing - Report writing - Letter writing - Expansion of an idea
   - Comprehension
4. Reading: What is efficient and fast reading? - What is Awareness of existing reading habits - Tested techniques for improving speed - Improving concentration and comprehension through systematic study

COMMUNICATION

5. Introduction: Communication process - Elements of communication - Barriers of communication and how to overcome them.
6. Speaking: Importance of speaking efficiently - Voice culture - Preparation of speech - secrets of good delivery - Audience psychology handling - Presentation skills - Conference/Interview technique
7. Listening: Importance of listening - Self-awareness about listening -Action plan execution - Barriers in listening - Good and persuasive listening
8. Nonverbal Communication: Basics of nonverbal communication
9. Memory: What is memory, Brain- mind potential? - Systems for memorizing
   - Summary page
   - Building positive mental habits
10. Self-awareness: Self-image - Self talk – Relaxation - Personality development

III HEALTH CARE

Teaching Hours: 20

1. **Introduction to Health**: Definition of Health, Determinants of Health, Health Indicators of India, Health Team Concept, National Health Policy, National Health, Programmes (Briefly Objectives and scope) Population of India and Family welfare programme in India
2. **Introduction to Nursing**
   - Nursing principles. Inter-Personnel relationships. Bandaging: Basic turns; Bandaging extremities; Triangular Bandages and their application. Nursing Position, Bed making, prone, lateral, dorsal, dorsal recumbent, Fowler's positions, comfort measures, Aids and rest and sleep. Lifting and Transporting Patients: Lifting patients up in the bed. Transferring from bed to wheel chair. Transferring from bed to stretcher.
   - Bed Side Management: Giving and taking Bed pan, Urinal : Observation of stools, urine. Observation of sputum, Understand use and care of catheters, enema giving.
   - Methods of Giving Nourishment: Feeding, Tube feeding, drips, transfusion
   - Care of Rubber Goods
   - Recording of body temperature, respiration and pulse, Simple aseptic technique, sterilization and disinfection. Surgical Dressing: Observation of dressing procedures

3. **First Aid:** Syllabus as for Certificate Course of Red Cross Society of St. John's Ambulance Brigade.

Reference Books:

1. Preventive and Social Medicine by J.Park
2. Text Book of P & SM by Park and Park
3. Counseling & Communicate skills for medical and health, Bayne- Orient Longman Pvt. Ltd.

III. BASIC SCIENCE WITH SKILL DEVELOPMENT TRAINING AND HOSPITAL PROCEDURE AND RECORDS

Teaching Hours: 40

1. Basic science with skill development training

- Medical ethics & the relevant medico legal aspects
- Responsibilities & duties
- Ethical behaviour & conduct
- Medico-legal aspects and its relation to consumer protection act
- Biomedical waste & Its management
- Cardiopulmonary resuscitation- basic cardiac life support & advanced cardiac life support
- Critical care nephrology - management of renal failure in ICU
- Basic principles of blood transfusion & fluid therapy
- Sterilization - material & methods
- Biochemistry, Microbiology, Pathology & other related instrumentation: Basic principles of commonly used instruments, care & maintenance

2. Infection control

- The cycle of infection
- Infectious organisms
- The reservoir of infection
- The susceptible host Transmission of disease Practical asepsis
- Handling linen
- Disposal of contaminated waste
- Environmental asepsis
- Isolation technique
- The isolation patient in radiology dept.
- Precaution for the comprised patient Surgical asepsis

3. **Medication and their administration (nursing classes)**

    - The role of the radiographer Medication information
    - The topical route
    - The oral route
    - The parenteral route Preparation of injection
    - The intravenous route Charting

4. **Dealing with acute situations (emergency medicine classes)**

    - Accident victims: Head injury/ Fractures/ Burns
    - Life threatening emergencies: Respiratory arrests, Heart attacks and cardiac arrests, Shocks
    - Other emergencies - Epitaxis, Postural hypotension and vertigo Seizures, Diabetic coma and insulin reaction Asthma

5. **CARDIOPULPONARY RESUSCITATION (C.P.R)**

    - Basics of CPR - How to give CPR? Precautiosn during CPR
    - Basic cardiac life support & advanced cardiac life support

6. **HOSPITAL PROCEDURE AND RECORDS**

    General idea about the role, importance and procedures of the following within the hospital set up -

    - Medical records
    - Medical photography
    - Computer networking system
    - Laboratory services
    - Sample collection and transport
    - Biomedical waste disposal

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SECOND YEAR

BACHALORE OF SCIENCE

IN

OPTOMETRY

(2ND B. Sc. OPTOMETRY)

SECOND YEAR B.Sc. OPTOMETRY

- 1. Pharmacology, Microbiology & Pathology
- 2.Optometric Optics & Dispensing Optics
- 3.Visual Optics and clinical exam of visual system(CEVS)
- 4.Optometric Instruments & appliances

1. PHARMACOLOGY (SecA)

BASIC AND OCULAR PHARMACOLOGY

TEACHING HOURS: 40 hours

Theory - 30 hours
Practical - 10 hours
THEORY: Course content

Sl.NO.	TOPICS
TOPIC PH 1: GENERAL PHARMACOLOGY	
1	Introduction and sources of drugs, routes of drug administration
2	Pharmacokinetics - Absorption and bioavailability, distribution biotransformation, excretion
3	Pharmacodynamics- Types and mechanism of drug action Adverse drug reactions
SYSTEMIC PHARMACOLOGY	
TOPIC PH 2: DRUGS ACTING ON ANS	
4	Introduction, neurotransmitters and mechanism of action
5	Ophthalmic uses and adverse effects of drugs affecting autonomic nervous system (mydriatics and miotics)
6	Skeletal muscle relaxants
7	Drugs used in treatment of Glaucoma
8	Drugs used in allergic conditions, inflammatory disorders & degenerative disorders of the eye
9	Botulinum toxin type A in the treatment of strabismus, blepharospasm and related drugs
10	Drugs induced ocular toxicity
TOPIC PH 3: DRUGS ACTING ON CVS	
11	Anti-hypertensive drugs

12	Anti-anginal drugs
TOPIC PH 4: DRUGS ACTING ON RENAL SYSTEM	
13	Diuretics - emphasis on drugs used in ocular diseases
14	Osmotic agents

TOPIC PH 5: DRUGS ACTING ON CNS	
15	Sedative, hypnotics, alcohol
16	General and local anesthetics and anesthetics agents used in ophthalmic procedures
17	Opioid drugs
18	Non-steroidal anti-inflammatory drugs
19	Antihistaminics and mast cell stabilizers
TOPIC PH 6: BLOOD	
20	Coagulant drugs, surgical hemostasis and thrombolytic agents
TOPIC PH 7: HORMONES	
21	Corticosteroids
22	Antidiabetic drugs
TOPIC PH 8: CHEMOTHERAPY	
23	**General chemotherapy** Basic principles of chemotherapy
24	**Systematic chemotherapy -** Classification / examples, spectrum uses and adverse effects a) Antibacterial drugs: Sulphonamides, fluoroquinolones, beta-lactam antibiotics, tetracyclines and chloramphenicol, macrolides, aminoglycosides, others: polymyxin, bacitracin b) Antifungal, Antiviral, Anti-tubercular, Anti-leprosy drugs in brief
TOPIC PH 9: MISCELLANEOUS	
25	Agents used to treat blind and painful eye
26	Vitamin A and anti-oxidants

SECTION B: OCULAR PHARMACOLOGY

TOPIC PH 1: OCULAR PHARMACOLOGY	
1	Ocular formulations and ocular routes of administration, drug delivery system and special ocular drug delivery system
2	Ocular pharmacokinetics Delivery methods of ocular medication: residence in the conjunctival sac, drug vehicles affect drug delivery, advanced ocular delivery systems
3	Drugs induced ocular toxicity

SECTION C: Diagnostic and Therapeutic applications of drugs in ophthalmology

TOPIC PH 1	
1	Drugs used to assist in ocular diagnosis - anterior segment and external diagnostic uses posterior segment diagnostic uses
2	Drugs and biological agents used in ocular surgery - anesthetics used in ophthalmic procedures
3	Drugs used in allergic conditions, inflammatory disorders and degenerative disorders of the eye
4	Immune modulators in ophthalmic practice
5	Other agents used in ophthalmic practice Enzymes , Trace elements , Antioxidants , Wetting Agents, Tear Substitutes
TOPIC PH 2: Miscellaneous	
6	Pre-surgical antiseptics
7	Viscoelastic substances
8	Ophthalmic glue
9	Anterior segment gases
10	Vitreous substitutes
11	Esotropia
12	Ocular myasthenia

Topics on diagnostic and therapeutic applications of drugs used in ophthalmology to be conducted by Department of Ophthalmology

PRACTICAL: Course content

Sl No	Topic
1	Dosage forms
2	Routes of drug administration (emphasis on ocular routes of drug delivery system)
3	Effects of various drugs on eye (CAL)

RECOMMENDED BOOKS (Latest editions)

1. Essentials of Medical Pharmacology KD Tripathi
2. Bartlett and Jaanus: Clinical Ocular Pharmacology, Elsevier Publishers
3. T S Mauger & E L Craig - Mosby's - Ocular Drug Handbook

4. Ocular Therapeutics by N.R. Biswas, Vinay Gupta, Ashok Dubey CBS Publishers
5. Essentials of ocular Pharmacology & Therapeutics by Sengupta Komal Kumar - Anshan Ltd.
6. Clinical Applications of Antibiotics & Anti-inflammatory, Drugs in Ophthalmology - Jaypee Publishers

MICROBIOLOGY (Sec B)

SL.NO	TOPICS
1	**General Microbiology** 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
2	**Ocular Microbiology** 1. Common bacterial infections of the eye 2. Common fungal infections of the eye 3. Common viral infections of the eye 4. Common parasitic infections of the eye

TEXT BOOKS RECOMMENDED (LATEST EDITIONS)

1. Essentials of Medical Microbiology Apurba Shankar Sastry 2nd ed
2. Textbook of Microbiology Ananthnarayan and Paniker's 10 ed
3. Essentials of Medical Microbiology Apurba Shankar Sastry 3rd ed
4. Ocular Microbiology- P. K. Mukherjee, Preeti Bandyopadya

PATHOLOGY (Sec C)

SL.NO	TOPICS
1	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

2. OPTOMETRIC OPTICS & DISPENSING OPTICS (THEORY)

SL.NO	TOPICS
1	Spectacle Lenses : 1.1 Manufacture of glass Lens materials Lens surfacing Principle of surface generation and glass cements Terminology used in Lens workshop Lens properties Lens quality Faults in lens material Faults on lens surface Methods of Inspecting the quality of lenses Safety standards for ophthalmic lenses (FDA, ANSI, ISI, Others)

2	Spectacle Frames: Types and parts Classification of spectacle frames-material, weight, temple position, Coloration Frame construction Frame selection Size, shape, mounting and field of view of ophthalmic lenses
3	Tinted & Protective Lenses Characteristics of tinted lenses Absorptive Glasses Polarizing Filters, Photochromic & Reflecting filters Safety lenses-Toughened lenses, Laminated Lenses, CR 39, Polycarbonate lenses
4	Multifocal Lenses: Introduction, history and development, types Bifocal lenses, Trifocal & Progressive addition lenses
5	Reflection from spectacle lens surface & lens coatings: Reflection from spectacle lenses - ghost images -Reflections in bifocals at the dividing line Antireflection coating, Mirror coating, Hard Multi Coating [HMC], Hydrophobic coating
6	Miscellaneous Spectacle: Iseikonic lenses Spectacle magnifiers Recumbent prisms Fresnel prism and lenses Lenticular &Aspherical lenses High Refractive index glasses

DISPENSING OPTICS

SL.NO	TOPICS
1	Components of spectacle prescription & interpretation, transposition, Add and near power relation
2	Frame selection –based on spectacle prescription, professional requirements, age group, face shape
3	Measuring Inter-pupillary distance (IPD) for distance & near, bifocal height
4	Lens & Frame markings, Pupillary centers, bifocal heights, Progressive markings & adjustments –facial wrap, pantoscopic tilt
5	Recording and ordering of lenses (power, add, diameter, base, material, type, lens enhancements)
6	Neutralization –Hand &lensometer, axis marking, prism marking
7	Faults in spectacles (lens fitting, frame fitting, patients complaints, description, detection and correction)
8	Final checking & dispensing of spectacles to customers, counseling on wearing & maintaining of spectacles, Accessories –Bands, chains, boxes, slevets, cleaners, screwdriver kit
9	Spectacle repairs –tools, methods, soldering, riveting, frame adjustments
10	Special types of spectacle frames Monocles Ptosis crutches Industrial safety glasses Welding glasses
11	Frame availability in Indian market
12	FAQ's by customers and their ideal answers

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 editio

3. VISUAL OPTICS & CLINICAL EXAMINATION OF VISUAL SYSTEM (CEVS)
VISUAL OPTICS

SL.NO	TOPICS
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, Bi-refringence, Dichroism 1.9 Aberration and application Spherical and Chromatin
2	OPTICS OF OCULAR STRUCTURES 2.1 Cornea and aqueous 2.2 Crystalline lens 2.3 Vitreous 2.4 Schematic and reduced eye
3	Basic Aspects of Vision. Visual Acuity Light and Dark Adaptation Color Vision Spatial and Temporal Resolution Science of Measuring visual performance and Application to Clinical Optometry
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
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

	5.4 Contrast sensitivity– Definition, charts available, measurements and recordings 5.5 Trial set & Trial frame & Phoropter – advantages and disadvantages
6	REFRACTIVE CONDITIONS Aetiology, optical condition, types, clinical features and management 6.1 Emmetropia/Ametropia 6.2 Myopia 6.3 Hyperopia 6.4 Astigmatism 6.5 Anisometropia And Aniseikonia 6.6 Presbyopia 6.7 Aphakia and pseudophakia, Biometry 6.8 Axial Vs Refractive Ametropia
7	ACCOMMODATION 7.1. Mechanism 7.2. Range & Amplitudes of accommodation 7.3. Anomalies of accommodation
8	CONVERGENCE 8.1. Types, measurement & Anomalies 8.2. Relation between accommodation & convergence
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
10	EFFECTIVE POWER & MAGNIFICATION 10.1. Ocular refraction Vs Spectacle refraction 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

SL.NO	TOPICS
1	1. Study of purkinje images I & II, III & IV 2. Mathematical models of the eye- Emmetropia, Hyperopia, & Myopia 3. Effect of trial lenses & accessories in front of the eye
2	Visual acuity Measurement & recording (Distance & Near)
3	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
4	Dynamic retinoscopy – Methods 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 (CEVS)

SL.NO	TOPICS
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

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

4. OPTOMETRIC INSTRUMENTS & APPLIANCES

SL. NO	TOPICS
1	Pre examination history
2	Refractive Instruments 2.1 Visual acuity charts, Features, Advantages & disadvantages, newer developments 2.2. Trial case lenses – best form lenses 2.3. Trial frame design – Phoropter – Advantages & Difficulties 2.4. Retinoscope – Optics, types, adjustments & special features 2.5. Autorefractometer – Schenier's and other optical principles, Features, Advantages & disadvantages, newer developments 2.6 Vision analyzer 2.7 Potential Acuity Meter, 2.8 Pupilometer
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 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** 4.1. Optometer principle 4.2. Badal & non-badal principle – advantages & disadvantages 4.3. Lens gauge or clock 4.4. Hand neutralization
5	**Slit Lamp** 5.1. Slit-lamp systems 5.2. Mechanical design

	5.3. Illumination techniques 5.4. Accessories 5.5. Scanning laser devices
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** 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
7	**Color vision testing devices** 7.1. Color vision theories 7.2. Common color vision defects 7.3. Pseudoisochromatic test plates 7.4. Color arrangement tests 7.5. Interpretation & clinical significance of findings
8	**Ophthalmoscopes** 8.1. Optical principle & Types 8.2. Direct ophthalmoscope – Instrumentation, Characteristics clinical procedure& Uses 8.3. Indirect ophthalmoscope – Instrumentation, Characteristics, clinical procedure & Uses 8.4. Direct ophthalmoscope Vs Indirect ophthalmoscope\ 8.5 Fundus biomicroscope- Principle & Instrumentation, Characteristics clinical procedure& Uses
9	**Ophthalmic Ultrasonography** 9.1. Physics of Ultrasonography 9.2. A-scan – Procedure & clinical uses 9.3. B-Scan – Procedure & Clinical uses

10	**Electrophysiology – ERG, VEP & EOG** Principle & Instrumentation, Characteristics clinical procedure& Uses,interpretation of report
11	Fundus camera & Flourescine angiography

SECOND YEAR Subsidiary subjects

Sl No	Subject	Teaching hours
1	Indian constitution	20
2	Sociology	20
3	Environment science and health	20
4	Clinical psychology	20

I. INDIAN CONSTITUTION

Teaching Hours: 20

1. Meaning of the term 'Constitution' Making of the Indian Constitution 1946-1950
2. The democratic institutions created by the constitution Bicameral system of Legislature at the Centre and in the States.
3. Fundamental Rights and Duties their content and significance
4. Directive Principles of States Policies the need to balance Fundamental Rights with Directive Principles.
5. Special Rights created in the Constitution for: Dalits, Backwards, Women and Children and the Religious and Linguistic Minorities.
6. Doctrine of Separation of Powers legislative, Executive and Judicial and their functioning in India
7. The Election Commission and State Public Service commissions
8. Method of amending the Constitution
9. Enforcing rights through Writs:
10. Constitution and Sustainable Development in India

Reference Books:

1. J.C. Johari: The Constitution of India- A Politico-Legal Study-Sterling Publication, Pvt. Ltd. New Delhi.
2. J.N . Pandey: Constitution Law of India, Allahbad, Central Law Agency, 1998.
3. Granville Austin: The Indian Constitution – Corner Stone of a Nation-Oxford, New Delhi, 2000.

II. SOCIOLOGY

Teaching Hours: 20

Course Description

This course will introduce student to the basic sociology concepts, principles and social process, social institutions [in relation to the individual, family and community and the various social factors affecting the family in rural and urban communities in India will be studied.

1. **Introduction:**

   Meaning – Definition and scope of sociology. Its relation to Anthropology, Psychology, Social Psychology

   Methods of Sociological investigations – Case study, social survey, questionnaire, interview and opinion poll methods.

   Importance of its study with special reference to health care professionals

2. **Social Factors in Health and Disease:**

   Meaning of social factors, Role of social factors in health and disease

3. **Socialization:**

   Meaning and nature of socialization, Primary, Secondary and Anticipatory socialization, Agencies of socialization

4. **Social Groups:**

   Concepts of social groups influence of formal and informal groups on health and sickness. The role of peoples involved in the primary and secondary health care groups in the hospital and rehabilitation setup.

5. **Family:**

   The family, meaning and definitions, Functions of types of family, Changing family patterns. Influence of family on individual's health, family and nutrition, the effects of sickness in the family and psychosomatic disease and their importance to physiotherapy

6. **Community:**

   Rural community: Meaning and features – Health hazards to rural communities, health hazards to tribal community.
   Urban community: Meaning and features – Health hazards of urbanities
   Culture and Health: Concept of Health Concept of culture and Health, Culture and Health Disorders

Social Change: Meaning of social changes, Factors of social changes, Human adaptation and social change, Social change and stress, Social change and deviance, Social change and health programme. The role of social planning in the improvement of health and rehabilitation

Social Problems of disabled: Consequences of the following social problems in relation to sickness and disability remedies to prevent these problems, Population explosion Poverty and unemployment Beggary, Juvenile delinquency Prostitution Alcoholism, Problems of women in employment

7. Social Security:

Social Security and social legislation in relation to the disabled

8. Social Work:

Meaning of Social Work, The role of a Medical Social Worker

Reference Books:

1. Sachdeva & Vidyabhushan, Introduction to the study of sociology
2. Indrani T.K., Text book of sociology for graduates nurses and Physiotherapy students, JP Brothers, New Delhi 10

III. ENVIRONMENT SCIENCE AND HEALTH

Teaching hours: 20

1. Introduction to Environment and Health
2. Sources, health hazards and control of environmental pollution
3. Water
4. The concept of safe and wholesome water.
5. The requirements of sanitary sources of water.
6. Understanding the methods of purification of water on small scale and large scale. Various biological standards, including WHO guidelines for third world countries. Concept and methods for assessing quality of water.
7. Domestic refuse, sullage, human excreta and sewage their effects on environment and health, methods and issues related to their disposal.
8. Awareness of standards of housing and the effect of poor housing on health.
9. Role of arthropods in the causation of diseases, mode of transmission of arthropods borne diseases, methods of control

Recommended Books:

1. Text Book of Environmental Studies for under gradute courses By Erach Bharucha Reprinted in 2006, Orient Longman Private Limited /Universities Press India Pvt. Ltd.

IV. CLINICAL PSYCHOLOGY

Total teaching hours: 20

1. Introduction to psychology
2. Intelligence, Learning, Memory, Personality, Motivation
3. Body integrity- one's body image
4. Patient in his Milan
5. Self-concept of the therapist, Therapist patient relationship-some guidelines
6. Illness and its impact on the patients
7. Maladies of the age and their impact on the patient's own and others concept of his body image
8. Adapting changes in vision
9. Why Medical Psychology needs / demands commitment?

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THIRD YEAR

BACHALORE OF SCIENCE

IN

OPTOMETRY

(3RD B. Sc. OPTOMETRY)

THIRD YEAR B.Sc. OPTOMETRY

1. Pediatric Optometry ,binocular vision & Community Optometry ((Occupational Optometry, Research Methodology & Statistics)
2. Contact Lens
3. Geriatric Optometry and low vision aids, Practice management and law of Optometry

4. Ocular Diseases and systemic diseases

1) PEDIATRIC OPTOMETRY (Sec A)

SL. NO	TOPICS
1	**Introduction** i. Review of ocular anatomy & Physiology ii.Visual development-– visual system, visual acuity, refractive error, contrast sensitivity function, eye movements, accommodation, binocular vision, color vision
2	**Pediatric case history** i. Genetic factors ii. Prenatal factors iii. Perinatal factors iv.Postnatal factors
3	**Normal Appearance, pathology and structural anomalies of** Orbit Eyelids Lacrimal system Conjunctiva Cornea Sclera Anterior chamber, Uveal tract, pupils Lens Vitreous, Fundus Oculomotor system
4	**Ocular Examination** i. Measurement of visual acuity Various visual acuity charts for different age groups

	Teller acuity chart & VEP ii. Measurement of refractive status Dry & Cycloplegic refraction Interpretation of results iii. Assessment of oculomotor function iv. Measurement of fusion and stereopsis, color vision v. Assessment of accommodation & Convergence
5	**Post examination processes** Compensatory treatment & remedial therapy for Myopia Pseudomyopia Hyperopia Astigmatism Anisometropia Strabismus Nystagmus
6	Pediatric dispensing Spectacles Contact Lenses

Recommended books

1. Principles & Practice of pediatric optometry -Alfred Rosenboom, M.W.Morgan
2. Pediatric Optometry- Jerome Rosner
3. Clinical pediatric optometry- Leonard.J.Press – 1st edition
4. Visual Development, Diagnosis, Treatment of the -Robert H Duckman, Pediatric Patients

BINOCULAR VISION & ADVANCES IN OPTOMETRY (THEORY) (Sec B)

SL. NO	TOPICS
1	Binocular Vision and Space perception. Relative subjective visual direction. Retino motor value Grades of BSV SMP and Cyclopean Eye Correspondence, Fusion, Diplopia, Retinal rivalry Horopter Physiological Diplopia and

	Suppression Stereopsis, Panum's area, BSV. Stereopsis and monocular clues -significance. Egocentric location, clinical applications. Theories of Binocular vision.
2	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
3	Near Vision Complex Accommodation Definition and mechanism (process). Methods of measurement. Stimulus and innervation. Types of accommodation. Anomalies of accommodation – aetiology and management.
4	Convergence Definition and mechanism. Methods of measurement. Types and components of convergence - Tonic, accommodative, fusional, proximal. Anomalies of Convergence – aetiology and management.
5	Sensory adaptations Confusion
6	Suppression Investigations Management Blind spot syndrome
7	Abnormal Retinal Correspondence Investigation and management Blind spot syndromeSurgical
8	Eccentric Fixation Investigation and management
9	Amblyopia Classification Aeitiology Investigation Management
10	Neuro-muscular anomalies Classification and etiological factors
11	History – recording and significance

12	Convergent strabismus Accommodative convergent squint Classification Investigation and Management Non accommodative Convergent squint
13	Divergent Strabismus Classification A& V phenomenon Investigation and Management
14	Vertical strabismus Classification Investigation and Management
15	Paralytic Strabismus Acquired and Congenital Clinical Characteristics Distinction from comitant and restrictive Squint
16	Investigations History and symptoms Head Posture Diplopia Charting Hess chart PBCT Nine directions Binocular field of vision
17	Non-surgical Management of Squint
18	Restrictive Strabismus Features Musculo fascical anomalies Duane's Retraction syndrome Clinical features and management Brown's Superior oblique sheath syndrome

BINOCUALR VISION ADVANCES IN OPTOMETRY – PRACTICALS

SL. NO	TOPICS
1	**Strabismus assessment** Cover test, Krimsky, Synaptophore, Sterioacuity test, Diplopia charting Examination Procedures of different types of strabismus and its non-surgical management**.**

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

COMMUNITY OPTOMETRY
(Sec C)

SL. NO	TOPICS
1	**Public Health & Community Optometry** 1. Public health & Community optometry- concepts and implementation 2. Global medicine and evolution of public health in India 3. Health care delivery systems in India and determinants of health 4. Quality assessment in health delivery programmes 5. Natural history of disease, transmission of disease 6. Levels of prevention – optometrist's role in community 7. Concepts of national health programme 8. Screening in population (Screening for eye disease) 9. Epidemiology of blindness- cataract, glaucoma, deficiency disorders 10. Eye care in Primary Health care 11. Community Eye Care Programs 12. Community based Rehabilitation Program 13. Vision 2020: The Right to Sight 14. Scope of geriatric ophthalmology in preventive and rehabilitation care 15. Basics in research methodology in populations 16. Demography and vital statistics (This can be a part of Research Methadology) 17. National and international agencies in health care 18. Fundamentals of health economics, health plan 19. Evaluation & Assesment of Health Programmes 20. Role of Optometrist in Public Health & Community Optometry 21. Role of Optometrist in school eye screening Program 22. Community outreach-camps and school screening programmes

2	i. Introduction to occupational health, hygiene and safety ii.International bodies like ILO, WHO, national bodies like labour institutes, National institutes of occupational health, national safety council etc
3	**Acts and rules,** i. Factories act and rules ii.Workmen's compensation act, ESI act etc
4	i Light / Illumination (Defination, Units ,Sources,advantages,disadvantages) ii. Color (Defination,Color defects, Color vision tests) iii. Introduction to Different Occupation Occupation where Illumination and Color vision is Important
5	i.Occupational Hazards A. Physical Hazards B. Biological Hazards C. Ergonomic Hazards D. Air-Borne Hazards E. Chemical Hazards Example of Occupation related to each Hazards ii. Radiation (Electromagnetic radiation, Ionizing & Non ionizing, Infrared, Ultraviolet, Microwave & laser) iii.Pesticides – General & Ocular defects iv Occupational hygiene & ergonomics a. Environmental monitoring b. Recognition, evaluation and control of hazards
6	i.Occupational diseases ii. Occupation related diseases caused by (Physical agents, Chemical agents Biological agents) iii.Common Systemic Disease Associated with Various Occupation iv. Common Ocular Disease in Various Occupation v. Visual Problems in various Occupation vi. Occupational safety a. Prevention & Protective Methods b. Personal protective equipment Goggles, Face shields etc Selection, use & Testing for standards vii. Occupational Accidents

	vii. Causes of accidents viii. Accident analysis, accident prevention
7	i. Task Analysis of Occupation ii. Vision Standards for Occupation like Railways, Roadways, Airlines etc
8	Prevention of occupational diseases Medical examination / medical monitoring Pre-employment/pre- placement examinations
9	Visual Display Unit (Computer ,Laptop, Digital Devices)
10	Contact lens & work
11	i. Role of optometrist – promotion of general and visual health and safety of people at Work ii. Industrial visits & Industrial Vision Screening

RESEARCH METHODOLOGY & STATISTICS

SL. NO	TOPICS
1	**Introduction I: Biostatistics** Definition role of statistics in health science and health care delivery system
2	**Introduction II: Research Methodology** Research process Steps involved in research process Research methods and methodology
3	Variables and scales of measurements Definitions and examples of qualitative, quantitative, continuous discrete, dependent and independent variables. Definitions, properties and examples of nominal, ordinal, interval and ratio scales of measurements.
4	**Sampling** Population, sample, sampling, reasons for sampling, probability and non-probability sampling. Methods of probability sampling – simple random, stratified, systematic- procedure Merits and demerits. Use of random number table.

5	**Organization of data** Frequency table, histogram, frequency polygon, frequency curve, bar diagram, pie chart
6	**Measures of location** Arithmetic mean, median, mode, quartiles and percentiles – definition Computation (for raw data), merits, demerits and applications
7	**Measures of variation** Range, inter-quartile range, variance, standard deviation, coefficient of variation- definition Computation (for raw data), merits, demerits and applications
8	**Normal distribution** Concept, graphical form, properties, examples Concept of Skewnes and Kurtosis
9	**Correlation** Scatter diagram concept and properties of correlation coefficient, examples [No computation]
10	**Health Information System** Definition, requirement, component and uses of health information system. Sources of health information system- Census, Registration of vital events, Sample registration system (SRS), Notification of diseases, Hospital records, Disease registries, Record linkage, Epidemiological surveillance, Population survey
11	**Vital statistics and hospital statistics** Rate, ratio, proportion, Incidence, Prevalence. Common morbidity, mortality and Fertility statistics – Definition and computation.
12	**Hypothesis** What is hypothesis Formulation of hypothesis Characteristics of good hypothesis.
13	**Epidemiology** Concept of health and disease Definition and aims of Epidemiology, Descriptive Epidemiology- methods and uses.
14	Concept of reliability & validity

Recommended books

1. Methods in Biostatistics for medical students & Research workers - Mahajan B.K- 6th edition
2. Research methodology – Methods & techniques - Kothari.C.R
3. Introduction to Biostatistics: A manual for students in health sciences -Sundar Rao PSS, Richard.J
4. Text book of Preventive and social medicine -Park.E.Park

2. CONTACT LENS (THEORY)

SL. NO	TOPICS
1	i. Introduction to CL (Definition /Types) ii.2 History of Contact Lens iii. Review of Ocular Anatomy & Physiology a.Lids b. Tear film c. Lacrimal Apparatus d. Cornea e. Conjunctiva
2	i. Glossary of terms – Contact lenses ii. Optics of Contact Lens A. Magnification & Visual Field B. Accommodation & Convergence C. Back/Front Vertex Power (Vertex Distance Calculation) D. Axial & Refractive Ammetropia iii. Contact Lens materials A. Monomer/Polymer B. Properties of CL Material (RGP& SCL) iv. Manufacturing of CL (RGP, SCL& SOFT TORIC) v.Indications & Contraindications
3	i. Contact Lens Design & Parameters A. RGP contact lens design B. Soft Contact lens design ii. Preliminary Examination A. Instruments & Its use in Contact Lens Practice (Pachymeter/Specular Microscopy/ Keratometer/Placido Disc /Corneal Topography, Slit Lamp Biomicroscope) B. Steps of Preliminary Examination C. Significance of each steps iii. Parameter Selection (Base Curve/ Diameter) iii. Fitting philosophies
4	i.Types of CL A. Soft Contact Lens(SCL) B. Soft toric Contact Lens (SOFT TORIC) C. Rigid gas Permeable Contact Lens(RGP) Indication, Parameter selection,Modification,Fitting assessment & Recording, Final

	Prescription, Dispensing & Follow up Visit with Examination for each type of CL ii. Fitting in astigmatism – Toric CL A. Stabilization Technique iii. Handling of Contact Lens (RGP/SCL/SOFT TORIC) A. Insertion & Removal (RGP/SCL/SOFT Toric) B..Do's & Don'ts
5	i.Contact Lens Deposits (RGP/SCL) ii. Complication of contact lens (RGP /SCL)
6	i. Speciality Contact Lens A. Therapuetic Contact Lens (Indication / Fitting Assessment) B. Peaditric Contact Lens Fitting (Aphakia & Pseudophakia) C. Post Refractive Surgery D. Fitting in irregular astigmatism – Keratoconus/PMD etc E. Contact lenses for special purposes – Swimming, sports, occupational etc F. Orthokeratology ii. Bifocal Contact Lens (Types/Indication/Fitting assessment)
7	i. Modifications of finished CL ii. Inspection & Verification of finished contact lenses
8	Review of Contact lenses & Solutions available in India
9	i. Recent developments in contact lenses ii. Current contact lens research.

CONTACT LENS PRACTICALS

SL. NO	TOPICS
1	1.. Fitting & Dispensing of contact lenses in Myopia, Hyperopia, Astigmatism, Presbyopia, Anisometropia, Aphakia, Pseudophakia, Keratoconus, PMD etc 2. Paediatric contact lens fitting 3.CL fitting following ocular surgeries 4. Visit to factories manufacturing contact lenses

Recommended books

1. Contact Lenses- Antony.J.Philips, Janet Stone
2. Textbook of Contact Lenses - V.K.Dada – 4th Edition
3. Contact Lens Practice - Ruben & Guillon
4. Color Atlas of Contact Lens - Montague Rubem
5. Contact Lens –The CLAO guide Peter.R.Castle
6. IACLE – Contact Lens modules International Association of Contact Lens Educators, Sydney, Australia
7.Manual of Contact Lens prescribing & Fitting - Milton.M.Hom – 3rd edition
8. Manual of Gas Permeable contact Lens - Edward.S.Bennet, Milton.M.Hom – 2nd edition
9. Clinical manual of specialized CL prescribing - Terry.R.Scheid
10. Clinical Contact Lens Practice - Edward.s.Bennet, Barry.A.weissman
11. Cosmetic Contact Lens & Artificial eyes - Devendra Kumar & Gopal Krishnan
12. Common Contact Lens Complications - lyndon.W.Jones, Deborah.A.Jones
13. Anterior segment Complication of CL wear - Joel Silbert – 2nd edition
14. Contact lens practice

3. GERIATRIC OPTOMETRY&LOW VISION AIDS, LAW AND OPTOMETRY AND PRACTICE MANAGEMENT

Geriatric Optometry

SL. NO	TOPICS
1	i. Introduction ii. structural & physiological changes in the eye associated with ageing Structural changes to lid & adnexa Physiological changes to cornea, lens & Uvea Degenerative & Physiological changes in vitreous, choroid & retina
2	Optical & refractive changes Refractive changes in cornea, lens & vitreous Refractive changes due to diabetes Refractive changes due to uveitis
3	Cataract Glaucoma Macular disorders Vascular disorders
4	Optical correction of refractive conditions
5	Dispensing in geriatric age groups Spectacle Contact lenses

Recommended books

1) Vision of the ageing patient- Hirsch Wick
2) Vision & Ageing –General& Clinical perspective Alfred Rosenboom, Meredith.W.Morgan
3) Clinical refraction- Borish

LOW VISION AIDS (THEORY)

SL. NO	TOPICS
1	**Introduction** i. Definition & Classification ii. Causes of Low Vision iii. Optometrist's role in Low Vision management
II	**Examination of a Patient with Low vision** i. Case history ii. Visual acuity Distant vision – Charts, measurement & Documentation Near vision - Charts, measurement & Documentation Refraction – Significance & Technique Diagnostic procedures in low vision examination Screening for vision disability A collaborative model of service delivery Teaching other staff how to screen for vision disability and refer to you Six sensory impairments, realistic simulations and performance signs Impaired acuity Impaired contrast sensitivity Central field loss Peripheral field loss Oculomotor problems Perceptual impairment Normal age related vision loss Pathogenesis Sighted guide instructional video
3	Optics & Characteristics of Low vision aids i. Magnification ii. Galilean telescope Vs Keplarian Telescopes iii. Spectacle magnifiers iv. Hand Magnifiers v. Stand Magnifiers vi. CCTV vii. Bioptic telescopes viii.Accessory low vision aids
4	Selection of Low vision aids for distance, intermediate & Near
5	Guidelines & training to use various aids
6	Choices of tests & Aids in various pathological conditions

	i. Conditions causes overall blurring of the visual field ii. Condions causes central field defects iii.Conditions causes peripheral field defects
7	Light, glare & Contrast in Low vision care & Rehabilitation
8	Children with low vision
9	Genetics
10	Rehabilitation of visually handicapped
11	Definitions and eligibility for services in India
12	Description of advanced low vision devices and their practice

LOW VISION AIDS – PRACTICAL

1	Demonstration followed by evaluation of a low vision patient by students Low vision case history Visual acuity measurement & Documentation Refraction Needed diagnostic tests for each pathological condition Selection, trial & dispensing of visual aids Rehabilitation methods

Recommended books

1. Low vision care - E.B.Mehr, Allen.N.Fried
2. Clinical Low vision - Eleanor.E.Fay

Oxititute

LAW AND OPTOMETRY

SL. NO	TOPICS
	1. Legal environment and techniques- History – law and equity 2. History and theory of licensure 3. Licensure as a means of internal and external discipline- unprofessional conduct- incompetence- gross immorality 4. International optometry- important foreign optometry law 5. Optometrist in court 6. Malpractice- theory of liability- damages –minimizing malpractice

	claims 7. Insurance 8. Negligence 9. Ethics – professional ethics 10. Laws governing practice of medical and paramedical profession in India 11. Registered medical practitioner- laws against practice of medicine of those unregistered- medical council of India- dental council- nursing council 12. Present rules and regulations – laws regarding optical product Manufacturers- 13. dispensing in India 14. 13. Opticians- are they registered? Dispensing opticians- rules in UK

Recommended books

1. Public health and community Optometry - Robert.D.Newcomb, Jerry.L.Jolly
2. Industrial & Occupational ophthalmology - Samuel.L.Fox
3. Guide to occupational and other visual needs -Holmes
4. Work and the eye - Raechel.V.North
5. Diagnosing and treating computer related vision problems- Sheedy, Shaw-McMinn
6. Principles of Ophthalmic lenses - M.O.Jalie – 2nd edition
7. System for ophthalmic dispensing- Clifford.W.Brooks, Irwin.M.Borish
8. Clinical Optics- Troy Fannin, Theodore Grosvenor – 2nd edition
9. Ophthalmic lenses & Dispensing - M.O.Jalie – 2nd edition
10. Practical aspects of ophthalmic optics- Margeret Dowaliby – 4th edition

PRACTICE MANAGEMENT

1. Basics of book keeping
2. Data management
3. Record keeping
4. Clinic management
5. Staff management
6. Inventory control
7. Public relations.
   Definitions
   PR- its dysfunction from publicity, propaganda & advertising
   Internal and external aspects of PR
   Phases of PR: analysis building, promotion of product or services, better employee, government and
   Community relation
8. Methods of public relations:
   Press relations: Press release, Press conference, and Letter to editor.
   Printed work: Style, colour & design
9. Basic Accountancy and Public relations
   Introduction
   Terms used in accounts, Principles of accountancy
   Journal & ledger
   Trial Balance
   Subsidiary books, petty cash book, sales register, purchase register, stock register
   Bank reconciliation and Banking procedures
   Depreciation
   Balance sheet and profit & loss accounts
   General ideas about Income tax and sales tax
   Project report and financial inability
   Costing in practice (Buying, stock-keeping, assesment of fees and costing of appliance)

4. OCULAR DISEASES AND SYSTEMIC DISEASES
OCULAR DISEASES

SL. NO	TOPICS
1	**EYELIDS** i. Eye lid anatomy review ii. Congenital anomalies Blepharophimosis, Epicanthus, Cryptophthalmos, Coloboma, Hemangioma iii. Acquired disorders External and Internal hordeolum,Chalazion,Lid oedema, Blepharitis, iv. Blepharospasm v. Eyelid tumours Evaluation, Benign lesions, Malignant tumours vi. Malpositioning disorders Ectropion, Entropion, Trichiasis, Distichiasis, Symblepharon, Ankyloblepharon, Eyelid retraction, Lagophthalmos,Poliosis,Madarosis vii. Ptosis Classification, Clinical evaluation and Management viii. Eyelid trauma
2	**LACRIMAL SYSTEM** 2.1. Lacrimal anatomy review 2.2 Methods of Lacrimal evaluation 2.3 Congenital and developmental anomalies 2.4 Infections of lacrimal system 2.5 Tumours of lacrimal system 2.6 Lacrimal trauma 2.7 Dry eye and Watering Etiology , Clinical evaluation and Management
3	**ORBIT** 3.1 Orbital anatomy 3.2 Evaluation of orbital disordres 3.3 Congenital and developmental anomalies of orbit Anophthalmos, Microphthalmos, Nanophthalmos, Cryptophthalmos, Hypertelorism, Craniofacial anomalies,Craniosynostosis 3.4 Orbital tumours Dermoids, Hemangiomas,Rhabdmyosarcoma,Optic nerve glioma,Meningiomas, 3.5 Orbital inflammations Preseptal cellulitis,Orbital cellulitis,Orbital periostitis,Cavernous sinus thrombosis,Sinus related disorders 3.7 Orbital trauma Blow out fractures 3.8 Proptosis Etiology, Classifications, clinical evaluation and

	Management 3.9 Graves Ophthalmopathy Etiology, Examination, and Management 3.10 Enophthalmos Etiology, Evaluation and Management
4	**SCLERA** 4.1 Sclera anatomy review 4.2 Blue sclera 4.3 Scleral Degenerations Ectasia and staphyloma 4.4 Scleral Inflammations , Scleritis and episcleritis 4.5 Toxic and traumatic injuries of sclera
5	**CONJUNCTIVA and CORNEA** 5.1 Anatomy reviewConjunctiva 5.2 Examination techniques 5.3 Inflammations of Conjunctiva Conjunctivitis (classification, etiology, evaluation and management) 5.4 Degenerative conditions Pinguecula, Pterygium, Concretions 5.5 Symptomatic conditions Hyperaemia, Chemosis, Ecchymosis, Xerosis, Discoloration, Papillae, Follicles, Hemorrhage 5.6 Cysts and tumours **B) Cornea** 5.7 Congenital anomalies Megalocornea, Microcormea,Cornea plana, Cloudy cornea 5.8 Corneal Dystrophies Classifications, evaluation and management 5.9 Corneal degenerations Arcus senilis, Hassal-henle bodies, Lipoid Keratopathy, Band shaped keratopathy, Salzmann's nodular degeneration, Droplet keratopathy, Pellucid Marginal Degeneration,Corneal guttatta 5.10 Keratoconus and Keratoglobus (Etiology, Classifications, Clinical evaluation and Management) 5.11 Corneal inflammations Keratitis/Ulcer (Etiology, Classifications, Evaluation and Management) Corneal oedema Corneal opacity and neovascularization 5.12 Miscellaneous ocular surface disorders Keratoconjunctivitis Sicca Steven Johnson Syndrome Benign Mucosal Pemphigoid- ocular pemphigoid Vitamin A deficiency Trauma and burns Metabolic diseases associated with corneal changes 5.13 Corneal surgeries Keratoplasty Refractive surgeries 5.14 Slit lamp colour coding

6	**LENS** 6.1 Normal lens anatomy, physiology and aging process 6.2 Congenital and Developmental defects Aphakia,Lenticonus,Lentiglobus, Coloboma,Peters anomaly, Microspherophakia, Cataract 6.3 Acquired lenticular defects Morphological cataract Drug induced cataract Traumatic cataract Metabolic cataract Complicated cataract Association with other ocular disorders and syndromes 6.4 Cataract Management Surgical and non-surgical management Pre-operative evaluation Complications of cataract surgery 6.5 Lens displacement Lens subluxation and dislocation
7	**UVEA AND PUPIL** 7.1 Congenital anomalies Heterochromia, Aniridia, Coloboma, Correctopia, Polycoria, Pupillary membrane 7.2 Inflammations of Uvea Classification of uveitis Etiology and pathogenesis Clinical approach to uveitis Endophthalmitis and panophthalmitis Complications of uveitis Ocular involvement in AIDS 7.3 Tumours of uvea 7.4 Anomalies of pupillary reactions
8	**VITREOUS** 8.1 Developmental abnormalities Hereditary hyaloidoretinopathies Persistent hyperplastic primary vitreous 8.2 Vitreous opacities Asteroid hyalosis Cholesterolosis Pigment granules in vitreous Vitreous haemorrhage 8.3 Posterior vitreous detachment Etiology, Clinical features and Management 8.4 Trauma and vitreous 8.5 Inflammations and vitreous 8.6 Parasitic infestations 8.7 Vitreous complications secondary to surgery
9	**RETINA** 9.1 Applied anatomy 9.2 Congenital and developmental anomalies Optic disc coloboma, Drusen, Hypoplasia, Medullated nerve fibers

	9.3 Retinopathy of prematurity Etiology, Stages, Clinical features and Management 9.4 Retinal vascular diseases Diabetic retinopathy Associated with cardiovascular disease Hypertensive retinopathy Retinal artery and vein occlusions 9.5 Retinal Inflammations Retinitis, Retinal vasculitis 9.6 Retinal degenerations Retinitis pigmentosa, Lattice degenerations 9.7 Macular disorders Hereditory diseases Central serous retinopathy Cystoid macular oedema Solar retinopathy Albinism Age related macular degeneration Macular holes 9.8 Retinal detachment and Retinoschisis Etiology, Classifications, Clinical features and management 9.9 Retinal tumours 1. Retinoblastoma 2. Retinal and optic nerve head astrocytomas Lymphoid tumour 9.11 Miscellaneous disorders Epiretinal membranes Intraocular foreign bodies Other metabolic disorders of retina Diseases of choroidal vasculature and Bruch's membrane Diseases of retinal pigment epithelium 9.11 Fundus Drawing –colour coding
10	**NEURO OPHTHALMOLOGY** 10.1 Applied anatomy review 10.2 Neuro ophthalmic examination History Visual Acuity Colour vision Pupillary evaluation Ocular motility Fundus examination Visual field examination

	Adjunctive tests 10.3 Visual pathway and systems Vascular supply to anterior and posterior visual systems Visual pathway defects Disorders of visual integration Disorders of higher cortical functions Disorders with ocular motility anomalies/diplopia 10.4 Nystagmus Etiology, classifications, clinical evaluations and management 10.5 Miscellaneous disorders Systemic disorders with neuro ophthalmologic signs Optic neuropathy Papilledema Papillitis
11.	**GLAUCOMA** 11.1 Optic nerve, Anterior chamber and Aqueous Dynamics Review 11.2 Overview of glaucoma Diagnostic instruments 11.3 Evaluation of optic nerve head 11.4 Classification of glaucoma 11.5 Primary open angle glaucoma Etiology, clinical features, diagnosis and management 11.6 Primary angle closure glaucoma Etiology, clinical classification, clinical features, diagnosis and management 11.7 Developmental glaucoma Congenital glaucoma, Infantile glaucoma and juvenile glaucoma Syndromes with glaucoma 11.8 Secondary glaucoma Pseudoexfoliation glaucoma, pigmentary glaucoma, Inflammation induced, Neovascular glaucoma, Lens induced glaucoma, Traumatic glaucoma 11.9 Glaucoma management Pharmacological and surgical management 11.10 Glaucoma screening

	SYSTEMIC DISEASES
1	**ARTERIAL HYPERTENSION** i. Pathophysiology, classification, clinical examination, Diagnosis ii. Complications, management iii.Hypertension and the eye
2	**DIABETES MELLITUS** i. Pathology, classifications, clinical features ii. Diagnosis, complications, management iii. Diabetes mellitus and the eye
3	**ACQUIRED HEART DISEASES- EMBOLISM** i. Rheumatic fever- Pathophysiology, classifications, diagnosis complications and management ii. embolism iii.Subacute bacterial endocarditis
4	**CANCER –INTRODUCTION** Neoplasia and the eye(retinoblastoma,rhabdomyosarcoma,choroidal melanoma)
5	**CONNECTIVE TISSUE DISEASES** i. Anatomy and pathophysiology: arthritis ii.Eye and Rheumatoid arthritis
6	**THYROID DISEASE** i. Anatomy and physiology of thyroid gland ii. Classification of thyroid disease iii. Diagnosis, complications, clinical features, management iv.Thyroid disease and the eye
7	**TUBERCULOSIS** i. Etiology, pathology, clinical features, pulmonary tuberculosis, diagnosis, complication, treatment ii.Tuberculosis and the eye
8	i.Herpes virus (Herpes simplex, Varicella Zoster, Cytomegalovirus, Epstein Barr Virus) ii.Herpes and the eye
9	Hepatitis (Hepatitis A, B, C) 2
10	Myasthenia Gravis
11	**HELMINTHIASIS** i. Classification of helminthic diseases, - schistosomiasis, ii. principles of diagnosis and management iii.Helminthic disease and the eye[Taenia., echinococcus, larva migrans

12	**COMMON TROPICAL MEDICAL AILMENTS** **i**. Introduction to tropical diseases: malaria ii.Tropical diseases and the eye- leprosy, toxoplasmosis, syphilis, Trachoma
12	**MALNUTRITION** i.Etiology & nutritional disorders of the eye
13	**INTRODUCTION TO IMMUNOLOGY** i. Introduction & components of immune system ii. Principles of immunity in health iii. Immunology in disease iv.Immunology and the eye
14	**GENETICS** i. Introduction to genetics ii. Organisation of the cell iii. Chromosome structure and cell division iv. Gene structure and basic principles of genetics v. Genetic disorders and their diagnosis vi. Genes and the eye vii.Genetic counseling and genetic engineering

Recommended books

1. Clinical Ophthalmology Jack.J.Kanski – 4th edition
2. Textbook of Ophthalmology A.K.Khurana
3. Parson's diseases of the eye Revised by Ramanjith Sihota & Radhika Tandon
4. Glaucoma Handbook Anthony.B.Litwak

Subsidiary Subjects

THIRD YEAR

Sl No	Subject	Teaching hours
1	Research methodology	20
2	Biostatistics	20

THIRD YEAR

I. RESEARCH METHODOLOGY

Teaching hours:20

1. **Introduction: Research Methodology**
   - Research process
   - Steps involved in research process
   - Research methods and methodology
2. **Variables and scales of measurements**
   - Definitions and examples of qualitative, quantitative, continuous discrete, dependent and independent variable
   - Definitions, properties and examples of nominal, ordinal, interval and ratio scales of measurements.
3. **Sampling**
   - Population, sample, sampling, reasons for sampling, probability and non-probability sampling.
   - Methods of probability sampling – simple random, stratified, systematic- procedure
   - Merits and demerits.
   - Use of random number table.
4. **Organization of data**
   - Frequency table, histogram, frequency polygon, frequency curve, bar diagram, pie chart
5. **Measures of location**
   - Arithmetic mean, median, mode, quartiles and percentiles – definition
   - Computation (for raw data), merits, demerits and applications
6. **Measures of variation**
   - Range, inter-quartile range, variance, standard deviation, coefficient of variation- definition
   - Computation (for raw data), merits, demerits and applications

II. BIO-STATISTICS

Teaching hours:20

1. **Introduction I: Biostatistics**
   - Definition
   - Role of statistics in health science and health care delivery system

2. **Normal distribution**
    - Concept, graphical form, properties, examples
    - Concept of Skewnes and Kurtosis
3. **Correlation**
    - Scatter diagram
    - Concept and properties of correlation coefficient, examples [No computation]
4. **Health Information System**
    - Definition, requirement, component and uses of health information system.
    - Sources of health information system- Census, Registration of vital events, Sample registration system (SRS), Notification of diseases, Hospital records, Disease registries, Record linkage, Epidemiological surveillance, Population survey
5. **Vital statistics and hospital statistics**
    - Rate, ratio, proportion, Incidence, Prevalence. Common morbidity, mortality and
6. **Fertility statistics – Definition and computation.**
7. **Hypothesis**
    - What is hypothesis
    - Formulation of hypothesis
    - Characteristics of good hypothesis.
8. **Epidemiology**
    - Concept of health and disease
    - Definition and aims of Epidemiology,
    - Descriptive Epidemiology- methods and uses.
9. **Concept of reliability & validity**

RECOMMENDED BOOKS

1. Methods in Biostatistics for medical students & Research workers, Mahajan B.K.- 6th edition
2. Research methodology – Methods & techniques, Kothari. C.R
3. Introduction to Biostatistics: A manual for students in health sciences, Sundar Rao PSS, Richard. J
4. Text book of Preventive and social medicine, Park. E. Park

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Annexure 1

ANATOMY

SCHEME OF EXAMINATION:

Marks distribution:

Paper	Subjects	Theory		*Practical/ Viva		Total
		UE	IA	UE	IA	
1	General Anatomy and Ocular Anatomy	70	30	-	-	100

*There shall be NO University practical examination in Anatomy

Weightage: Blue printing of Question paper:

ANATOMY

Sl No	Topic	Contents	Marks Weightage	No. of questions		
				LEQ	SEQ	SAQ
1	GA1	**Introduction to Human Anatomy:** Definition and its relevance in medicine and optometry, Planes of the body, relationship of structures, organ system	2			1
2	GA2	**Skeleton System**	2			1
3	GA3	**Tissues of the Body:** Epithelium, connective tissue, bone and cartilage, Embryology, histology, different types of each of them, types of cells, cellular differentiation and arrangements in different tissues	5		1	

4	GA4	**Muscles:** Different types of muscles, their functional differentiation, their relationship with different structures, their neural supply	5		1	
5	GA5	**Blood vessels:** Differentiation between arteries and veins, embryology, histology of both arteries and veins, Functional differences between the two, anatomical differences at different locations	5		1	
6	GA6	**Skin and appendages:** Embryology, anatomical differences in different areas, functional and protective variations, innervations, relationship with muscles and nerves	2			1
7	GA7	**Lymphatic system:** Embryology, functions, relationship with blood vessels and organs	2			1
8	GA8	**Glands:** Embryology, different types of glands (exocrine and endocrine), functional differences, neural control of glands	5		1	
9	GA9	**Nervous system**: Parts of Nervous system, cell types of nervous system, Blood-brain barrier, Reflex arc, Peripheral Nerves, Spinal nerves, Nerve fibers, Autonomic Nervous system	5		1	

10	GA10	**Brain and Cranial nerves:** Major parts of Brain, Protective coverings of the Brain, Cerebrospinal Fluid, Brain stem, Cerebellum, Diencephalon, Cerebrum, Cranial nerves	10	1		
11	OA1	**1.1 Introduction to anatomical terminologies –** cross section of eyeball **1.2 Ocular Adnexa** a. Eye Brows b. Eyelids – Structure, Facial spaces, Arterial supply, nerve supply, venous & lymphatic drainage c. Conjunctiva – general arrangements, structure, glands, arteries, veins, caruncle, plica semilunaries **1.3 Lacrimal System** – Lacrimal Gland, Drainage, Tear film **1.4 Extraocular Muscles** - anatomy, innervations, actions	12	1		1
12	OA2	**Cornea:** layers, cellular structures, refractive properties	5		1	
13	OA3	**Coats of eye ball** **Sclera** (Episclera & Sclera) **Choroid**, Ciliary body, Iris **Retina** (Detailed anatomy, cellular structure, blood supply and nerve supply	10	1		
14	OA4	**Aqueous, anterior chamber, Intraocular pressure, vitreous body**	2			1
15	OA5	**Pupil & Pupillary pathway and its lesions**	2			1

16	OA6	**Crystalline lens –** structure, suspension, accommodation	5		1	
17	OA7	**Orbit** Orbital margin, Walls of orbital cavity Orbital structure & Foramen Surface anatomy, Relations of bony orbit, Orbital Muscles	2			1
18	OA8	**Cranial Nerves** 1. Optic nerve 2. Oculomotor nerve 3. Trochlear Nerve 4. Trigeminal nerve 5. Abducent nerve 6. Facial Nerve (Nuclei, course, relationship with brain, ocular contribution in detail)	2			1
19	OA9	**Visual Pathway –** Definition, anatomy of visual pathway, visual reflexes, Lesions of visual pathway	5		1	
20	OA10	**Ocular Embryology**	2			1
TOTAL				**3**	**8**	**10**

Marks Distribution: Total - 70 marks

- Long essay: 2 Questions X 10 marks each = 20 marks (answer 2 out of 3 questions)
- Short essay: 6 Questions X 5 marks each = 30 marks (answer 6 out of 8 questions)
- Short answer: 10 Questions X 2 marks each = 20 marks (answer all questions)

PHYSIOLOGY

SCHEME OF EXAMINATION:

Marks distribution:

Paper	Subjects	Theory		Practical/Viva		Total
		UE	IA	UE	IA	
II	Human Physiology and Ocular Physiology	70	30	-	-	100

*There shall be NO University practical examination in Physiology.

Weightage: Blue printing of Question paper

Sl No	Topic	Marks Weightage	No. of questions		
			LEQ	SEQ	SAQ
1	General and Skeletal Muscle Physiology	2	-	-	1
2	Blood	12	1	-	1
3	Gastro-Intestinal Tract	5	-	1	-
4	Renal System	5	-	1	-
5	Endocrine System	7	-	1	1
6	Reproductive System	2	-	-	1
7	Respiratory System	7	-	1	1
8	Cardiovascular System	12	1	-	1
9	Central Nervous System	5	-	1	-
10	Environmental Physiology	2	-	-	1
11	Special Senses	7	-	1	1
12	Ocular Physiology	24	1	2	2
	Total Number of Questions		3	8	10

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BIOCHEMISTRY

1) Weightage: Blue printing of Question paper

Sl No	Topic	Contents	Marks Weightage	No. of questions		
				LEQ	SEQ	SAQ
1	Topic GB1	Chemistry of carbohydrate, lipids, aminoacids, proteins, nucleic acids, Enzymes	9	-	1	2
2	Topic GB2	Metabolism of carbohydrates, lipids, proteins	17	1	1	1
3	Topic GB3	Nutrition, Vitamins, Minerals	17	1	1	1
4	Topic GB4	Acid-Base balance, Clinical Biochemistry	7	-	1	1
5	Topic OB1	Cell biology, Hormone action, Extracellular matrix, Biochemical basis of ocular features in clinical conditions	9	-	1	2
6	Topic OB2	Tears, Aqueous humour, Vitreous humour	7	-	1	1
7	Topic OB3	Cornea, Lens, Retina	17	1	1	1
8	Topic OB4	Free Radicals and Antioxidants, Oxidative stress, Immunoglobulins, Radioisotopes	7	-	1	1
Total Number of Questions				**3**	**8**	**10**

Weightage: Blue printing of Question paper

4) PHYSICAL OPTICS **MARKS WEIGHTAGE: 36**

Sl No	Contents	No. of questions		
		LEQ	**SEQ**	**SAQ**
1	**Refractive index**; its dependence on wavelength, Refraction at a plane surface, Fermat's and Huygen's Principle –Derivation of laws of reflection and refraction (Snell's law) from these principles, Definition of crown and flint glasses; materials of high refractive index	-	SEQ	SAQ
2	Imaging by concave mirror, convex mirror. Image formation by a lens by application of vergence at a distance formula; definitions of front and back vertex powers; equivalent power; first and second principal planes/points; primary and secondary focal planes/points; primary and secondary focal lengths	-	SEQ	SAQ
3	**Prisms;** angular dispersion; dispersive power; Abbe's number, definition; definition of Prism diopter; deviation produced by a thin prism; it dependence on refractive index,	LEQ	SEQ	SAQ
4	**Refraction by a spherical surface**; sign convention; introduction to spherical aberration using image formed by a spherical surface of a distance object; sag formula, **Imaging by a thin convex lens**; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions, **Imaging by a thin concave lens**; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions	LEQ	SEQ	SAQ
5	Newton's formula; linear magnification; angular magnification Nodal Planes. Astigmatism. - To calculate the position of the line image in a sphero-cylindrical lens	-	SEQ	-
6	Gullstrand's schematic eyes, visual acuity, Stile Crawford, Spatial distribution of optical information- modulation transfer functions-Spatial filtering-applications. Aperture stops-entrance and exit pupils	-	SEQ	SAQ
	Total Number of Questions	**1**	**3**	**5**

Weightage: Blue printing of Question paper

GEOMETRIC OPTICS **MARKS WEIGHTAGE: 34**

Sl No	Contents	No. of questions		
		LEQ	**SEQ**	**SAQ**
1	Nature of light –light as electromagnetic oscillation, concepts of frequency, wavelength, amplitude and phase. Electromagnetic Spectrum	-	SEQ	SAQ
2	Polarized light; linearly polarized light; and circularly polarized light, Methods of producing polarized light; Brewster's angle. Malus'Law	LEQ	SEQ	SAQ
3	Birefringence; ordinary and extraordinary rays	-	SEQ	SAQ
4	Coherence; interference; constructive interference, destructive interference; fringes; fringe width, Double slits, multiple slits, gratings, Diffraction; diffraction by a circular aperture; Airy's disc	-	SEQ	SAQ
5	Raleigh's criterion, Scattering; Raleigh's scattering; Tyndall effect	-	SEQ	SAQ
6	Fluorescence and Phosphorescence, Basics of Lasers –coherence; population inversion; spontaneous emission; Inverse square law of photometry; Lambert's law	LEQ	SEQ	SAQ
	Total Number of Questions	**1**	**3**	**5**

Annexure 2

SECOND YEAR OPTOMETRY

1). PHARMACOLOGY

SCHEME OF EXAMINATION:

Marks distribution:

Paper	Subjects	Theory		Practical/ Viva		Total
		UE	IA	UE	IA	
3	Basic and Ocular Pharmacology	30	10	-	-	40

*There shall be NO University practical examination in Pharmacology.

Weightage: Blue printing of Question paper for university examination

Sl No	Topic	Contents	Marks Weightage	No. of questions		
				LEQ	SEQ	SAQ
1	Topic 1	General Pharmacology	5	1		1
2	Topic 2	Drugs acting on ANS, CVS & Renal system, Blood	5		1	1
3	Topic 3	Drugs acting on CNS, Hormones, GIT	5		1	1
4	Topic 4	Chemotherapy	6	1	1	1
5	Topic 5	Ocular Pharmacology	9		1	1
Total Number of Questions				**1**	**2**	**5**

Marks Distribution: Total - 30 marks

- Long essay: 1 Questions X 10 marks each = 10 marks (answer 1 out of 2 questions)
- Short essay: 2 Questions X 5 marks each = 10 marks (answer 2 out of 4 questions)
- Short answer: 5 Questions X 2 marks each = 10 marks (answer all questions)

MICROBIOLOGY

Weightage: Blue printing of Question paper (Microbiology) 20marks

Sl No	Topic	Contents	Marks Weightage	No. of questions		
				LEQ	SEQ	SAQ
1	Topic GM1	General Microbiology	9	-	2	2
2	Topic OM1	Ocular Microbiology	11	-	2	3
Total Number of Questions				**-**	**10**	**10**

Marks Distribution: Total - 20 marks
Section B (20 Marks)

Short essays (answer any 2 out of 3) 2x5 = 10 marks

Short answers (answer all) 5x2 = 10 marks

PATHOLOGY

Weightage: Blue printing of Question paper (Pathology)

Sl No	Topic	Contents	Marks Weightage 20	No. of questions		
				LEQ	SEQ	SAQ
1		Inflammation and repair		LEQ	SEQ	SAQ
2		Infections [Tuberculosis, Leprosy, Syphilis, Fungus, Virus, Chlamydiae]		LEQ	SEQ	SAQ
3		Genetic abnormality				SAQ
4		Hematology [Anemia, Leukemia, Bleeding disorders]				SAQ
5		Circulatory disturbances [Shock, edema, Thrombosis, Infarction, Embolism]				SAQ
6		Intraocular tumors [Retinoblastoma and choroidal melanoma]		LEQ	SEQ	SAQ
7		Optic nerve tumors			SEQ	SAQ
8		Rhabdomyosarcoma			SEQ	SAQ
Total Number of Questions				**3**	**8**	**10**

Marks Distribution: Total - 20 marks

- Short essay: 2 Questions X 5 marks each = 10 marks (answer 2 out of 4 questions)
- Short answer: 5 Questions X 2 marks each = 10 marks (answer all questions)

1) OPTOMETRIC OPTICS MARKS WEIGHTAGE:36

Sl No	Topic	Contents	No. of questions		
			LEQ	SEQ	SAQ
1	Spectacle lenses	Manufacture of glass Lens materials Lens surfacing Principle of surface generation and glass cements Terminology used in Lens workshop Lens properties Lens quality Faults in lens material Faults on lens surface Methods of Inspecting the quality of lenses Safety standards for ophthalmic lenses (FDA, ANSI, ISI, Others)	LEQ	SEQ	SAQ
2	Spectacle frames	Types and parts Classification of spectacle frames-material, weight, temple position, Coloration Frame construction Frame selection Size, shape, mounting and field of view of ophthalmic lenses		SEQ	SAQ
3	Tinted and protective lenses	Characteristics of tinted lenses Absorptive Glasses Polarizing Filters, Photochromic & Reflecting filters Safety lenses-Toughened lenses, Laminated Lenses, CR 39, Polycarbonate lenses	LEQ	SEQ	SAQ
4	Multifocal lenses	Introduction, history and development, types Bifocal lenses, Trifocal & Progressive addition lenses		SEQ	SAQ
5	Reflection	Reflection from spectacle lenses -		SEQ	SAQ

	from spectacle lens surface & lens coatings	ghost images -Reflections in bifocals at the dividing line Antireflection coating, Mirror coating, Hard Multi Coating [HMC], Hydrophobic coating			
6	Miscellaneous Spectacle	Iseikonic lenses Spectacle magnifiers Recumbent prisms Fresnel prism and lenses Lenticular &Aspherical lenses High Refractive index glasses			SAQ
Total Number of Questions			**3**	**8**	**10**

DISPENSING OPTICS **MARKS WEIGHTAGE: 34**

Sl No	**Topic**	**Contents**	**No. of questions**		
			LEQ	**SEQ**	**SAQ**
1		Components of spectacle prescription & interpretation, transposition, Add and near power relation		SEQ	SAQ
2		Frame selection –based on spectacle prescription, professional requirements, age group, face shape	LEQ		
3		Measuring Inter-pupillary distance (IPD) for distance & near, bifocal height	LEQ		
4		Lens & Frame markings, Pupillary centers, bifocal heights, Progressive markings & adjustments –facial wrap, pantoscopic tilt	LEQ	SEQ	SAQ
5		Neutralization –Hand &lensometer, axis marking, prism marking	LEQ	SEQ	SAQ
6		Faults in spectacles (lens fitting, frame fitting, patients complaints, description, detection and correction)		SEQ	SAQ
7		Spectacle repairs –tools, methods, soldering, riveting, frame adjustments		SEQ	SAQ
8		Special types of spectacle frames Monocles Ptosis crutches		SEQ	SAQ

		Industrial safety glasses Welding glasses			
		Total Number of Questions	**3**	**8**	**10**

2) VISUAL OPTICS MARKS WEIGHTAGE:70

Sl No	**Topic**	**Contents**	**No. of questions**		
			LEQ	**SEQ**	**SAQ**
1	Accommodation & Presbyopia	Far and near point of accommodation Range and amplitude of accommodation Mechanism of accommodation Variation of accommodation with age Anomalies of accommodation Presbyopia Hypermetropia and accommodation	LEQ	SEQ	
2	Objective Refraction (Static & Dynamic)	Streak retinoscopy Principle, Procedure, Difficulties and interpretation of findings Transposition and spherical equivalent Dynamic retinoscopy various methods Radical retinoscopy and near retinoscopy Cycloplegic refraction	LEQ	SEQ	SAQ
3	Subjective Refraction	Principle and fogging Fixed astigmatic dial(Clock dial),Combination of fixed and rotator dial(Fan and block test),J.C.C Duochrome test • Binocular balancing- alternate occlusion, prism dissociation, dissociate Duochrome balance, Borish dissociated fogging • Binocular refraction-Various techniques		SEQ	SAQ

4	Basic Aspects of Vision	Visual Acuity Light and Dark Adaptation Color Vision Spatial and Temporal Resolution Science of Measuring visual performance and Application to Clinical Optometry	LEQ	SEQ	SAQ
5	Refractive conditions	Aetiology, optical condition, types, clinical features and management i. Emmetropia/Ametropia ii. Myopia iii. Hyperopia iv. Astigmatism v. Anisometropia And Aniseikonia vi. Presbyopia vii.Aphakia and pseudophakia, Biometry viii. Axial Vs Refractive Ametropia	LEQ	SEQ	SAQ
6	Effective power and magnification	Ocular refraction vs. Spectacle refraction Spectacle magnification vs. Relative spectacle magnification Axial vs. Refractive ammetropia, Knapp's law Ocular accommodation vs. Spectacle accommodation Retinal image blur-Depth of focus and depth of field		SEQ	SAQ
7.	CEVS	Assessment of visual acuity i.. Distance & Near visual acuity ii. Color vision & Contrast sensitivity	LEQ	SEQ	SAQ
		i.Assessment of accommodation & Convergence ii.Pupil evaluation & Measurement of Inter pupillary distance (IPD)	LEQ	SEQ	SAQ
		Total Number of Questions	**3**	**8**	**10**

3) OPTOMETRIC INSTRUMENTS & APPLIANCES

MARKS WEIGHTAGE:70

Sl No	Topic	Contents	No. of questions		
			LEQ	SEQ	SAQ
1	Refractive Instruments1	i. Visual acuity charts, Features, Advantages & disadvantages, newer developments ii. Trial case lenses – best form lenses iii. Trial frame design – Phoropter – Advantages & Difficulties iv. Retinoscope – Optics, types, adjustments & special features v. Autorefractometer – Schenier's and other optical principles, Features, Advantages & disadvantages, newer developments vi. Vision analyzer vii.Potential Acuity Meter, viii. Pupilometer	LEQ	SEQ	SAQ
2	Corneal Diagnostics	i.Keratometer. i. principle ii. Types – Bausch & Lomb, Javal-Schiotz models iii. Measurement, Documentation & Interpretation of 2.Corneal topography i.Placido's disc ii. Photokeratoscope iii. Topography Modelling System iv. ORBSCAN & PENTACAM 3.Aberrometer –Principle, Instrumentation, clinical procedure & Interpretation 4.Pachymeter Principle, Types, Instrumentation & Clinical procedure, Indications		SEQ	
3	Lens	i.Optometer principle		SEQ	SAQ

	checking instruments.	ii. Badal & non-badal principle – advantages & disadvantages iii. Lens gauge or clock iv. Hand neutralization			
4	Slit lamp	i.Slit-lamp systems ii. Mechanical design iii. Illumination techniques iv. Accessories v. Scanning laser devices		SEQ	SAQ
5	Glaucoma diagnostics	A.Tonometer i. Types, principle & standardization (Schiotz, Applanation & NCT) ii. Measurement, documentation & interpretation of results B.Field of Vision and Screening Devices ii. Introduction – Visual fields & boundaries of visual fields ii. Visual field screening devices – Central & Peripheral iii. Quantitative perimetry – Manual & Automated iv. Results & Analysis of visual field examination c.Gonioscope i. Principle & Instrumentation ii. Direct Gonioscope iii. Indirect Gonioscope		SEQ	SAQ
6	Optical coherence tomography	i.Anterior and Posterior OCT ii. Principle & Instrumentation iii. Clinical Procedure & Interpretation Glaucoma imaging & newer developments		SEQ	SAQ
7	Colour vision testing devices8	.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	LEQ	SEQ	SAQ

8	Ophthalmoscopes	i.Optical principle & Types ii. Direct ophthalmoscope – Instrumentation, Characteristics clinical procedure& Uses iii. Indirect ophthalmoscope – Instrumentation, Characteristics, clinical procedure & Uses iv. Direct ophthalmoscope Vs Indirect ophthalmoscope\ v. Fundus biomicroscope- Principle & Instrumentation, Characteristics clinical procedure& Uses		SEQ	
9	Ophthalmic Ultrasonography	i. Physics of Ultrasonography ii. A-scan – Procedure & clinical uses iii. B-Scan – Procedure & Clinical uses			**SAQ**
10	Fundus camera & Flourescine angiography				SAQ
		Total Number of Questions	3	8	10

Annexure 3
THIRD YEAR OPTOMETRY

1) PEDIATRIC OPTOMETRY MARKS WEIGHTAGE: 20

Sl No	Topic	Contents	No. of questions		
			LEQ	SEQ	SAQ
1	Pediatric optometry	Pediatric case history i. Genetic factors ii. Prenatal factors iii. Perinatal factors iv.Postnatal factors			SAQ
2	Ocular Examination	i. Measurement of visual acuity Various visual acuity charts for different age groups Teller acuity chart & VEP ii. Measurement of refractive status Dry & Cycloplegic refraction Interpretation of results iii. Assessment of oculomotor function iv. Measurement of fusion and stereopsis, color vision v. Assessment of accommodation & Convergence	LEQ		
3	Post examination processes	Compensatory treatment & remedial therapy for Myopia Pseudomyopia Hyperopia Astigmatism Anisometropia Strabismus Nystagmus	LEQ	SEQ	SAQ
4	Pediatric dispensing	Spectacles Contact Lenses		SEQ	SAQ
		Total Number of Questions	**3**	**8**	**10**

BINOCULAR SINGLE VISION MARKS WEIGHTAGE: 30

Sl No	Topic	Contents	No. of questions		
			LEQ	SEQ	SAQ
1	Binocular Vision and Space perception	Relative subjective visual direction. Retino motor value Grades of BSV SMP and Cyclopean Eye Correspondence, Fusion, Diplopia, Retinal rivalry Horopter Physiological Diplopia and Suppression Stereopsis, Panum's area, BSV. Stereopsis and monocular clues -significance. Egocentric location, clinical applications. Theories of Binocular vision.	LEQ	SEQ	SAQ
2	Laws of ocular motility and Uniocular & Binocular movements	Donder's and Listing's law Sherrington's law Hering's law Uniocular & Binocular movements - fixation, saccadic & pursuits. Version & Vergence. Fixation & field of fixation		SEQ	
3	Near Vision Complex	Accommodation Definition and mechanism (process). Methods of measurement. Stimulus and innervation. Types of accommodation. Anomalies of accommodation – aetiology and management	LEQ	SEQ	

4	Convergence	Definition and mechanism. Methods of measurement. Types and components of convergence - Tonic, accommodative, fusional, proximal. Anomalies of Convergence – aetiology and management		SEQ	SAQ
5	Sensory adaptations Confusion			SEQ	SAQ
6		Suppression Investigations Management Blind spot syndrome		SEQ	SAQ
7		Abnormal Retinal Correspondence Investigation and management Blind spot syndromeSurgical		SEQ	SAQ
8		Eccentric Fixation Investigation and management		SEQ	SAQ
9.		**Amblyopia**	LEQ	SEQ	
10.		Neuro-muscular anomalies Classification and etiological factors			SAQ
11.	Convergent strabismus	Accommodative convergent squint Classification Investigation and Management Non accommodative Convergent squint	LEQ	SEQ	SAQ
12.	Divergent strabismus	Classification A& V phenomenon Investigation and Management			SAQ
13.	Vertical strabismus	definitions			SAQ

14.	Paralytic strabismus				SAQ
15.	Investigations	History and symptoms Head Posture Diplopia Charting Hess chart PBCT Nine directions Binocular field of vision	LEQ	SEQ	SAQ
16.	Non-surgical management of strabismus			SEQ	
17.	Restrictive Strabismus Features	Musculo fascical anomalies Duane's Retraction syndrome Clinical features and management Brown's Superior oblique sheath syndrome			SAQ
		Total Number of Questions	3	8	10

COMMUNITY AND OCCUPATIONAL OPTOMETRY

MARKS WEIGHTAGE: 20

Sl No	**Topic**	**Contents**	**No. of questions**		
			LEQ	**SEQ**	**SAQ**
1	Preventive	Levels of prevention – optometrist's role in community Vision 2020: The Right to Sight Role of Optometrist in Public Health & Community Optometry Role of Optometrist in school eye screening Program	LEQ	SEQ	SAQ
2	Occupational hazards	Occupational Hazards A. Physical Hazards B. Biological Hazards C. Ergonomic Hazards D. Air-Borne Hazards	LEQ	SEQ	SAQ

		E. Chemical Hazards Example of Occupation related to each Hazards i.Radiation (Electromagnetic radiation, Ionizing & Non ionizing, Infrared, Ultraviolet, Microwave & laser) ii. Pesticides – General & Ocular defects iii.Occupational hygiene & ergonomics A. Environmental monitoring B. Recognition, evaluation and control of hazards			
3	Prevention of occupational diseases	Medical examination / medical monitoring Pre-employment/pre- placement examinations		SEQ	SAQ
4	Role of optometrist	i.promotion of general and visual health and safety of people at Work ii. Industrial visits & Industrial Vision Screening		SEQ	SAQ
5	Research Methodology	Research process Steps involved in research process Research methods and methodology		SEQ	SAQ
6	Health Information System	Definition, requirement, component and uses of health information system. Sources of health information system- Census, Registration of vital events, Sample registration system (SRS), Notification of diseases, Hospital records, Disease registries, Record linkage, Epidemiological surveillance, Population survey		SEQ	SAQ

7	Epidemiology	Concept of health and disease Definition and aims of Epidemiology, Descriptive Epidemiology- methods and uses.		SEQ	SAQ
		Total Number of Questions	**3**	**8**	**10**

2) CONTACT LENSES MARKS WEIGHTAGE70

Sl No	**Contents**	**No. of questions**		
		LEQ	**SEQ**	**SAQ**
1	Optics of Contact Lenses: Magnification & Visual field, Accommodation & Convergence Back & Front Vertex Power / Vertex distance calculation	LEQ	SEQ	SAQ
2	Introduction to CL materials: Monomers, Polymers, Properties of CL materials, Physiological (Dk, Ionicity, Water content) Physical (Elasticity, Tensile strength, Rigidity), Optical (Transmission, Refractive index) Indications and contraindications: Parameters / Designs of Contact Lenses & Terminology, RGP Contact Lens materials, Manufacturing Rigid and Soft Contact Lenses – various methods	-	SEQ	SAQ
3	Pre-Fitting examination – steps, significance, recording of results, Correction of Astigmatism with RGP lens, Types of fit – Steep, Flat, Optimum – on spherical cornea with spherical lenses Types of fit – Steep, Flat, Optimum – on Toric cornea with spherical lenses Calculation and finalising Contact lens parameters, Ordering Rigid Contact Lenses – writing a prescription to the Laboratory Checking and verifying Contact lenses from Laboratory, Modifications possible with Rigid lenses	LEQ	SEQ	SAQ

	Common Handling Instructions: Insertion & Removal Techniques, Do's and Dont's Care and Maintenance of Rigid lenses Cleaning agents & Importance, Rinsing agents & Importance, Disinfecting agents & importance, Lubricating & Enzymatic cleaners, Follow up visit examination Complications of RGP lenses			
4	SCL Materials & Review of manufacturing techniques: Comparison of RGP vs. SCL, Pre-fitting considerations for SCL, Fitting philosophies for SCL, Fit assessment in Soft Contact Lenses: Types of fit – Steep, Flat, Optimum Calculation and finalising SCL parameters, Disposable lenses, Advantages and availability, Soft Toric CL, Stabilization techniques, Parameter selection, Fitting assessment, Common Handling Instructions Insertion & Removal Techniques, Do's and Dont's Care and Maintenance of Soft lenses, Cleaning agents & Importance, Rinsing agents & Importance, Disinfecting agents & importance, Lubricating & Enzymatic cleaners, Follow up visit examination, Complications of Soft lenses	LEQ	SEQ	SAQ
5	Therapeutic contact lenses, Indications Fitting consideration Specialty fitting, Aphakia, Pediatric, Post refractive surgery, Management of Presbyopia with Contact lenses	LEQ	SEQ	SAQ
Total number of questions		**2**	**6**	**10**

5. GERIATRIC OPTOMETRY MARKS WEIGHTAGE:30

Sl No	Topic	Contents	No. of questions		
			LEQ	SEQ	SAQ
1	structural & physiological changes in the eye associated with ageing	Structural changes to lid & adnexa Physiological changes to cornea, lens & Uvea Degenerative & Physiological changes in vitreous, choroid & retina	LEQ	SEQ	SAQ
2	Optical & refractive changes	Refractive changes in cornea, lens & vitreous Refractive changes due to diabetes Refractive changes due to uveitis			SAQ
3	Optical correction of refractive conditions			SEQ	SAQ
4	Dispensing in geriatric age groups	Spectacle Contact lenses		SEQ	SAQ
5	Ocular diseases	Cataract Glaucoma Macular disorders Vascular disorders	LEQ	SEQ	SAQ
		Total Number of Questions	**3**	**8**	**10**

LOW VISION AIDS **MARKS WEIGHTAGE: 30**

Sl No	Contents	No. of questions		
		LEQ	SEQ	SAQ
1	Definitions & classification of Low vision	-	SEQ	SAQ
2	Pre-clinical evaluation of low vision patients – prognostic & psychological factors; psycho-social impact of low vision	-	SEQ	SAQ
3	Types of low vision aids – optical aids, non-optical aids & electronic devices	LEQ	SEQ	SAQ
4	Optics of low vision aids	LEQ	SEQ	SAQ
5	Clinical evaluation – assessment of visual acuity, visual field, selection of low vision aids, instruction & training	LEQ	SEQ	-
6	Pediatric Low Vision care Low vision aids – dispensing & prescribing aspects Visual rehabilitation & counselling Legal aspects of Low vision in India	-	SEQ	SAQ
7	Assessment of visual acuity in paediatric age	LEQ	SEQ	
8	Determining binocular status Determining sensory motor adaptability		SEQ	SAQ
9	Paediatric eye disorders : Cataract, Retinopathy of Prematurity, Retinoblastoma, Neuromuscular conditions (myotonic dystrophy, mitochondrial cytopathy)		SEQ	SAQ
10	Spectacle dispensing for children Paediatric contact lenses		SEQ	SAQ
Total number of questions		**2**	**6**	**10**

LAW OF OPTOMETRY **Marks 10**

1.	**Acts and rules,** Factories act and rules Workmen's compensation act, ESI act etc i. Licensure as a means of internal and external discipline- unprofessional conduct- incompetence- gross immorality ii. International optometry- important foreign optometry law iii. Optometrist in court iv. Malpractice- theory of liability- damages – minimizing malpractice claims vii. Insurance viii. Negligence ix. Ethics – professional ethics		**SEQ**	**SAQ**
	Toal number of questions		**2**	**4**

3) OCULAR DISEASES **MARKS WEIGHTAGE: 50**

Sl No	Topic	Contents	No. of questions		
			LEQ	SEQ	SAQ
1	EYELIDS	1.1 Anatomy 1.2 Congenital anomalies Blepharophimosis, Epicanthus, Cryptophthalmos, Coloboma, Hemangioma 1.3 Acquired disorders External and Internal hordeolum,Chalazion,Lid oedema, Blepharitis, Blepharospasm 1.4 Eyelid tumours Evaluation, Benign lesions, Malignant tumours 1.5 Malpositioning disorders Ectropion, Entropion, Trichiasis, Distichiasis, Symblepharon, Ankyloblepharon, Eyelid retraction, Lagophthalmos,Poliosis,Madarosis 1.6 Ptosis Classification, Clinical evaluation and Management 1.7 Eyelid trauma		SEQ	SAQ
2	LACRIMAL SYSTEM	2.1 Lacrimal anatomy review 2.2 Methods of Lacrimal evaluation 2.3 Congenital and developmental anomalies 2.4 Infections of lacrimal system 2.5 Tumours of lacrimal system		SEQ	SAQ

		2.6 Lacrimal trauma 2.7 Dry eye and Watering Etiology , Clinical evaluation and Management			
3	ORBIT	3.1 Orbital anatomy 3.2 Evaluation of orbital disordres 3.3 Congenital and developmental anomalies of orbit Anophthalmos, Microphthalmos, Nanophthalmos, Cryptophthalmos, Hypertelorism, Craniofacial anomalies,Craniosynostosis 3.4 Orbital tumours Dermoids, Hemangiomas,Rhabdmyosarcoma,Optic nerve glioma,Meningiomas, 3.5 Orbital inflammations Preseptal cellulitis,Orbital cellulitis,Orbital periostitis,Cavernous sinus thrombosis, Sinus related disorders 3.7 Orbital trauma Blow out fractures 3.8 Proptosis Etiology, Classifications, clinical evaluation and Management 3.9 Graves Ophthalmopathy Etiology, Examination, and Management 3.10Enophthalmos		SEQ	SAQ

4	SCLERA	4.1 Sclera anatomy review 4.2 Blue sclera 4.3 Scleral Degenerations Ectasia and staphyloma 4.4 Scleral Inflammations , Scleritis and episcleritis 4.5 Toxic and traumatic injuries of sclera		SEQ	SAQ
5	CONJUNCTIVA AND CORNEA	5.1 Anatomy review Conjunctiva 5.2 Examination techniques 5.3 Inflammations of Conjunctiva Conjunctivitis (classification, etiology, evaluation and management) 5.4 Degenerative conditions Pinguecula, Pterygium, Concretions 5.5 Symptomatic conditions Hyperaemia, Chemosis, Ecchymosis, Xerosis, Discoloration, Papillae, Follicles, Hemorrhage 5.6 Cysts and tumours **B) Cornea** 5.8 Congenital anomalies Megalocornea, Microcormea,Cornea plana, Cloudy cornea 5.8 Corneal Dystrophies Classifications, evaluation and management 5.9 Corneal degenerations	LEQ	SEQ	SAQ

		Arcus senilis, Hassal-henle bodies, Lipoid Keratopathy, Band shaped keratopathy, Salzmann's nodular degeneration, Droplet keratopathy, Pellucid Marginal Degeneration,Corneal guttatta 5.10 Keratoconus and Keratoglobus (Etiology, Classifications, Clinical evaluation and Management) 5.11 Corneal inflammations Keratitis/Ulcer (Etiology, Classifications, Evaluation and Management) Corneal oedema Corneal opacity and neovascularization 5.12 Miscellaneous ocular surface disorders Keratoconjunctivitis Sicca Steven Johnson Syndrome Benign Mucosal Pemphigoid- ocular pemphigoid Vitamin A deficiency Trauma and burns Metabolic diseases associated with corneal changes 5.13 Corneal surgeries Keratoplasty			

		Refractive surgeries 5.14 Slit lamp colour coding			
6	LENS	6.1 Normal lens anatomy, physiology and aging process 6.2 Congenital and Developmental defects Aphakia, Lenticonus, Lentiglobus, Coloboma, Peters anomaly, Microspherophakia, Cataract 6.3 Acquired lenticular defects Morphological cataract Drug induced cataract Traumatic cataract Metabolic cataract Complicated cataract Association with other ocular disorders and syndromes 6.4 Cataract Management Surgical and non-surgical management Pre-operative evaluation Complications of cataract surgery 6.5 Lens displacement Lens subluxation and dislocation	LEQ	SEQ	SAQ
7	UVEA AND PUPIL	7.1 Congenital anomalies Heterochromia, Aniridia, Coloboma, Correctopia, Polycoria, Pupillary membrane 7.2 Inflammations of Uvea	LEQ	SEQ	SAQ

		Classification of uveitis Etiology and pathogenesis Clinical approach to uveitis Endophthalmitis and panophthalmitis Complications of uveitis Ocular involvement in AIDS 7.3 Tumours of uvea 7.4 Anomalies of pupillary reactions			
8	VITREOUS AND RETINA	8.1 Developmental abnormalities Hereditary hyaloidoretinopathies Persistent hyperplastic primary vitreous 8.2 Vitreous opacities Asteroid hyalosis Cholesterolosis Pigment granules in vitreous Vitreous haemorrhage 8.3 Posterior vitreous detachment Etiology, Clinical features and Management 8.4 Trauma and vitreous 8.5 Inflammations and vitreous 8.6 Parasitic infestations 8.7 Vitreous complications secondary to surgery **RETINA** 9.1 Applied anatomy 9.2 Congenital and developmental anomalies		SEQ	SAQ

		Optic disc coloboma, Drusen, Hypoplasia, Medullated nerve fibers 9.3 Retinopathy of prematurity Etiology, Stages, Clinical features and Management 9.4 Retinal vascular diseases Diabetic retinopathy Associated with cardiovascular disease Hypertensive retinopathy Retinal artery and vein occlusions 9.5 Retinal Inflammations Retinitis, Retinal vasculitis 9.6 Retinal degenerations Retinitis pigmentosa, Lattice degenerations 9.7 Macular disorders Hereditory diseases Central serous retinopathy Cystoid macular oedema Solar retinopathy Albinism Age related macular degeneration Macular holes 9.8 Retinal detachment and Retinoschisis Etiology, Classifications, Clinical features and management 9.9 Retinal tumours Retinoblastoma Retinal and optic nerve head astrocytomas			

		Lymphoid tumour 9.11 Miscellaneous disorders Epiretinal membranes Intraocular foreign bodies Other metabolic disorders of retina Diseases of choroidal vasculature and Bruch's membrane Diseases of retinal pigment epithelium 9.11 Fundus Drawing –colour coding			
10	**NEURO OPHTHALMOLOGY**	10.1 Applied anatomy review 10.2 Neuro ophthalmic examination History Visual Acuity Colour vision Pupillary evaluation Ocular motility Fundus examination Visual field examination Adjunctive tests 10.4 Visual pathway and systems Vascular supply to anterior and posterior visual systems Visual pathway defects Disorders of visual integration Disorders of higher cortical functions Disorders with ocular motility anomalies/diplopia 10.4 Nystagmus Etiology, classifications,		**SEQ**	**SAQ**

		clinical evaluations and management 10.5 Miscellaneous disorders Systemic disorders with neuro ophthalmologic signs Optic neuropathy Papilledema Papillitis			
11	GLAUCOMA	11.1 Optic nerve, Anterior chamber and Aqueous Dynamics Review 11.2 Overview of glaucoma Diagnostic instruments 11.3 Evaluation of optic nerve head 11.4 Classification of glaucoma 11.5 Primary open angle glaucoma Etiology, clinical features, diagnosis and management 11.6 Primary angle closure glaucoma Etiology, clinical classification, clinical features, diagnosis and management 11.7 Developmental glaucoma Congenital glaucoma, Infantile glaucoma and juvenile glaucoma Syndromes with glaucoma 11.8 Secondary glaucoma Pseudoexfoliation glaucoma, pigmentary glaucoma,	LEQ	SEQ	SAQ

		Inflammation induced, Neovascular glaucoma, Lens induced glaucoma, Traumatic glaucoma 11.9 Glaucoma management Pharmacological and surgical management 11.10 Glaucoma screening			

SYSTEMIC DISEASES **MARKS WEIGHTAGE:20**

Sl No	Topic	Contents	No. of questions		
			LEQ	SEQ	SAQ
1	ARTERIAL HYPERTENSION	1.1. Pathophysiology, classification, clinical examination, Diagnosis 1.2. Complications, management 1.3.Hypertension and the eye		SEQ	SAQ
2	DIABETES MELLITES	2.1.Pathology, classifications, clinical features 2.2. Diagnosis, complications, management 2.3. Diabetes mellitus and the eye		SEQ	SAQ
3	ACQUIRED HEART DISEASES	3.1. Rheumatic fever-Pathophysiology, classifications, diagnosis complications and management 3.2. embolism 3.3. Subacute bacterial endocarditis		SEQ	SAQ

4	CANCER	Malignancy in eye (retinoblastoma, rhabdomyosarcoma, choroidal melanoma)			SAQ
5	CONNNECTIVE TISSUE DISORDERS	Eye and rheumatoid arthritis			SAQ
6	THYROID	6.1. Anatomy and physiology of thyroid gland 6.2. Classification of thyroid disease 6.3. Diagnosis, complications, clinical features, management 6.4.Thyroid disease and the eye			SAQ
7	TUBERCULOSIS	7.1. Etiology, pathology, clinical features, pulmonary tuberculosis, diagnosis, complication, treatment 7.2.Tuberculosis and the eye		SEQ	SAQ
8	COMMON TROPICAL MEDICAL AILMENTS	**8**.1. Introduction to tropical diseases: malaria 8.2.Tropical diseases and the eye- leprosy, toxoplasmosis, syphilis, Trachoma			SAQ
		Total Number of Questions	**3**	**8**	**10**

LEARNING AND TEACHING STRATEGY

The curriculum of Optometry is designed in such a way that it ensures the development of professional skills as well as behaviors of an individual that helps them to deliver a comprehensive primary eye care to the needy.

The curriculum incorporates 4 Major phases

Phase - I (First year Optometry)

The emphasis of learning understands & analysis of the basic sciences, philosophies, theories & skills required developing professionally and academically. This theory oriented first year ensures a sound scientific foundation for the upcoming years.

Phase - II (Second year Optometry)

The curriculum arranged in this part allows the students to apply the basic science knowledge procured from Phase-I in the Optometry topics. The introductory clinical posting in the ophthalmic outpatient department helps them to understand and learn the primary eye care procedures.

Phase – III (Third year Optometry)

As the curriculum concentrates more on optometric patient evaluation and management, the focus is to refine the student's clinical and application skills to make him/her an Optometrist. The student will learn about the diagnostic approaches and management of various ocular disorders, binocular vision anomalies, assessment and dispensing of contact lenses and Low vision aids.

Phase – IV (Fourth year Optometry)

This one year compulsory course work program is designed to facilitate the transition from student hood to a competent optometrist.

The learning and teaching process includes;

Lectures
Practical demonstration
Projects & Assignments
Seminars

Case discussions
Journal clubs
Clinical teaching
Industrial visits
Community outreach

PROJECT:

No. of practical hrs: 72

Each student is encouraged to take up a research project in the area of his/her liking. The project should be original and should have considerable clinical relevance. The concerned faculty members guide the student in his/her project. After completing the project, each student has to submit a complete report of their respective projects

PROJECT GUIDELINES

All BSc. Optometry degree students enrolled in the Rajiv Gandhi University of Health Sciences should complete a scholarly project as partial fulfillment of requirements for the award of BSc optometry (OPTOMETRY) degree.

What is a project?

A Project is a preliminary form of research. It is an independent investigation. It is very largely the students' own work and is to be pursued by them from the inception till completion. A master's project (non-thesis) will be completed during the third year and involves the student in hands- on project led by a research supervisor/ faculty advisor who will choose, develop and guide the project from its inception to completion.

Purpose of a project work

The purpose of the Project Work is to enable the student to gain practical experience. It enables the student to meet program objectives through development of an appreciation of the interrelations between theory research and practice. A project forms an introduction to scientific thinking and working. Project suggestions prior to the practical work, students work out a concept with their supervisor that could include any of the following points:

Scientific question
Educational objectives (which methods have to be mastered and understood)
Recent trends in the respective fields
Case study

Prospective studies
Retrospective studies

This scholarly project provides the student with the opportunity to participate in a mentored research experience. The student will actively participate in a research project throughout all current applicable phases of the project such as the problem statement development, review of the literature, hypotheses formation, proposal writing, study design, data collection, data analysis, and result reporting. This may be done as a group project. A portfolio, paper, or poster is a presentation of those outcomes.

Project supervision: The supervisor schedules the project work together with the student and provides an introduction to all laboratory skills that are needed. She or he is then the contact person for all questions and problems during the project. If required, she or he may also ask for a progress report and preliminary results while the project is still ongoing.

Assessment Four copies of the project report should be submitted to the Principal along with a soft copy (CD), three months before the final examinations. Projects are assessed with a written report and a seminar. The written report and the presentation, as well as the practical work in the laboratory are to be included in the internal assessment. The Project report will carry 10 marks which would be assessed and awarded during the viva voce examination and added along with the viva voce marks.

GUIDELINES FOR THE PREPARATION OF PROJECT REPORTS

The project report should be typed in Times New Roman. The size of the titles should be 14 and Bold and the size of the subtitles should be 12 and bold.
The matter should have double spacing except for long quotations, footnotes and endnotes, which are single spaced. The left hand margin must be 1.5", other margins should be 1.0".
The project report should be hardbound.
The project report should be organized in the following subdivisions:

a. Title page
b. Certificate
c. Acknowledgement
d. List of abbreviations used
   a. Table of contents
   b. Introduction

c. Main project
d. Summary of the project work
e. List of references
f. Annexures

CLINICAL POSTINGS

Aim: To enable the students to learn the Optometric examination procedures, clinical assessment skills and management techniques this helps them to become a competent clinician.

Description: The students will be posted in different specialties of eye care on a rotatory basis under the supervision of experienced clinical supervisors.

Clinical Posting – II nd Year:
At the end of second year clinical postings, the students will be performing History recording (Ocular and systemic – of relevance), Visual acuity assessment and documentation (Adults & Infants), Objective and subjective refraction, Spectacle prescription, Dispensing of various types of lenses and frames, Lensometry, Keratometry, demonstrating the slit lamp illumination techniques, color vision assessment, Do's and Don'ts of pupillary dilatation, Gross ophthalmic examination etc. under experienced clinical supervisors.

The students will have to complete clinical postings in different clinics like Optometry,Orthoptics,Investigative procedures,Operation theatre each of two months and medical records and pharmacy each of one month.

Total clinical hours (second year): 200 hours/year

Clinical Posting – IIIrd year:

By the completion of IIIrd year clinical posting, the students will be able to perform the following under experienced clinical supervisors.

Optometric workup to detect the ocular disorders (Ocular & relevant systemic history, Visual acuity assessment and refraction, Slit lamp examination, Applanation Tonometry, fundus evaluation)
Contact lens workup
Low vision workup
Orthoptic workup

The students have to complete clinical postings in various departments like contact lens clinic,pediatric Ophthalmology,low vision clinic,investigative Ophthalmology and community Ophthalmology each for two months.

Total clinical hours (third year): 575 hours/year.

Clinical Postings – IV th year:

Successful completion of the course work program will facilitate the students to become competent independent Optometrist. The student will be proficient in

Complete Optometric workup including diagnosis and management
Contact lens workup including dispensing
Low vision workup, dispensing of aids and counseling
Orthotic workup and non-surgical management
Detection of ocular diseases and referral to specialists at the appropriate stage
Managing an optical outlet/clinic of his/her own
Screening of Ocular disorders in community outreach programmes like Camps, School screening etc.
Utilizing the latest technology in the diagnosis of ocular anomalies including visual field devices, imaging technology including ultrasound and retinal imaging techniques, corneal topography including ORBSCAN etc

CLINICS AND SPECIAL CLINICS

Semester	Procedures	Minimum Number	Comments
I year	Role Play (Patient-Optometrist)	3 cases	
	Clinical Observation and Report writing	6 cases	
	Vision Check (Snellen's Chart) – Distance + Near	12 cases	
	Lensometry (Spherical lenses)	--	
II year	History taking - General - Specific - Conditions	9 cases	Can practice on the following complaints : Blurred Vision, Headache, Pain, redness, Watering, Flashes, Floaters, Blackspots

IIyear	Lensometry	100 cases	Simple Sphere, Simple cylinder, Spherocylinder (90, 180, Oblique degrees), Bifocals, PAL
	Vision Check (log MAR) Pinhole acuity	100 cases	Simulation, especially to show and ask the students to Interpret the findings.
	Extraocular Motility	10 cases	
	Cover test	10cases	Video output Simulation of various conditions
	Alternate Cover test	10 cases	Video output Simulation of various conditions
	Hirschberg test	10 cases	Video output Simulation of various conditions
	Modified Krimsky test	3 cases	Video output Simulation of various conditions
	Push up test (Amplitude of Accommodation)	10 cases	
	Push up test (Near point of Convergence)	(1 case in presbyopic age)	
	Stereopsis test	10 cases	
	Tear Break up time	10 cases	

	Amsler's Grid test	10cases (simulate)	Simulation of various conditions
	Photostress test	10 cases	
	Color vision test	10 cases (Normals)	
	Schirmer's test	10 cases	
IIyear	Confrontation test	10 cases	
	Slit lamp illumination	3 cases	
	Slit lamp examination	10 cases	
	Finger tension	10 cases (normal)	
	Schiotz Tonometry	10cases (normal)	
	Applanation Tonometry	10 cases (normal)	
	Negative Relative Accommodation	10 cases	
	Positive Relative Accommodation	10 cases	
	von Herick Grading of Anterior chamber depth	10 cases	
	Accommodative facility(+ 2.00 D)	10 cases	
	Corneal Sensitivity test	10 cases	
	IPD	10 cases	
	Proptosis evaluation	1 demo	
	Ptosis evaluation	1 demo	
	Pupillary evaluation -Direct -Consensual -RAPD	10 cases	
	HVID	10 cases	
	Maddox rod (Phoria)	10 cases	
	Negative Fusional vergence	10 cases	
	Positive Fusional Vergence	10 cases	

II year	Retinoscopy- Static, Dynamic and Cycloplegic Retinoscopy	25 + 25 +25 cases	Model eye for retinoscopy.
	Keratometry	25 cases	
	Subjective Refraction JCC Clock Dial Duochrome Borish Delayed	25 cases	
	Addition calculation	25 cases	Give more simulated problems and discuss on it
III year	Direct ophthalmoscope	10 cases (Normals)	Show slides of various commonly seen retinal conditions
	Visual Field chart interpretation	10 cases – discussion	Both kinetic and Static
	B scan Interpretation	10 cases – discussion	
	A scan chart Interpretation	10 cases – discussion	Discussion having different types of wave patterns
	Case Analysis	10 cases	
	+90 D lens	10 cases (Normals)	Slides of various Cup: Disc ratios can be shown
III year	Gonioscopy	5 cases (Normals)	Slides of abnormal angles
	Posting in optometry clinics	5+5+5+5+10 cases	Pediatric/contact lens/Low vision/ Orthoptics/ GOPD

	Camps	4 camps	School screening, Cataract
	IDO (on each other)	10cases (Normal)	Slides of abnormal fundus
	Case Analysis	5+ 5+ 5+ 5 cases	Pathology Binocular Vision Clinical Refraction Dispensing optics
IV year CLINICAL INTERNSHIP	General OPD (History taking –DO)	500 cases	Weekly 1 case report submission
	Contact Lens	20 cases (5 RGP+ 5 Soft + 5 toric)	Totally 3 different case reports submission at the end of the postings
	Opticals	100 cases	Weekly 1 case report submission
	Low Vision care Clinic	10 cases	Totally 3 different case reports submission at the end of the postings
	Binocular Vision clinic	10 cases	Totally 3 different case reports submission at the end of the postings
	Ophthalmology clinic (Common eye conditions)	50 cases	Totally 3 different case reports submission at the end of the postings
	Camps	10 camps	Camp report submission

FOURTH YEAR B.Sc. OPTOMETRY

PROJECT WORK

CLINICAL POSTING & SECIALITY POSTING

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SDM College of Medical Sciences & Hospital

SDM College of Dental Sciences & Hospital

SDM College of Physiotherapy &
SDM Institute of Nursing Sciences

Shri Dharmasthala Manjunatheshwara University

SDM Research Institute for Biomedical Sciences

Panoramic View of Campus