ALAGAPPA UNIVERSITY

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

DIRECTORATE OF COLLABORATIVE PROGRAMMES

BSc Optometry

Regulations and Syllabus

GENERAL INSTRUCTIONS AND REGULATIONS

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

Applicable to all the candidates admitted from the academic year **2023** onwards.

1. **Eligibility:**

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

2. **For the Degree:**

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

3. **Admission:**

   Admission is based on the marks in the qualifying examination.

4. **Duration of the course:**

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

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

6. **Continuous internal Assessment:**
   a. Continuous Internal Assessment for each paper shall be by means of Written Tests, Assignments, Class tests and Seminars
   b. **25 marks** allotted for the Continuous Internal assessment is distributed for Written Test, Assignment, Class test and Seminars.
   c. Two Internal Tests of 2 hours duration may be conducted during the semester for each course / subject and the best marks may be considered and one Model Examination will be conducted at the end of the semester prior to University examination. Students may be asked to submit at least five assignments in each subject. They should also participate in Seminars conducted for each subject and marks allocated accordingly.
   d. Conduct of the continuous internal assessment shall be the responsibility of the concerned faculty.
   e. The continuous internal assessment marks are to be submitted to the University at the end of every year.
   f. The valued answer papers/assignments should be given to the students after the valuation is over and they should be asked to check up and satisfy themselves about the marks they have scored.
   g. All mark lists and other records connected with the continuous internal assessments should be in the safe custody of the institution for at least one year after the assessment.

7. Attendance:

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

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

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

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

8. Examination:

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

9. Question Paper pattern:

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

10. Miscellaneous

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

11. Fee structure

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

Semester pattern

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

12. Other Regulations:

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

MODEL SYLLABUS UNDER CBCS PATTERN

UG – BSc OPTOMETRY

PROGRAMME STRUCTURE

Sem.	Part	CourseCode	Title of the Paper	T/P	Cr.	Hrs./ Week	Max. Marks		
							Int.	Ext.	Total
I	I	T/OL 91411T/11H/ 11F	Tamil /Other Languages –I	T	3	4	25	75	100
	II	E-91412	General English – I	T	3	4	25	75	100
	III	CC-91413	General Anatomy & Physiology	T	4	5	25	75	100
		CC-91414	Geometrical Optics	T	4	5	25	75	100
		Allied-91415	General & Ocular Biochemistry	T	4	4	25	75	100
		DSE- 91416A 91416B	Nutrition / Basic Life Support	T	4	4	25	75	100
	IV	SEC –I91417	Value Education	P	2	2	25	75	100
			Library			2			
			Total		**21**	**30**	**175**	**525**	**700**
II	I	T/OL 91421T/H/F/ M/TU/A/S	Tamil/Other Languages-II	T	3	3	25	75	100
	II	E 91422	General English – II	T	3	3	25	75	100
	III	CC 91423	Ocular Anatomy	T	4	4	25	75	100
		CC – 91424	Ocular Physiology	T	4	4	25	75	100
		CC- 91425	Physical Optics	T	4	4	25	75	100
		CC - 91426	Practical – Physical & Geometrical Optics	P	3	6	25	75	100
		Allied - 91427	Microbiology & Pathology	T	4	4	25	75	100
	IV	SEC –II - 91428	Environmental Studies	P	2	2	25	75	100
			Library			--			
			Total		**27**	**30**	**200**	**600**	**800**
III	I	T/OL – 91431T/H/F/ M/TU/A/S/	Tamil/Other Languages-III	T	3	3	25	75	100
	II	E- 91432	General English – III	T	3	3	25	75	100
	III	CC – 91433	Visual Optics	T	4	4	25	75	100
		CC – 91434	Optometric Optics	T	3	3	25	75	100
		CC - 91435	Ocular Diseases – I	T	4	4	25	75	100
		CC - 91436	Practical – Visual & Optometric Optics	P	3	5	25	75	100
		Allied - 91437	General & Ocular Pharmacology	T	4	4	25	75	100
	IV	SEC –III - 91438	Entrepreneurship	P	2	2	25	75	100
		SEC –IV 91439A 91439B 91439C 91439D	NME- I 1.Adipadai Tamil 2.Advance Tamil 3.IT Skills for Employment/ MOOC'S	P	2	2	25	75	100
			Total		**28**	**30**	**225**	**675**	**900**
	I	T/OL	Tamil /Other Languages –IV	T	3	3	25	75	100

IV		91441T/H/F/M/TU/A/S							
	II	E – 91442	General English – IV	T	3	3	25	75	100
	III	CC - 91443	Optometric Instrumentation & Clinical Examinations of the Visual System (CEVS)	T	4	5	25	75	100
		CC – 91444	Ocular Diseases – II	T	4	4	25	75	100
		CC - 91445	Practical- Instrumentation & CEVS	P	3	5	25	75	100
		Allied – 91446	Occupational Optometry & Community Optometry	T	4	4	25	75	100
		DSE – 91447A 91447B	Hospital Procedures / Quality and Patient Safety	T	4	4	25	75	100
	IV	SEC –V 91448A 91448B 91448C 91448D	NME- II 1.Adipadai Tamil 2.Advance Tamil 3. Small Business Management / MOOC'S	P	2	2	25	75	100
			Total		**27**	**30**	**200**	**600**	**800**
V	III	CC - 91451	Contact Lens – I	T	4	5	25	75	100
		CC- 91452	Binocular Vision - I	T	4	5	25	75	100
		CC- 91453	Pediatric & Geriatric Optometry	T	4	5	25	75	100
		CC- 91454	Dispensing Optics	T	4	4	25	75	100
		CC-91455	Practical – Clinical Optometry - I	P	3	6	25	75	100
		DSE-91456A 91456B	Research Methodology/ Biostatistics	T	4	4	25	75	100
		91457A 91457B	Career development/ employabilityskills			1			
VI	III		**Total**		**23**	**30**	**150**	**450**	**600**
		CC-91461	Contact Lens – II	T	4	5	25	75	100
		CC-91462	Binocular Vision - II	T	4	5	25	75	100
		CC-91463	Low Vision Aids	T	4	5	25	75	100
		CC-91464	Practical – Clinical Optometry - II	P	3	6	25	75	100
		CC-91465	Systemic Diseases Affecting the Eye	T	4	5	25	75	100
		DSE 91466A 91466B	Medical Law and Ethics/ Clinical Psychology	T	4	4	25	75	100
			Total		**23**	**30**	**150**	**450**	**600**
VII		CC-91471	Internship - I		8	18	25	75	100
		CC-91472	Project - I		8	12	25	75	100
			Total		**16**	**30**	**50**	**150**	**200**
VIII		CC-91481	Internship - II		8	18	25	75	100
		CC-91482	Project - II		7	12	25	75	100
			Total		**15**	**30**	**50**	**150**	**200**
Grand Total					**180**	**--**	**1200**	**3600**	**4800**

T – Theory 1 cr = 1 hr for Theory Paper

P-Practical 1 cr = 2 hrs for Practical Paper

Minimum Credit = 140

- MIL-Modern Indian Language, E – English
- CC-Core course –Core competency , critical thinking, analytical reasoning ,research skill &team work
- Allied / GEC -Exposure beyond the discipline
- SEC-Skill Enhancement Course - Exposure beyond the discipline (Value Education ,Entrepreneurship Course, Computer application for Science, etc.,
- NME -Non Major Elective – Exposure beyond the discipline
- DSE – Discipline specific elective –Additional academic knowledge, critical thinking, and analytical reasoning-Student choice - either Internship or Theory papers or Project + 2 theory paper. If internship – Marks = Internal (150 (75+75) two midterm evaluation through Viva voce + Report 150+ External Viva voce 100 = 400, If Project Marks = Internal -25
  +Thesis -+ Viva voce = 75=100 and + 3 theory paper = 300 = 400
- Extension activity & MOOCs – Voluntary basis

Program Outcome (POs)-On successful completion of the B.Sc. Optometry Program (914)	
PO1	Obtain relevant information about a patient using observation, clear and effective communication and diagnostic testing.
PO2	Knowledge of basic and applied sciences related to ocular disorders for early diagnosis and management.
PO3	Provide quality vision care through comprehensive and appropriate examination, diagnosis and management of various ocular disorders.
PO4	Design, manufacture and prescribe diverse optical aids including spectacles, sunglasses, ophthalmic lenses, contact lenses, low vision aids etc.
PO5	Undertake public health optometry programs and vision screening eye camps to create awareness about the importance of vision and visual hygiene.
PO6	Develop an entrepreneurial spirit to co-manage with ophthalmologist or efficiently manage and run any ophthalmic or optical clinic, industry & trade.
PO7	Demonstrate teamwork skills by engaging in community activities to reduce the burden of ocular disorders and promote interdisciplinary care.
PO8	Recognize the epidemiological, environmental and etiological factors that require for the intervention of visual deterioration or ocular disease.
PO9	Possess and demonstrate ethical values and professionalism within the legal framework of the society.
PO10	Able to perform and disseminate at least basic research relevant to optometry and vision science and thereby engaging in continual professional development.

Program Specific Outcome (PSOs)	
After the successful completion of the Optometry program, the students are expected to	
PSO1	The graduates will be knowledgeable in ophthalmic and systemic care to practice as an optometrist, interpret results of common ophthalmic procedures, and develop differential and definitive diagnoses.
PSO2	The graduates will be skillful in techniques and current technologies, skillful in problems solving, and will possess professional, ethical and compassionate behavior and standards.
PSO3	The graduates will provide quality vision care through comprehensive and appropriate examination, measurement, assessment, diagnosis and management of eye and vision conditions.
PSO4	The graduate will be knowledgeable and responsive to the health care needs of the community and possess a commitment to continuously improve knowledge, abilities, will work and communicate effectively in an inter-disciplinary environment, either independently or in a team, and demonstrate significant leadership qualities.
PSO5	The graduates will possess the initiative and critical acumen required to continuously improve their knowledge through self-study, continuing education program or higher studies.

I - Semester					
Core	**Course code:91413**	**General Anatomy & Physiology**	**T**	**Credits: 4**	**Hours: 5**
Pre-requisite	**Basic Knowledge of Human Anatomy & Physiology**		**Syllabus revised**		**2022- 23**
Course Objectives	1. To expertise the students about the basic anatomy and physiology of every organs of human body. 2. To update the recent methodologies of studying anatomy and physiology. 3. To familiarize the internal structure and functioning of every organs of human body at microscopic level. 4. To cultivate the knowledge about the integration of every organs in normal body functioning. 5. To educate the clinical applications of knowledge about every organs of the human body.				
Unit I	**Introduction to Anatomy & Physiology:** Subdivisions, Basic terminologies, Planes & positions. Cell & its organelles - Cell physiology. Primary tissues – epithelial tissue –types, glands, connective tissue - components in detail – bone, cartilage, nervous tissue – neuron, neuroglia, muscular tissue – types. Vascular tissue – components, erythropoiesis, anemia, ESR. Lymphatic tissue – Thymus, Spleen – Immunity- clinical correlations.				
Unit II	**Musculoskeletal system:** Skeleton – axial & appendicular skeleton – vertebral column, skull and sutures, sternum, ribs, pelvis, scapula, clavicle, humerus, radius, ulna, carpels, hip, femur, tibia, fibula, tarsals, phalanges – joints and types. Basic muscle physiology, Neuromuscular junction - myasthenia gravis. Knowledge about extraocular muscles, diaphragm, intercostal muscles, deltoid, gluteal muscles – clinical correlations.				
Unit III	**Respiratory system, Cardiovascular system & Nervous system:** Respiratory- thoracic cavity, structure – nose, pharynx, larynx, trachea, bronchial tree, lungs & pleura, alveoli. Mechanism of respiration – control of respiration – transport of gases – diffusion. Pulmonary function tests - volumes & capacities. Surfactant, hypoxia, cyanosis - clinical correlations. Heart – Mediastinum - structure & position of heart - heart wall, chambers, valves, blood supply. Structure of artery, veins, capillaries - aorta, SVC, IVC. Systemic & pulmonary circulation, Cardiac cycle, Cardiac output, Blood pressure, Conducting system, Heart sounds, ECG – Clinical correlations. Nervous system – Classification. Brain – parts – cerebrum, diencephalon - thalamus, hypothalamus, brainstem-midbrain, pons, medulla oblongata – structure & functions – meninges, ventricles – CSF. Spinal cord – reflex arc. Peripheral – cranial & spinal nerves. Autonomic – sympathetic & parasympathetic. Clinical correlations.				
Unit IV	**Genitourinary system & Endocrine system:** Female reproductive organs – external, internal & secondary – vulva, vagina, uterus, fallopian tubes, ovaries, mammary glands. Oogenesis, ovarian cycle, menstrual cycle. Male reproductive organs- external & internal – penis, scrotum, testes, epididymis, vas deferens, seminal vesicle, ejaculatory duct, prostate. Spermatogenesis Puberty, fertilization, pregnancy, contraception – Clinical correlations Urinary system – structure- kidney, nephron, juxtaglomerular apparatus, ureters, urinary bladder, urethra – male and female. Physiology of urination, micturition, RAAS mechanism – clinical correlations. Endocrine system - structure- pituitary, thyroid, parathyroid, adrenal, islets of Langerhans. Actions & regulation of hormones - pituitary, thyroid, parathyroid, adrenal, pancreatic, estrogen, progesterone, testosterone. Hypothalamic regulation.				
Unit V	**Digestive system & Sense organs:** Digestive system - structure and functions of oral cavity - teeth, tongue, palate, pharynx, esophagus, stomach, small intestine, large intestine, accessory organs - salivary glands, liver, gallbladder, pancreas, saliva, gastric juice, bile.				

	Sense organs – Integumentary - Skin & appendages- temperature regulation. Tastebuds - taste pathway, Olfactory epithelium - olfactory pathway, Eye - visual pathway, Ear – auditory pathway

References

Susan Sandring (2020).*Gray's Anatomy,international (forty second ed.):* elsevier

Richard L Drake,&A.Wayne,Adam W M M(2023)*Gray's Anatomy for students*.*(fifth ed.)*:elsevier

John E Hall& Michael E Hall ,(2020).*Guyton and Hall textbook of medical physiology :* elsevier

K Sembulingam&PremaSembulingam.(2019).*Essentials of medical physiology (eighth ed) :* Jaypee

ChaurasiaBd(2022).*B D Chaurasia's Human Anatomy (ninth ed) :* CBS

Kim E Barrett , Susan M B, Heddwen L B, Jason Yuan (2019).*Ganong's review of medical physiology :* lange

Related online content (MOOC, Swayam, NPTEL, Website etc.)

www.udemy.com/topic/anatomy/

https://www.nlm.nih.gov/research/visible/visible_human.html

Course Outcomes		**Knowledge level**
CO-1	Understanding the fundamental concepts of human anatomy and physiology.	K3
CO-2	Discuss the factors of skeletal framework and locomotion of human body.	K4
CO-3	Acquire the knowledge about the three vital systems - cardiovascular, respiratory, nervous	K5
CO-4	Analyze in detail about the gastrointestinal & sensory mechanisms of human body	K4
CO-5	Detailed discussion for understanding the genital, renal & endocrine systems.	K4

Course designed by **Dr Shabna M V**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
CO2	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
CO3	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
CO4	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
CO5	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
W.AV	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M (2)	L (1)	L (1)	L (1)	L (1)
CO2	M (2)	L (1)	L (1)	L (1)	L (1)
CO3	M (2)	L (1)	L (1)	L (1)	L (1)
CO4	M (2)	L (1)	L (1)	L (1)	L (1)
CO5	M (2)	L (1)	L (1)	L (1)	L (1)
W.AV	**2**	**1**	**1**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

I - Semester					
Core	**Course code: 91414**	**Geometrical Optics**	**T**	**Credits: 4**	**Hours: 5**
Pre-requisite	**Basic Knowledge of Reflection & Refraction**		**Syllabus revised**		**2022- 23**
Course Objectives	1. To equip the students with a profound knowledge of reflection and refraction. 2. To predict the properties of image formed by lenses and prisms and hence helping the student to understand the optics of the eye. 3. To learn the matrix methods to locate cardinal points/planes in optical systems. 4. To enhance the knowledge about various types of aberrations and their effects. 5. To study total internal reflection and its application in the field of fibre optics.				
Unit I	**Nature of Light:** Light as an electromagnetic wave – ideas of sinusoidal oscillation – Fermat's principle – geometrical and optical path lengths – laws of reflection and refraction using Fermat's principle – reflection by plane and spherical mirrors – reflectivity and transmittance – concepts of wave fronts and rays – Vergence – divergence and convergence.				
Unit II	**Refractive Index:** Absolute and relative refractive indices – Snell's law – Refraction by plane glass slab – Refraction by spherical surfaces – convex and concave – Derivation of Vergence equation – Focal points – lateral and axial magnification – Thin lenses – different lens forms – vergence equation for a thin lens – imaging by thin convex and concave lenses – image properties.				
Unit III	**Front and Back vertex powers:** Equivalent power – equivalent focal length of two thin lenses placed in contact and separated by a distance – Thick lenses – Cardinal points/planes – matrix methods in paraxial optics – refraction and translation matrices – to locate cardinal points/planes using matrix theory.				
Unit IV	**Aberrations:** Chromatic aberrations – methods of removing chromatic aberration – monochromatic aberrations – spherical aberrations, coma, astigmatism, distortion and curvature of field – ways of minimizing them – wave front aberration. .				
Unit V	**Solid Prisms:** Deviation produced by a prism – prism dioptre – angular dispersion – dispersive power – reflecting prisms – total internal reflection and critical angle – optical fibres – types and theory of OFCS - uses				

References

Pedrotti L.S, Pedrotti Sr.F.L, *Optics and Vision*, Prentice hall
Keating.N.M, *Geometric, Physical and Visual Optics*
Subrahmanyam, Brijlal, *A Text book of Optics*, S Chand Co
Milton Kartz, *Introduction to Geometric Optics*, World Scientific Publishing Co.
Stevan.P, Schwartz S.H, *Geometrical and Visual Optics*, Mc Graw - Hill

Related online content (MOOC, Swayam , NPTEL, Website etc.)

https://www.sciencedirect.com/topics/physics-and-astronomy/geometrical-optics

https://www.animations.physics.unsw.edu.au/light/geometrical-optics/index.html

Course Outcomes		**Knowledge level**
CO-1	Understand nature and properties of light.	K1
CO-2	Construct ray diagrams and evaluating nature and properties of image.	K4
CO-3	Apply matrix methods in paraxial optics enabling the student to identify the positions of principle, nodal and focal points/planes in optical systems.	K3

CO-4	Discuss aberrations in lenses in comparison with ocular aberrations.	K2
CO-5	Demonstrate total internal reflection as the principle behind optical signal transmission through OFCS.	K5
		Course designed by **Unni Naduvilapatt**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
CO2	L (1)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
CO3	L (1)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
CO4	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
CO5	L (1)	L (1)	S (3)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
W.AV	**1**	**1**	**1.8**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L (1)	L (1)	L (1)	L (1)	L (1)
CO2	L (1)	L (1)	L (1)	L (1)	L (1)
CO3	L (1)	L (1)	L (1)	L (1)	L (1)
CO4	L (1)	L (1)	L (1)	L (1)	L (1)
CO5	L (1)	L (1)	M (2)	L (1)	L (1)
W.AV	**1**	**1**	**1.2**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

I - Semester					
Allied	**Course code: 91415**	**General & Ocular Biochemistry**	**T**	**Credits: 4**	**Hours: 4**
Pre-requisite	**Basic Knowledge of General Biomolecules**		**Syllabus revised**		**2022- 23**
Course Objectives	1. To learn biological importance of chemical compounds. 2. To understand the basic structure and function of biomolecules. 3. To familiarize the general metabolism of human body. 4. To evaluate the importance of biochemistry in optometry. 5. To learn the biochemical composition of eye.				
Unit I	**Carbohydrate Chemistry:** Classification, structure a function of monosaccharide, disaccharides and polysaccharide - classification. Carbohydrate metabolism - introduction, glycolysis and TCA cycle and its energetics. Diabetes mellitus - Types and Management.				
Unit II	**Lipid chemistry**: Classification, importance of saturated, unsaturated and essential fatty acids, triglycerides - structure and function of phospholipids and cholesterol. Lipid metabolism - Introduction to lipid metabolism, B-Oxidation of saturated fatty acids and its energetics. Ketone bodies. Atherosclerosis and its consequences. **Enzymes:** Properties, mode of action, classification, examples of coenzymes, factors affecting enzyme activity, Michaelis Menten equation (no derivation).				
Unit III	**Amino acids and protein:** Classification and structure of Amino acids. Proteins - Classification, structure -primary, secondary, tertiary and quaternary structure (haemoglobin as example). **Vitamins:** Biological function and disease manifestation of water and fat soluble vitamins (no structures).				
Unit IV	**Importance of ocular biochemistry in clinical optometric practice.** **Tear film:** Composition - Lipid layer, aqueous layer & mucoid layer - Tear secretion function and dysfunction - Diagnostic tests - Tear substitutes. **Cornea:** Biochemical composition of epithelium, bowman's layer, stroma, descemet's layer & endothelium – function - corneal metabolism - nutrient uptake - transparency & refractive power - abnormalities and change in contact lens wearer.				
Unit V	**Aqueous humour:** Composition – function - ciliary body - aqueous humour production – IOP - Glaucoma. **Lens:** Structure and function of lens - dehydration and transparency - cataract formation - cataractogenic agents - Diabetic cataract.				

References

DM Vasudevan (2023) - *A textbook of biochemistry for paramedical students (10th ed)*

Ramamoorthy, (2021) - *Textbook of biochemistry for paramedical students (2nd ed)*

Satyanarayana (2021) - *Biochemistry* (6th ed)

David R.WHIKEHART PHD - *Biochemistry of eye (2003) (2nd ed)*

AK Khurana - *comprehensive ophthalmology2023 (9 ed)*

Related online content (MOOC, Swayam , NPTEL, Website etc.)

https://www.studocu.com/

https://core.ac.uk/

Course Outcomes		**Knowledge level**
CO-1	Understand the structure, function and metabolism of carbohydrates.	K4
CO-2	Knowledge about lipids and enzymology.	K3
CO-3	Understand structure of amino acids and protein and disease related with vitamins.	K4

CO-4	Know the biochemical composition of tear film and cornea.	K2
CO-5	Understand the structure, function and composition of aqueous humour and lens	K4
		Course designed by **Lesna Febin C**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
CO2	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
CO3	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
CO4	L (1)	S (3)	L (1)	L (1)	L (1)	L (1)	L (1)	M (2)	L (1)	L (1)
CO5	L (1)	S (3)	L (1)	L (1)	L (1)	L (1)	L (1)	M (2)	L (1)	L (1)
W.AV	**1**	**2.4**	**1**	**1**	**1**	**1**	**1**	**1.4**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L (1)	L (1)	L (1)	L (1)	L (1)
CO2	L (1)	L (1)	L (1)	L (1)	L (1)
CO3	L (1)	L (1)	L (1)	L (1)	L (1)
CO4	L (1)	L (1)	M (2)	L (1)	L (1)
CO5	L (1)	L (1)	M (2)	L (1)	L (1)
W.AV	**1**	**1**	**1.4**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

I - Semester					
DSE	**Course code: 91416A**	**Nutrition**	**T**	**Credits: 4**	**Hours: 4**
Pre-requisite	**Basic Knowledge of Nutrition**			**Syllabus revised**	**2022- 23**
Course Objectives	1. To gain basic concepts of nutrition. 2. To understand the deficiencies of various nutrients. 3. To develop skills to evaluate nutritional status. 4. To know the composition of foods. 5. To understand the different foods and their function in the body.				
Unit I	**Introduction to Nutrition:** History of nutrition – Nutrition as science – Food groups, RDA – Diet planning – Assessment of nutritional status.				
Unit II	**Concepts on Energy:** Units of energy – Measurements and energy value of food – Energy expenditure – Total energy and calories requirement for different age groups and diseases – Satiety value – Energy unbalance – obesity, saturation limitation of the daily food guide.				
Unit III	**Proteins:** Sources and functions – Essential and non-essential amino acids – Incomplete and complete protein supplement food – PEM (protein energy malnutrition) & Eye – Nitrogen balance – Change in the protein requirement.				
Unit IV	**Fats and Minerals:** Functions and sources – Essential fatty acids – Excess and deficiency – Lipids and eye – Hyperlipidemia and heart diseases – Atherosclerosis. Minerals – General function and sources – Macro and micro minerals associated with eye – Deficiency and excess ophthalmic complication (e.g.: Iron, Calcium, Iodine etc).				
Unit V	**Vitamins:** General function – food sources – Vitamin deficiency and associated eye disorders with particular emphasis on vitamin A – Promotiny sound habit in pregnancy – Lactation and infancy. Nutrients with anti oxidation properties. Measles and eye disorders.				

References

Srilakshmi, B., Nutrition science , New Age International (P) Ltd,2017.

Swaminadhan., M., Handbook of Food and Nutrition , Bappco publication, 2020

Bamji.,M.S.,Textbook of human Nutrition .,4th edition.,Oxford &IBH publishing company (P) Ltd,2019

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://www.nhlbi.nih.gov/health/atherosclerosis

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4848694/

Course Outcomes		**Knowledge level**
CO-1	To gain knowledge on various types nutrients in relation to eye health.	K1
CO-2	To have an overview on the methods used for the assessment of nutritional status.	K2
CO-3	To understand the different types of food groups.	K2
CO-4	To gain knowledge on stages of atherosclerosis.	K1
CO-5	To apply knowledge on patient counseling about deficiencies.	K5

Course designed by **Athira Antony**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
CO2	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
CO3	L (1)	M (2)	L (1)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)
CO4	L (1)	M (2)	L (1)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)
CO5	L (1)	M (2)	L (1)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)
W.AV	**1**	**2**	**1**	**1**	**1.6**	**1**	**1**	**1**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L (1)	L (1)	L (1)	L (1)	L (1)
CO2	L (1)	L (1)	L (1)	L (1)	L (1)
CO3	M (2)	L (1)	L (1)	L (1)	L (1)
CO4	M (2)	L (1)	L (1)	L (1)	L (1)
CO5	M (2)	L (1)	L (1)	L (1)	L (1)
W.AV	**1.6**	**1**	**1**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

I - Semester					
DSE	**Course code: 91416B**	**Basic Life Support**	**T**	**Credits: 4**	**Hours: 4**
Pre-requisite	**Basic Knowledge of Health Care**			**Syllabus revised**	**2022- 23**
Course Objectives	1. To familiarize basic information about health care. 2. To educate importance of vital signs. 3. To provide knowledge in preliminary examinations of the eye. 4. To learn basic vision assessment. 5. To educate about first aids.				
Unit I	**Health care:** Introduction – Vision and Mission – Basic protocols – Hospital departments – Medical Records – WHO - NABH				
Unit II	**Vital signs:** Blood pressure – Blood glucose level – Blood oxygen level – Temperature – Pulse rate – Respiration - BMI				
Unit III	**Preliminary Ocular Examinations:** External observation – History taking – Torch light examination – Pupillary examination – Lid eversion				
Unit IV	**Vision Assessment:** Vision and its components – Visual acuity and its components – Prerequisites – Procedure - Recording				
Unit V	**First Aid and Concepts of Emergency:** Basics of First Aid – danger, response, send for help, airway, breathing, CPR, defibrillator – Foreign Bodies - Dressings - Bandages.				

References

Basic life support (BLS) provider manual – by Channing L Bete Co Inc - American heart association (2016)

Basic life support provider manual – M. Mastenbjork M D, S Meloni M D - Medical creations (2021)

A text book of first aid – Dr. A Helen Mary Perdita – Vikas Publish (2014)

Vital Signs for nurses – Joyce Smith and Rachel Robert – Wiley–Blackwell (2011)

Primary Care Optometry – Theodore P. Grosvenor ; Edition, 4, illustrated ; Publisher, Butterworth-Heinemann, (2002)

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://pubmed.ncbi.nlm.nih.gov/

https://www.webmd.com/

Course Outcomes		**Knowledge level**
CO-1	Understand basic concepts of health care.	K2
CO-2	Analyze and evaluate vital signs.	K5
CO-3	Understand and perform preliminary ocular examinations.	K5
CO-4	Perform vision assessment.	K5
CO-5	Knowledge of first aid procedures.	K2

Course designed by **Aswathi S R**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	L (1)	L (1)	L (1)	L (1)	M (2)	M (2)	L (1)	M (2)	L (1)
CO2	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	M (2)	L (1)	L (1)
CO3	M (2)	M (2)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
CO4	M (2)	M (2)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
CO5	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
W.AV	**1.6**	**1.4**	**1.4**	**1**	**1**	**1.2**	**1.2**	**1.2**	**1.2**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L (1)	L (1)	L (1)	M (2)	L (1)
CO2	L (1)	L (1)	L (1)	M (2)	L (1)
CO3	M (2)	L (1)	M (2)	M (2)	L (1)
CO4	M (2)	L (1)	M (2)	M (2)	L (1)
CO5	L (1)	L (1)	L (1)	M (2)	L (1)
W.AV	**1.4**	**1**	**1.4**	**2**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

II - Semester					
CC	**Course code: 91423**	**Ocular Anatomy**	**T**	**Credits: 4**	**Hours: 4**
Pre-requisite	**Basic Knowledge on anatomy of the eye**		**Syllabus revised**		**2023- 24**

Course Objectives	1. Comprehend the normal disposition, inter-relationships, gross, functional and applied anatomy of various structures in the eye and adnexa and understand the basic principles of ocular embryology 2. Comprehend the basic structure and connections between the various parts of the central nervous system and the eye so as to understand the neural connections and distribution 3. To impart a detailed knowledge on the ocular anatomy. 4. To deliver knowledge on orbit and orbital nerves. 5. To impart knowledge on origin, course and insertion of extra ocular muscles.
Unit I	**Structures and Development of the Eye:** Introduction - Embryology – Formation of optic vesicle, lens vesicle, optic cup and changes in associated mesenchyme - Development of various structure of eye ball, orbit and ocular adnexa – Milestones of development of ocular structures. **Orbit and Orbital Nerves:** Bony orbit - Walls, base and apex of orbit - Orbital fascia - Surgical spaces of orbit - Orbit fat & reticular tissue - Apertures at the base of orbit- Contents of the orbit. Orbital nerve - Oculomotor, Trochlear, Abducent, Trigeminal, Facial nerves - their functional components, course and distribution & clinically applied aspects.
Unit II	**Eyelid:** Gross anatomy - Structure - Glands of the Lids - Blood Supply - Nerve Supply. **Conjunctiva:** Gross anatomy - Microscopic structures - Glands - Accessory structures - Blood Supply - Nerve Supply. **Lacrimal apparatus:** Lacrimal glands - Lacrimal passages.
Unit III	**Cornea:** Dimensions – Histology - Blood supply - Nerve supply. **Sclera:** Thickness – Special regions – Scleral apertures – Microscopic structure - Blood supply - Nerve supply. **Anterior chamber:** Angle of the anterior chamber - Trabecular meshwork – Schlemm' canal – Collector channels – Episcleral veins.
Unit IV	**Uvea:** Iris - macroscopic & microscopic appearance - Ciliary body - microscopic structure & ciliary processes. Choroid - macroscopic structure - Blood supply. **Lens:** Introduction - Structure of the lens - Structure of ciliary zonules - Arrangement of zonular fibres.
Unit V	**Vitreous:** General features – Structure – Attachments of the vitreous. **Retina:** Gross anatomy - Microscopic structure – Rods and Cones – Blood supply. **Visual Pathway:** Optic nerve - Optic chiasma - Optic tracts - Lateral geneculate body - Optic radiations - Visual cortex - Arrangement of nerve fibres - Blood supply. **The Ocular motor system:** Extraocular muscles – Origin, Course, Insertion, Blood supply and Nerve supply. Anatomy of Sphincter & Dilator muscle.

References

1. A Remington: *Clinical Anatomy of the Visual System*, Second edition, Elsevier Butterworth Heinemann, Missouri, USA, 2005.
2. AK Khurana, Indu Khurana: *Anatomy and Physiology of Eye*, Second edition, CBS Publishers, New Delhi, 2006
3. *Functional Anatomy and Histology of Eye* – Gordon Ruskell, Butterworth Heinemann
4. *Clinical Anatomy of the Eye* 2nd Edition, Kindle Edition by Richard S. Snell (Author), Michael A. Lemp
5. *Atlas of Ocular Anatomy* Hardcover –2016 by Mohammad Wakeel Ansari, Ahmed Nadeem

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://www.aao.org/

https://pubmed.ncbi.nlm.nih.gov/

Course Outcomes		**Knowledge level**
CO-1	Understand the ocular embryology in detail.	K2
CO-2	Define and correctly use anatomical terms as they relate to the eye.	K3
CO-3	Recognise and describe the macroscopic and microscope structures of the eye, and how	K5

	they contribute to perception.	
CO-4	Understand the orbital structures and their components, course and distribution.	K3
CO-5	Acquire knowledge about origin, course and insertion of extra ocular muscles.	K4
		Course designed by **Aswathi S R**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	M (2)	L (1)	L (1)
CO2	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	M (2)	L (1)	L (1)
CO3	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	M (2)	L (1)	L (1)
CO4	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	M (2)	L (1)	L (1)
CO5	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	M (2)	L (1)	L (1)
W.AV	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M (2)	L (1)	L (1)	L (1)	L (1)
CO2	M (2)	L (1)	L (1)	L (1)	L (1)
CO3	M (2)	L (1)	L (1)	L (1)	L (1)
CO4	M (2)	L (1)	L (1)	L (1)	L (1)
CO5	M (2)	L (1)	L (1)	L (1)	L (1)
W.AV	**2**	**1**	**1**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

II - Semester					
CC	**Course code: 91424**	**Ocular Physiology**	**T**	**Credits: 4**	**Hours: 4**
Pre-requisite	**Basic Knowledge about functions of Eye**		**Syllabus revised**		**2023- 24**
Course Objectives	1. Elucidate the physiological aspects of normal growth and development of the eye 2. List the physiological principles underlying pathogenesis and treatment of disease of the eye. 3. To impart a detailed knowledge on the ocular physiology. 4. To explain the functioning of eyes through phenomena like torsion, deviation, muscle action etc 5. To deliver knowledge on the crystalline lens and accommodation.				

Unit I	**Cornea:** Functions - Corneal transparency - Factors affecting corneal transparency - Maurice theory & Goldman's theory. **Uveal tissue:** Functions - Uveal meshwork - Uveo-Scleral drainage. **Aqueous Humour:** Functions and Properties - Formation of Aqueous humour - Drainage & circulation of Aqueous Humour - Rates of production & flow. **Intraocular pressure:** Features of normal IOP - Factors influencing the IOP - Measurement of IOP.
Unit II	**Lens:** Function of lens - Lens transparency - Lens culture - Changes in ageing lens - Cataract – overview. **Accommodation:** Far point, near point, range & amplitude of Accommodation - Mechanism of accommodation – Relaxation theory, Increased tension theory, Role of lens capsule, Gullstrand mechanical model of accommodation - Ocular changes in accommodation - Changes in accommodation. **Vitreous Humour:** Functions –Physicochemical properties. **Retina:** Organization of retina - Functions of retina – Initiation and transmission of visual sensations, Visual perception. **Optic Nerve:** Lesions of the visual pathway - Physiology of optic nerve.
Unit III	**Physiology of eyelid movements:** Opening movements - Closing movements - Muscles of lid closer & opening (orbicularis occulli, levator palpebrae, Muller's muscle) - Peering – Blinking. **Lacrimation:** Lacrimal glands – Functions of Tear film - Tear film dynamics (secretion of tear, formation of tear, retention & redistribution of tear, displacement phenomena, evaporation from tear film, drying & breakup of tear film, dynamic events during blinking, elimination of tear). **Pupil:** Normal pupil - Physiological changes in pupil size - Isocoria - Pupillary unrest - Hippies - Pupillary reflex – Light reflex, Near reflex, Darkness reflex, Psycho sensory reflex, Lid closure reflex – Abnormalities of pupil and pupillary reflexes. **The ocular motor system:** Extra ocular muscles - Functions - Basic Kinematics - Mechanics of actions – Agonist, Antagonist, Synergist and Yoke muscles - Fundamental laws (Donder's, Listing's, Herring's and Sherrington's law) - Ocular Movements (Monocular and Binocular) - Supranuclear eye movement systems.
Unit IV	**Ocular Circulation:** Vascular structure of the eye – ocular circulation, blood-ocular barrier (Blood-retinal, blood Vitreous & blood aqueous barrier). Regulation of ocular circulation. **Neurophysiology of Vision:** Genesis of visual impulse in the photoreceptor – Processing and transmission of visual impulse in the retina – Processing and transmission of visual impulse in the visual pathway – Analysis of visual impulse in the visual cortex. **Visual acuity:** Visual angle - Components of Visual acuity - Factors affecting - Measurement of visual acuity. **Visual Adaptation:** Dark adaptation curve - Mechanism of dark adaptation - Factors influencing dark adaptation - Time course of light adaptation - Mechanism of light adaptation - Rod vs. cone light adaptation.
Unit V	**Electrophysiology of retina and visual pathway:** ERG, EOG, VER **Contrast Sensitivity:** Types - Neural Mechanism – Factors affecting contrast sensitivity - Measurement of contrast sensitivity – Diagnostic applications. **Colour vision:** Theories of colour vision – Neurophysiology of colour vision – Normal colour attributes – Colour blindness – Tests for colour vision. **Binocular vision:** Grades of binocular vision - Advantages of binocular vision – Visual space v/s physical

	space – Visual directions – NRC – Horopter – Physiologic diplopia – Panum's area – Disturbances in the development of fusion - Diplopia, Supression , Amblyopia and ARC.

References

1. A Remington: *Clinical Anatomy of the Visual System*, Second edition, Elsevier Butterworth Heinemann, Missouri, USA, 2005.
2. *Clinical Ocular Physiology* – Nagi Hang Victor Chong, Butterworth Heinemann
3. AK Khurana, Indu Khurana: *Anatomy and Physiology of Eye*, Second edition, CBS Publishers, New Delhi, 2006
4. RD Ravindran: *Physiology of the eye*, Arvind eye hospitals, Pondicherry, 2001
5. PL Kaufman, A Alm: *Adler's Physiology of the eye clinical application*, 10th edition, Mosby, 2002

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://www.aao.org/

https://pubmed.ncbi.nlm.nih.gov/

Course Outcomes		**Knowledge level**
CO-1	Recall the working of eye lid, lacrimal apparatus and extra ocular muscles	K2
CO-2	Understand the cornea aqueous secretion and dynamics	K2
CO-3	Apply the knowledge of crystalline lens and accommodation for curing eye anomalies	K3
CO-4	Evaluate the problems associated with retina and acuity of vision	K5
CO-5	Appreciate the knowledge gained on ocular physiology in rectifying defects in colour vision	K4

Course designed by **Aswathi S R**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	M (2)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
CO2	L (1)	M (2)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
CO3	L (1)	M (2)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
CO4	L (1)	M (2)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
CO5	L (1)	M (2)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)
W.AV	**1**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M (2)	L (1)	L (1)	L (1)	L (1)
CO2	M (2)	L (1)	L (1)	L (1)	L (1)
CO3	M (2)	L (1)	L (1)	L (1)	L (1)
CO4	M (2)	L (1)	L (1)	L (1)	L (1)
CO5	M (2)	L (1)	L (1)	L (1)	L (1)
W.AV	**2**	**1**	**1**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

II - Semester					
CC	**Course code: 91425**	**Physical Optics**	**T**	**Credits: 4**	**Hours: 4**
Pre-requisite	**Basic Knowledge of Physical Behaviour of Light**		**Syllabus revised**		**2023- 24**

Course Objectives

1. To acquaint with wave and quantum concepts of light.
2. To learn interference of light and also to gain information about thin film anti-reflection coating.
3. To study diffraction and resolution of optical instruments.
4. To learn different states of polarization.
5. To provide basic information about lasers, holography and photometry.

Unit I	**Huygens' Principle**: Laws of reflection and refraction at a plane surface. Wave equation, Wave velocity & group velocity; determination of velocity of light (any one method). Simple harmonic waves - mathematical representation; Super position of simple harmonic waves.
Unit II	**Interference:** Coherence – Temporal coherence, Spatial coherence. Path and phase difference. Theory of interference fringes - intensity distribution infringes. Young's double slit experiment- fringe width. Fresnel's biprism, Lloyd mirror - visibility of fringes in them. Interference in thin films - Newton's ring experiment – Formation of images due to reflected and transmitted light, air wedge. Thin film anti-reflection coatings.
Unit III	**Diffraction:** Fresnel and Fraunhofer diffraction, zone plates. Diffraction by single slit, double slit, multiple slit. Diffraction grating- transmission and reflection. Diffraction by circular aperture - airy pattern. Dispersion by grating - dispersive power, resolution, Rayleigh's criterion – resolution of microscope and telescope.
Unit IV	**Polarization:** Linearly polarized light - Production of linearly polarized light. Anisotropic crystals – calcite crystal. Linear polarizers – Nicol prism, Polaroid sheets. Malus' law – nicol prism as polarizer and analyser. Circularly and elliptically polarized light. Retarders - quarter wave and half wave plates - analysis of light of unknown polarization – Optical activity – Scattering of light – Raman effect.
Unit V	Laser fundamentals - spontaneous and stimulated emissions – Einstein's theory – Population inversion, lasing action – ruby laser. Laser in ophthalmic surgery. Holography – basic principle, some applications. Spectrum - emission and absorption spectra - classification (visible, ultraviolet, infrared). Measurement of light – radiometry and photometry – photometric units – photopic and scotopic efficiency and efficacy curves.

References

1. Pedrotti L S, Pedrotti Sr. F L - *Optics and vision* - Prentice hall, New Jersey, USA.
2. Keating - *Geometrical, physical and visual optics* - Butter Worth – Heinemann, Massachusetts, USA.
3. Tunnacliffe A H, Hirst J G – *Optics* - the association of British opticians - London, USA.
4. Charles A Bennett - *Principles of physical optics* - Wiley.

Related online content (MOOC, Swayam, NPTEL, Website etc.)

http://www.opticsforhire.com

http://linkspringer.com

Course Outcomes		**Knowledge level**
CO-1	Understand fundamental concepts of dual nature of light.	K2
CO-2	Distinguish between interference and diffraction.	K4
CO-3	Discuss polarizers and analysers.	K3
CO-4	Acquine basic knowledge of lasers and holography.	K2
CO-5	Predict the distribution of light under various conditions.	K5

Course designed by **Unni Naduvilapatt**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)
CO2	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)
CO3	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)
CO4	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)
CO5	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)
W.AV	**1**	**1**	**1**	**3**	**1**	**2**	**1**	**1**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M (2)	L (1)	M (2)	L (1)	L (1)
CO2	M (2)	L (1)	M (2)	L (1)	L (1)
CO3	M (2)	L (1)	M (2)	L (1)	L (1)
CO4	M (2)	L (1)	M (2)	L (1)	L (1)
CO5	M (2)	L (1)	M (2)	L (1)	L (1)
W.AV	**2**	**1**	**2**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

II - Semester					
CC	**Course code: 91426**	**Practical – Physical & Geometrical Optics**	**P**	**Credits: 3**	**Hours: 6**
Pre-requisite	**Basic Knowledge of**		**Syllabus revised**		**2023- 24**
Course Objectives	1. To study properties of image formed by spherical mirrors. 2. To determine power of a single lens and combination of lenses. 3. To locate and measure the cardinal points of a lens system. 4. To familiarize with spectrometer experiments. 5. To demonstrate Malu's law using polarizer and analyser.				

Unit I	Image formation by spherical mirrors Spherical lenses – power determination liquid lens
Unit II	Refraction through a glass slab Spherometer – radius of curvature Refractive index of a transparent liquid by travelling microscope
Unit III	Spectrometer – solid prism (ci – d curve) Spectrometer – dispersive power of a prism Spectrometer – grating constant
Unit IV	Nodal slide – cardinal points Newton's rings – wavelength measurement Air wedge
Unit V	Verification of Malu's law using polarizer and analyser. Demonstration of birefringence using calcite crystals.

References

1. *Simple experiments in optics* – Roshan Aggarwal and Kambiz Alavi
2. *Optics experiments and demonstration for student laboratories* – Stephan G Lipson
3. *A practical guide to experimental geometrical optics* – Yuriy A Garboviskiy, Anatoliy V. Glush chenko

Course Outcomes		**Knowledge level**
CO-1	Understand imaging by spherical mirrors and lenses	K2
CO-2	Estimate power of combination of lenses	K6
CO-3	Analyze thin film interferences	K4
CO-4	Evaluate dispersive power of a prism	K5
CO-5	Categorize polarizer and analyser	K3

Course designed by **Unni Naduvilapatt**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)
CO2	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)
CO3	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)
CO4	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)
CO5	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)
W.AV	**1**	**1**	**1**	**3**	**1**	**2**	**1**	**1**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M (2)	L (1)	M (2)	L (1)	L (1)
CO2	M (2)	L (1)	M (2)	L (1)	L (1)
CO3	M (2)	L (1)	M (2)	L (1)	L (1)
CO4	M (2)	L (1)	M (2)	L (1)	L (1)
CO5	M (2)	L (1)	M (2)	L (1)	L (1)
W.AV	**2**	**1**	**2**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

II - Semester					
Allied	**Course code: 91427**	**Microbiology & Pathology**	**T**	**Credits: 4**	**Hours: 4**
Pre-requisite	**Basic Knowledge of Microorganisms and Ocular pathology**		**Syllabus revised**		**2023- 24**

Course Objectives	1. To familiarize basic information about microbiology and microorganisms. 2. To provide knowledge in ocular bacterial infections. 3. To learn about ocular viral, fungal and parasitic infections 4. To impart a detailed knowledge on diseases associated with eyes. 5. To deliver knowledge on the cornea and retina with the associated pathology.
Unit I	**Introduction to microbiology:** Definition of microbiology and Ocular microbiology, Normal ocular flora. Morphology of bacteria, fungi, and virus. Culture media (Introduction Only).Sterilization and disinfection – Physical and chemical methods. General immune system, structure and function of immunoglobulin. Basic laboratory Techniques- Collection of specimens; Conjunctiva swab, Lacrimal sac, Scrapings from corneal ulcer, AC and Vitreous tapings.
Unit II	**Ocular Bacteriology:**Clinical importance, ocular lesionsand treatment of: **Gram positive cocci -** *Staphylococci, Streptococci, Pneumococci*; **Gram negative cocci –**Gonococci and Meningococci, Chlamydia; **Gram positive bacilli** – *Corynebacterium diphtheriae*;**Gram Negative bacilli** –*Pseudomonas, Moraxella, Haemophilus*;**Mycobacteria** – *M. Tuberculosis, M. leprae*; **Spirochetes** – *Treponema pallidum, Leptospira.*
Unit III	**Ocular Virology:** Clinical importance, ocular lesions and treatment of Common virus – Poxvirus, Adenovirus, Picornavirus, Rubella and Retro virus. **Ocular Parastiology:** Clinical importance, ocular lesions and treatment of Acanthameoba, Toxocara, Filaria, Toxoplasma. **Ocular Mycology:** Clinical importance, ocular lesions and treatment of Common fungi- Fusarium, Mucor, Candida, Histoplasma.
Unit IV	**General Pathology:** Tissue injury, vascular and cellular components involved in inflammation. Heating and Repair – Role of Vascular and Cellular component
Unit V	**Ocular pathology:** Eye lids – Chalazion, Hordeolum internum and Hordeolum externum; Conjuctiva - conjunctivitis; Cornea - Ulcers and Keratoconus; Lens - Pathology of cataract, types, Lens induced glaucoma & uveitis and Diabetic cataract. Tumours – Retinoblastoma, Malignant Melanoma, Squamous cell carcinoma, Lacrimal gland tumors, Orbital tumors & pseudo tumors.

References

1. Ananthanarayan R and Paniker CKJ. (2005). *Textbook of Microbiology*. 7th edition (edited by Paniker CKJ).
2. Willey JM, Sherwood LM, and Woolverton CJ. (2008) *Prescott, Harley and Klein'sMicrobiology*. 7th edition. McGraw Hill Higher Education.
3. *Microbiology: An Introduction* by Tortora GJ, Funke BR, and Case CL
4. *General microbiology* by Stanier et al
5. *Clinical Ocular Pathology* – John Harry- Gery Misson, Butterworth Heinemann
6. *Pathological Basis of the diseases* - Robins & Kumar : 4th Edn.

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://microbenotes.com

https://www.ncbi.nlm.nih.gov/

Course Outcomes		**Knowledge level**
CO-1	Understand the basic information about microorganisms and microbiology.	K2
CO-2	Discuss about bacterial infections and treatment in ocular aspects.	K4
CO-3	Acquire knowledge of pathogenesis; treatment and prophylaxis of various viral, fungal and parasitic lesions occur in eyes.	K4
CO-4	Recall the diseases associated with eyes.	K2
CO-5	Understanding the pathology of cataract.	K4

Course designed by **Janisha I** & **Aswathi S R**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	S (3)	M (2)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)
CO2	L (1)	S (3)	M (2)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)
CO3	L (1)	S (3)	M (2)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)
CO4	L (1)	S (3)	M (2)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)
CO5	L (1)	S (3)	M (2)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)
W.AV	**1**	**3**	**2**	**1**	**1**	**1**	**1**	**3**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M (2)	L (1)	M (2)	L (1)	L (1)
CO2	M (2)	L (1)	M (2)	L (1)	L (1)
CO3	M (2)	L (1)	M (2)	L (1)	L (1)
CO4	M (2)	L (1)	M (2)	L (1)	L (1)
CO5	M (2)	L (1)	M (2)	L (1)	L (1)
W.AV	**2**	**1**	**2**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

III - Semester					
CC	**Course code: 91433**	**Visual Optics**	**T**	**Credits: 4**	**Hours: 4**
Pre-requisite	**Basic Knowledge of optics of the eye**		**Syllabus revised**		**2023- 24**

Course Objectives	1. To understand the fundamentals of optical components of the eye. 2. To gain theoretical knowledge and practical skill on visual acuity measurement. 3. Clinical approach in diagnosis and management of various types of refractive errors. 4. To educate on accommodation and presbyopia management. 5. To gain theoretical knowledge and practical skill on objective and subjective clinical refraction.
Unit I	**Optics of ocular structure:** cornea, aqueous, crystalline lens, Vitreous - Schematic and reduced eye - Aberration of the eye – Purkinje images - **Measurement of optical constant of the eye:** corneal curvature and thickness, keratometry, lens curvature, axial and axis of the eye - **Basic aspects of vision:** visual acuity, colour vision, contrast sensitivity, light and dark adaptation.
Unit II	**Refractive conditions:** Myopia, Hyperopia, Astigmatism, Anisometropia, Aniseikonia, Aphakia and pseudophakia - **Refractive anomalies and their causes:** Etiology of refractive anomalies, Contributing variability and their ranges, Populating distributions of anomalies - **Optical component measurements:** Growth of the eye in relation to refractive errors.
Unit III	**Accommodation:** Mechanism of accommodation, Scheiner's disc experiment, changes in the lens during accommodation, Far point and near point of accommodation, range of accommodation, amplitude of accommodation and its measurements, Relationship between accommodation and convergence, AC/A ratio - **Presbyopia:** etiology, types, sign, symptoms and management.
Unit IV	Ocular refraction (K), Spectacle refraction (F) and relationship between spectacle refraction (F) and ocular refraction (K) - Ocular accommodation versus spectacle accommodation - Vertex distance and the effect of vertex distance change - Depth of field and Depth of focus - **Magnification:** Spectacle magnification, ocular magnification and relative spectacle magnification.
Unit V	**Retinoscopy:** Principle, procedures and clinical application of Retinoscopy - **Review of subjective refractive methods:** Cross cylinder methods for astigmatism, Astigmatic Fan Test - Difficulties in subjective and objective tests and their avoidance - Binocular balancing and refraction – Prescribing prisms.

References

1. A H Tunnacliffe: *Visual optics*, The Association of British Optician, 1987
2. AG Bennett & RB Rabbets: *Clinical Visual optics*, 3rd edition, Butterworth Heinemann, 1998
3. WJ Benjamin: *Borish's clinical refraction*,2nd edition, Butterworth Heinemann, Missouri, USA,2006
4. T Grosvenor: *Primary Care Optometry*,4th edition, Butterworth – heinneman,USA,2002
5. A K Khurana: *Theory and practice of Optics and Refraction* – 5th Edition - Elsevier

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://www.aphys.kth.se/biox/research/vio/visual-optics

https://pubmed.ncbi.nlm.nih.gov/

Course Outcomes		**Knowledge level**
CO-1	Describe the geometrical optical properties of the eye, as well as its deficiencies such as refractive error, astigmatism and higher order aberrations.	K2
CO-2	Understand how ocular performance tests such as visual acuity and contrast sensitivity relate to optical engineering performance metrics.	K3
CO-3	Explain the optics of the human eye as an image formation system and be able to compare it to a camera.	K2
CO-4	Acquire knowledge in diagnosis and management of refractive errors.	K4
CO-5	Acquire objective and subjective refraction techniques.	K5

Course designed by **Aswathi S R**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	S (3)	S (3)	S (3)	M (2)	M (2)	L (1)	S (3)	L (1)	M (2)
CO2	L (1)	S (3)	S (3)	S (3)	M (2)	M (2)	L (1)	S (3)	L (1)	M (2)
CO3	L (1)	S (3)	S (3)	S (3)	M (2)	M (2)	L (1)	S (3)	L (1)	M (2)
CO4	L (1)	S (3)	S (3)	S (3)	M (2)	M (2)	L (1)	S (3)	L (1)	M (2)
CO5	L (1)	S (3)	S (3)	S (3)	M (2)	M (2)	L (1)	S (3)	L (1)	M (2)
W.AV	**1**	**3**	**3**	**3**	**2**	**2**	**1**	**3**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M (2)	L (1)	S (3)	L (1)	M (2)
CO2	M (2)	L (1)	S (3)	L (1)	M (2)
CO3	M (2)	L (1)	S (3)	L (1)	M (2)
CO4	M (2)	L (1)	S (3)	L (1)	M (2)
CO5	M (2)	L (1)	S (3)	L (1)	M (2)
W.AV	**2**	**1**	**3**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

III - Semester					
CC	**Course code: 91434**	**Optometric Optics**	**T**	**Credits: 3**	**Hours: 3**
Pre-requisite	**Basic Knowledge of Ophthalmic lenses**		**Syllabus revised**		**2023- 24**

Course Objectives	1. Measurement of lens power, lens centration using conventional techniques. 2. Transposition of various types of lenses and Knowledge to identify different forms of lenses (equi-convex, planoconvex, periscopic, etc.) 3. Knowledge to select the tool power for grinding process, measurement of surface powers using lens measure and method of laying off the lens for glazing process. 4. Ophthalmic prism knowledge –effects, units, base-apex notation, compounding and resolving prisms. 5. Knowledge of different types of materials used to make lenses and its characteristics.
Unit I	**Introduction to Spectacle Lenses:** Forms of Lenses- Cylindrical and Sphero-cylindrical Lenses - Properties of Crossed Cylinders- Toric Lenses- Toric Transportation- Astigmatic Lenses- Axis Direction of Astigmatic Lenses- Obliquely Crossed Cylinders- Sag Formula- Miscellaneous Spectacle Lenses- Vertex Distance and Vertex Power- Tilt Induced Power- Aberrations in Ophthalmic Lenses- Fresnel Prisms- Lenses and Magnifiers.
Unit II	Manufacture of Glass- Lens Surfacing- Principle of Surface Generation and Glass Cements. Faults in Lens Material- Faults on Lens Surface- Inspecting the Quality of Lenses Toughened Lenses.
Unit III	Definition of Prisms- Units of Prism Power- Thickness difference and Base-Apex Notation - Dividing-Compounding and Resolving Prisms- Rotary Prisms and Effective Prism Power in Near Vision-Prismatic Effect- Decentration -Prentice's Rule- Prismatic Effect of Sphero-cylinders and Plano Cylinders- Differential Prismatic Effects.
Unit IV	Frame Types and Parts Classification of Spectacle Frames – Material, Weight, Temple Position, Coloration; Frame Construction- Frame Measurements and Markings.
Unit V	Magnification in high plus lenses, Minification in high minus lenses - Aberration in Ophthalmic Lenses.

References

1. Jalie M: *The principles of Ophthalmic Lenses*, The Association of Dispensing Opticians, London, 1994.
2. David Wilson: *Practical Optical Dispensing*, OTEN- DE, NSW TAFE Commission,1999.
3. C V Brooks, IM Borish: *System for Ophthalmic Dispensing*, Second edition, ButterworthHeinemann, USA, 1996.
4. *Practice of Refraction* = Duke Elders, Edn. 9 1991.
5. *Optics for Clinicians* = MELVIN L RUBIN, Triad, 2nd Edition, 1974

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://pubmed.ncbi.nlm.nih.gov/

https://www.visioncenter.org/eyeglasses/prism/

Course Outcomes		**Knowledge level**
CO-1	Recall the types of optical lenses.	K1
CO-2	Understand the properties of optical lenses through laws of physics.	K2
CO-3	Apply the knowledge on optical properties in lens manufacturing.	K3
CO-4	Analyze the quality of lenses.	K4
CO-5	Identify the type of spectacle frames.	K4

Course designed by **Nigin C Philipose**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	L (1)	M (2)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	L (1)
CO2	L (1)	L (1)	M (2)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	L (1)
CO3	L (1)	L (1)	M (2)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	L (1)
CO4	L (1)	L (1)	M (2)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	L (1)
CO5	L (1)	L (1)	M (2)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	L (1)
W.AV	**1**	**1**	**2**	**3**	**1**	**3**	**1**	**1**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M (2)	L (1)	M (2)	L (1)	L (1)
CO2	M (2)	L (1)	M (2)	L (1)	L (1)
CO3	M (2)	L (1)	M (2)	L (1)	L (1)
CO4	M (2)	L (1)	M (2)	L (1)	L (1)
CO5	M (2)	L (1)	M (2)	L (1)	L (1)
W.AV	**2**	**1**	**2**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

III - Semester					
CC	**Course code: 91435**	**Ocular Diseases - I**	**T**	**Credits: 4**	**Hours: 4**
Pre-requisite	**Basic Knowledge of Diseases affecting anterior segment of the eye**		**Syllabus revised**		**2023- 24**
Course Objectives	1. To gain knowledge on the etiology, epidemiology, symptoms, signs, course sequelae of ocular diseases. 2. To acquire knowledge on diagnostic approach, and management of the ocular diseases. 3. To understand pathogenesis of disease and the implications of ocular health and function. 4. To be knowledgeable in ocular and laboratory testing used in the assessment of systemic, visual and ocular function. 5. To understand and identify glaucoma and diseases affecting eyelid, lacrimal apparatus, conjunctiva, cornea, sclera, uveal tissue and lens.				

Unit I	**Disease of the Lids:** Congenital Deformities of the Lids - Oedema of the Lids - Inflammatory Conditions of the Lids - Deformities of the Lid Margins - Deranged Movement of the Eyelids - Neoplasm's of the Lids - Injuries of the Lids. **Diseases of the Lachrymal Apparatus:** Dry Eye – Watering Eye - Disease of the Lachrymal Gland - Disease of the Lachrymal Passages.
Unit II	**Disease of the Conjunctiva:** Subconjunctival Haemorrhage - Infective Conjunctivitis - Follicular Conjunctivitis - Granulomatous Conjunctivitis - Allergic Conjunctivitis - Conjunctivitis Associated with Skin conditions - Degenerative conditions of the Conjunctiva - Vitamin- A Deficiency - Cysts and Tumours of the Conjunctiva - Conjunctival Pigmentation - Injuries of the Conjunctiva.
Unit III	**Disease of the Cornea:** Congenital Anomalies - Inflammation of the Cornea (Keratitis) - Superficial Keratitis - Deep Keratitis - Vascularisation of Cornea - Opacities of the Cornea – Keratoplasty - Corneal Degenerations - Corneal Dystrophy's - Corneal Pigmentation - Corneal Injuries - Refractive Corneal Surgery - Corneal Ulcer (Bacterial , Viral , Fungal). **Disease of the Sclera:** Episcleritis – Scleritis - Staphyloma of the Sclera - Blue Sclerotic Scleromalacia Performs – Nanophthalmos - Injuries of the Sclera.
Unit IV	**Disease of the Iris:** Congenital Anomalies - Inflammations (Anterior Uveitis) - Specific Types of Iridocyclitis - Degenerations of the Iris - Cysts and Tumours of the Iris - Injuries of the Iris. **Disease of the Ciliary Body:** Inflammations of the Ciliary Body – Purulent Iriodocyclitis (Panophthalmitis) – Evisceration - Sympathetic Ophthalmia - Vogt- Koyanagi - Harada Syndrome - Tumours of the Ciliary body - Injuries of the Ciliary body.
Unit V	**Glaucoma:** Developmental Glaucoma (Buphthalmas) - Primary Narrow Angle Glaucoma - Primary Open Angle Glaucoma - Normotensive Glaucoma - Ocular Hypertension - Secondary Glaucoma - Surgical Procedures for Glaucoma (Steps Only), YAGPI, trabeculectomy - Laser Procedure in Glaucoma - Artificial Drainage Devices in Glaucoma Surgery (Molteno). **Disease of the Lens:** Congenital Malformations – Cataract - Congenital and Developmental Cataract - Senile Cataract - Traumatic Cataract - Complicated Cataract - Secondary Cataract - After Cataract - Dislocation of the Lens - Surgical Procedures for Removal of the Lens (Operative Steps Only) – Phacoemulsification (ICCE,ECCE,IOL) - Small Incision Cataract Surgery (Manual Phaco) - Intra- ocular Lens Implantation- AC+PC, IOL.

References

1. A K Khurana: *Comprehensive Ophthalmology*, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007
2. Stephen J. Miller : *Parsons Diseases of the Eye*, 18th edition, Churchill Livingstone, 1990
3. Jack J. Kanski *Clinical Ophthalmology: A Systematic Approach*, 6th edition, Butterworth - Heinemann, 2007

Related online content (MOOC, Swayam, NPTEL, Website etc.)		
https://pubmed.ncbi.nlm.nih.gov/		
https://www.cdc.gov/visionhealth/basics/ced/index.html		
Course Outcomes		**Knowledge level**
CO-1	Understand various ocular diseases affecting various parts of the eyes.	K2
CO-2	Analyze clinical signs and symptoms, cause, patho-physiological mechanism, diagnostic approach, differential diagnosis and management aspects of the ocular diseases.	K4
CO-3	Ability to interpret and investigate the presenting symptoms of the patient.	K5
CO-4	Ability to recognize common ocular abnormalities and to refer when appropriate.	K5
CO-5	An understanding of risk factors for common ocular conditions.	K3
Course designed by **Aswathi S R**		

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	S (3)	S (3)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)
CO2	L (1)	S (3)	S (3)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)
CO3	L (1)	S (3)	S (3)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)
CO4	L (1)	S (3)	S (3)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)
CO5	L (1)	S (3)	S (3)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)
W.AV	**1**	**3**	**3**	**1**	**1**	**1**	**1**	**3**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S (3)	L (1)	S (3)	L (1)	M (2)
CO2	S (3)	L (1)	S (3)	L (1)	M (2)
CO3	S (3)	L (1)	S (3)	L (1)	M (2)
CO4	S (3)	L (1)	S (3)	L (1)	M (2)
CO5	S (3)	L (1)	S (3)	L (1)	M (2)
W.AV	**3**	**1**	**3**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

III - Semester					
CC	**Course code: 91436**	**Practical – Visual & Optometric Optics**	**P**	**Credits: 3**	**Hours: 5**
Pre-requisite	**Basic Knowledge of**		**Syllabus revised**		**2023- 24**
Course Objectives	1. To acquire knowledge to identify different types of lenses. 2. To understand the conversion of spectacle power into different forms. 3. To acquire knowledge to find out the power of an unknown lens. 4. To learn pupillary examination, AC grading and inter-pupillary distance measurement. 5. To educate on visual acuity assessment.				
Unit I	Lens Identification: Concave and convex lens - Sphere, Cylinder and Spherocylinder				
Unit II	Axis marking – Single, Bifocal, PAL. Transposition - Simple and Toric				
Unit III	Neutralization - Hand neutralization and Lensometer.				
Unit IV	Pupillary examination – Direct, Consensual, Swinging flash light test. AC depth – grading. IPD marking – Monocular PD, Binocular PD, Pupillometer.				
Unit V	Visual acuity – Distance and near vision charts, procedure, interpretation.				

Course Outcomes		**Knowledge level**
CO-1	Acquire practical knowledge and skill to identify the ophthalmic lenses.	K3
CO-2	Understand methods to convert optical power from one form to other.	K3
CO-3	Ability to find out optical power of an unknown lens.	K4
CO-4	Evaluate pupillary reaction, anterior chamber depth and to measure interpupillary distance.	K5
CO-5	Acquire practical skill to measure visual acuity.	K5

Course designed by **Aswathi S R**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
CO2	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
CO3	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
CO4	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
CO5	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
W.AV	**2**	**2**	**3**	**3**	**2**	**3**	**2**	**1**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M (2)	S (3)	S (3)	L (1)	M (2)
CO2	M (2)	S (3)	S (3)	L (1)	M (2)
CO3	M (2)	S (3)	S (3)	L (1)	M (2)
CO4	M (2)	S (3)	S (3)	L (1)	M (2)
CO5	M (2)	S (3)	S (3)	L (1)	M (2)
W.AV	**2**	**3**	**3**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

III - Semester					
Allied	**Course code: 91437**	**General & Ocular Pharmacology**	**T**	**Credits: 4**	**Hours: 4**
Pre-requisite	**Basic Knowledge of General and Ocular drugs.**		**Syllabus revised**		**2023- 24**

Course Objectives	1. To gain knowledge in basic principles of Pharmacokinetics and Pharmacodynamics. 2. To acquire knowledge in commonly used ocular drugs, mechanism, indications, contraindications, drug dosage, and adverse effects. 3. To learn actions, uses adverse effects and mode of administration of drugs for various diseases. 4. To learn about analgesics, anesthetic drugs and NSAIDs. 5. To acquire the knowledge about ophthalmic drugs.
Unit I	Nature & Sources of drug - Routes of drug administration (general & Ocular) - New drug delivery systems - Absorption & factors effecting drug absorption - Distribution & factors effecting drug distribution - Drug metabolisms – Liver first pass mechanism, Phase I and Phase II reaction - Factors effecting drug metabolism - Drug excretion & toxicity.
Unit II	Classification of drugs - Drug action - site of drug action, structure activity relationship - Drug receptor - Mechanism of drug action - Dose response relationship - Adverse drugs reactions (ADR) in man - Manifestations of ADR - Treatment of Acute drug poisoning.
Unit III	Drug action on the nervous system - General Considerations - Aliphatic Alcohol's - General Anesthetics - Sedatives, Hypnotics and Pharmacotherapy of Insomnia - Drugs Effective in Convulsive Disorders - Opioid Analgesics - Analgesic – Antipyretics and Non-steroidal Anti- inflammatory Drugs (NSAID) - Central Nervous System Stimulants - Local Anesthetics - Cocaine, Procaine and Other Synthetics Local Anesthetics.
Unit IV	Autonomic Nervous System - Types, Classification and functions of Adrenergic and Cholinergic receptors - Adrenergic and Adrenergic Blocking Drugs - Cholinergic and anti-cholinergic drugs.
Unit V	Preparation and packaging of ophthalmic drugs - Drug action and effectiveness - Ocular penetration - Ophthalmic diagnostic drugs - Topical anaesthetics - Ophthalmic Drugs – antibiotics, corticosteroids, anaesthetics, viscoelastics agents and Antiglaucomic drugs.

References

1. K D TRIPATHI: *Essentials of Medical Pharmacology*. 5th edition, Jaypee, New Delhi, 2004
2. Ashok Garg: *Manual of Ocular Therapeutics*, Jaypee, NewDelhi, 1996
3. T J Zimmerman, K S Kooner, M Sharir, R D Fechtner: *Text Book of Ocular Pharmacology*, Lippincott-Raven, Philadelphia, 1997

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://www.pharmacology2000.com/

https://pubmed.ncbi.nlm.nih.gov/

Course Outcomes		**Knowledge level**
CO-1	Understand the term Pharmacokinetics and Pharmacodynamics	K2
CO-2	Discuss ocular drugs its mechanism, indications, contraindications, drug dosage, and adverse effects.	K3
CO-3	Acquire knowledge about route of administration of drugs.	K4
CO-4	Understand main classifications of drugs and its clinical application.	K2
CO-5	Acquire knowledge about major ocular drugs and its clinical application.	K5

Course designed by **Aswathi S R**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	M (2)	S (3)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)
CO2	L (1)	M (2)	S (3)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)
CO3	L (1)	M (2)	S (3)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)
CO4	L (1)	M (2)	S (3)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)
CO5	L (1)	M (2)	S (3)	L (1)	M (2)	L (1)	L (1)	L (1)	L (1)	L (1)
W.AV	**1**	**2**	**3**	**1**	**2**	**1**	**1**	**1**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M (2)	L (1)	S (3)	L (1)	L (1)
CO2	M (2)	L (1)	S (3)	L (1)	L (1)
CO3	M (2)	L (1)	S (3)	L (1)	L (1)
CO4	M (2)	L (1)	S (3)	L (1)	L (1)
CO5	M (2)	L (1)	S (3)	L (1)	L (1)
W.AV	**2**	**1**	**3**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

IV - Semester					
CC	**Course code: 91443**	**Optometric Instrumentation & Clinical Examination of the Visual System (CEVS)**	**T**	**Credits: 4**	**Hours: 5**
Pre-requisite	**Basic Knowledge of optometric instruments and clinical tests**		**Syllabus revised**		**2023- 24**
Course Objectives	1. To illustrate the basic principles, features, merits and demerits of different refractive instruments. 2. To impart knowledge on the design and usage of ophthalmoscopes and other related devices. 3. To demonstrate various orthoptic and ophthalmic instruments and screening devices. 4. To impart knowledge on Ocular symptoms, testing and ophthalmic examination. 5. To provide knowledge on lacrimal and macular examinations.				
Unit I	Binoculars, Simple and Compound Microscopes (with Huygens and Ramsden Eye pieces and oil immersion objectives), Spectrometer and Radiuscope. Trial set and Trial frame, Refractor (phoropter), Lensometer, History taking, Visual acuity assessment, Objective Refraction - Autorefractometer , types of Retinoscope, static and dynamic retinoscopy, Other methods of Retinoscopy.				
Unit II	Subjective Refraction - Monocular Distance – fogging, testing of astigmatism under fog, fixed astigmatic dial (clock dial), rotary astigmatic dial, combination of fixed and rotary dial (Fan and Block test), J.C.C, Duochrome or Bichrome, Binocular balancing – alternate occlusion, prism dissociation, dissociated duochrome balance, Borish dissociated fogging, equalization Binocular Distance – T.I.B. (Turville Infinity Balance), Polarized – Target and polarized filter, fogging. Near subjective refraction. Cycloplegic refraction, cyclodemia, sudden unfogging, Borish delayed spherical end point, pinhole estimation of refractive error. Different methods of measuring amplitude of accommodation. Correction of Presbyopia – Different methods of stimulation of tentative presbyopic addition – amplitude of accommodation, NRA-PRA balance, Bichrome, Plus Build-up, based on age, Dynamic Retinoscopy, Occupational consideration, finalization of add for near and intermediate. Measurement of IPD and significance - Pupillometer. Final discussion with the patient. Writing prescription of power and counseling.				
Unit III	Slit lamp biomicroscope - Van Herric technique ,External examination of the eye, Lid Eversion, HVID & VVID. Keratometry, Corneal topography, Tonometry, Pachymetry, Ophthalmoscopes and Photostress test.				
Unit IV	Pupils Examination, Squint evaluation - Extraocular motility, Cover test, Hirschberg test, Modified Krimsky, Maddox Rod, Stereopsis. Tear film and dry eye assessment - pH testing & Schimer's test. TBUT, tear meniscus level, NITBUT (keratometer), Fluorescein staining & techniques, syringing& lacrimal function test. Corneal Sensitivity, Saccades and Pursuits. Colour vision test, CS testing / Glare test.				
Unit V	OCT, F.F.A, Fields Of Vision And Screening Devices - Confrontation test, Amsler test, Perimeter. Gonioscopy , Scans Ultrasonography – A scan, B scan. ERG, EOG, EMG, ENG, VER or VEP. Adaptation &adaptometry, berman's locator, cryo technique, diathermy & photo-coagulation. PAM, Brightness acuity test, Abberometer, Ophthalmic LASER application (Argon, Yag).				

References

1) David B Henson: *Optometric Instrumentation*, Butterworth-Heinemann Ltd (1 December 1982)
2) *Clinical Examination in Ophthalmology*, Dr. Mukherjee P. K
3) *Clinical Methods in Ophthalmology: A Practical Manual for Medical Students*, Dadapeer K, Jaypee Brothers Medical Publishers, January 2015
4) *Optometric Instrumentation* - Santosh K. Kumar
5) *Primary Care Optometry* - Theoder Grosvenor

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://pubmed.ncbi.nlm.nih.gov/

https://www.aao.org/eye-health

Course Outcomes		Knowledge level
CO-1	Understand the various topics related to refractive instruments	K2
CO-2	Discuss about the design, features and advantages of retinoscope, ophthalmoscope and related devices	K3
CO-3	Understand the basics of Ophthalmic subject, symptoms and testing in visual system	K3
CO-4	Examine various steps involved in Ophthalmic treatment	K4
CO-5	Appraise on the results of various vision testing and screening devices	K5
Course designed by **Aswathi S R**		

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S (3)	M (2)	S (3)	M (2)	M (2)	L (1)	L (1)	L (1)	L (1)	M (2)
CO2	S (3)	M (2)	S (3)	M (2)	M (2)	L (1)	L (1)	L (1)	L (1)	M (2)
CO3	S (3)	M (2)	S (3)	M (2)	M (2)	L (1)	L (1)	L (1)	L (1)	M (2)
CO4	S (3)	M (2)	S (3)	M (2)	M (2)	L (1)	L (1)	L (1)	L (1)	M (2)
CO5	S (3)	M (2)	S (3)	M (2)	M (2)	L (1)	L (1)	L (1)	L (1)	M (2)
W.AV	**3**	**2**	**3**	**2**	**2**	**1**	**1**	**1**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S (3)	L (1)	S (3)	L (1)	L (1)
CO2	S (3)	L (1)	S (3)	L (1)	L (1)
CO3	S (3)	L (1)	S (3)	L (1)	L (1)
CO4	S (3)	L (1)	S (3)	L (1)	L (1)
CO5	S (3)	L (1)	S (3)	L (1)	L (1)
W.AV	**3**	**1**	**3**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

IV - Semester					
CC	**Course code: 91444**	**Ocular Diseases - II**	**T**	**Credits: 4**	**Hours: 4**
Pre-requisite	**Basic Knowledge of Diseases affecting posterior segment of the eye**		**Syllabus revised**		**2023- 24**
Course Objectives	1. To provide a better understanding of ophthalmology, with reference to ocular diseases 2. To disseminate the knowledge on inflammation and complication caused in the vitreous body 3. To impart knowledge on the posterior segment trauma and blindness 4. To impart knowledge on the etiology, epidemiology, symptoms, signs, course sequelae of ocular disease, diagnostic approach, and Management of the ocular diseases. 5. To disseminate the knowledge on neuro-ophthalmology.				

Unit I	**Diseases of the Vitreous Humor**- Congenital Anomalies, Vitreous Opacities, Hereditary Vitreo – Retinal Degeneration's, Vitreous Haemorrhage, Detachment of Vitreous Humor, Vitreous Surgery, Methods of clinically assessing the posterior segment (direct& indirect opthalmoscopy). **Disease of the Retina** - Congenital & Dev. Defects, Inflammation of the Retina (Retinitis), Retinal Vasculitis, Oedema of the Retina, Haemorrhage of the Retina, Vascular Occlusion, Retinal Arteriosclerosis, Retinopathies, Retinal Telangiectasis, Degeneration's of the Retina, Detachment of the Retina, Surgical Procedures for Retinal Detachment, Tumours of the Retina, Phakomatoses, Injuries of the Retina. **Disease of the Optic Nerve** - Congenital Anomalies, Papilloedema, Inflammation of the Optic Nerve (Optic neuritis), Ischaemic Optic Neuropathy, Optic Atrophy, Tumours of the Optic Nerve, Injuries of the Optic Nerve, Symptomatic Disturbances of Visual Function, Visual Field Defects, Amblyopia, Amaurosis, Night Blindness, Day Blindness, Defects in Color Vision, Congenital Word Blindness, Malingering.
Unit II	**Neuro –Eye Disease** - Evaluation of optic nerve disease, Clinical features of optic nerve dysfunction, Optic disc changes, Optic atrophy, Special investigation, Classification of optic neuritis, Optic neuritis and demyelination, Systemic features of multiple sclerosis, Special investigation, Optic neuritis, Other causes of optic neuritis, Para-infectious optic neuritis, Infectious optic neuritis, Non-arteritic anterior ischaemic optic neuropathy, Arteritic anterior ischaemic optic neuropathy, Clinical features of giant cell arteritis, Special investigation, Leber hereditary optic neuropathy.
Unit III	Hereditary optic atrophies, Kjer syndrome, Behr syndrome, Wolfram syndrome, Alcohol-tobacco amblyopia, Drug-induced optic neuropathies. **Papilloedema -** Raised intracranial pressure, Causes, Hydrocephalus, Systemic features, Clinical features and Differential diagnosis. **Congenital Optic Nerve Anomalies -** Without neurological associations - Tilted disc, Optic disc drusen, Optic disc pit, Myelinated nerve fibers. With neurological associations - Optic disc coloboma, Morning glory anomaly, Optic nerve hypoplasia, Aicardi syndrome, Miscellaneous anomalies.
Unit IV	**Pupillary Reaction** - Applied anatomy, Abnormal pupillary reactions, Afferent pupillary conduction defects, Argyll robertson pupils, Differential diagnosis of light-near dissociation, Adie pupil, oculo-sympathetic palsy (horner syndrome). **Nystagmus –** Classifications, Causes, Physiological nystagmus, Motor imbalance nystagmus, Ocular nystagmus, nystagmoid movements. **Supranuclear Disorder of Eye Movements -** Conjugate eye movements, Saccadic movements, Smooth pursuit movements, Non-optical reflexes, Supranuclear gaze palsies, Horizontal gaze palsies, Vertical gaze palsies. **Third nerve disease -** Applied anatomy, Clinical aspects, Clinical features, Aberrant regeneration, Causes of isolated third nerve palsy. **Fourth nerve disease -** Applied anatomy, Clinical aspects, Clinical features, Causes of isolated fourth nerve palsy.

	Sixth nerve disease - Applied anatomy, Clinical aspects, Clinical features, Causes.
Unit V	**Disorders of chiasm –** Classification, Applied anatomy and physiology – Hyperpituitarism – Hypopituitarism - Pituitary adenoma - Clinical features, Special investigation, Treatment – Craniopharyngioma - Meningioma. **Disorders of retrochiasmal pathways and cortex -** Clinical features of optic tract lesion, Lesions of optic radiations, Applied anatomy, clinlcal features. **Ocular myopathies and related disorders** - Myasthienia gravis - Clinical features, Special investigations, Treatment. Ocular myopathies, Myotonic dystrophy - Systemic features, Ocular features. Essential blepharospasm - Clinical features, Treatment. **Neurofibromatosis** - Neurofibromatosis type-1(NF-1) - Systemic features, Ocular features.

References

1. Jack J. Kanski - *Clinical Ophthalmology: A Systematic Approach*, 6th edition, Butterworth- Heinemann, 2007
2. Stephen J. Miller : *Parsons Diseases of the Eye*, 18th edition, Churchill Livingstone, 1990
3. A K Khurana: *Comprehensive Ophthalmology*, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://pubmed.ncbi.nlm.nih.gov/

https://www.aao.org/eye-health

Course Outcomes		**Knowledge level**
CO-1	List the abnormalities, trauma and inflammation related to vitreous body	K2
CO-2	Discuss in detail about the retinal disorder and related diseases	K3
CO-3	Interpret on the background, defects and techniques involved in neuro-ophthalmology	K4
CO-4	Illustrate clearly on the supranuclear control of eye movements	K4
CO-5	Analyze on the causes, therapy and drug related to ocular diseases	K5

Course designed by **Aswathi S R**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	S (3)	S (3)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)
CO2	L (1)	S (3)	S (3)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)
CO3	L (1)	S (3)	S (3)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)
CO4	L (1)	S (3)	S (3)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)
CO5	L (1)	S (3)	S (3)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	M (2)
W.AV	**1**	**3**	**3**	**1**	**1**	**1**	**1**	**3**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S (3)	L (1)	S (3)	L (1)	M (2)
CO2	S (3)	L (1)	S (3)	L (1)	M (2)
CO3	S (3)	L (1)	S (3)	L (1)	M (2)
CO4	S (3)	L (1)	S (3)	L (1)	M (2)
CO5	S (3)	L (1)	S (3)	L (1)	M (2)
W.AV	**3**	**1**	**3**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

IV - Semester					
CC	**Course code: 91445**	**Practical – Instrumentation & CEVS**	**P**	**Credits: 3**	**Hours: 5**
Pre-requisite	**Basic Knowledge of**		**Syllabus revised**		**2023- 24**

Course Objectives	1. To learn detailed history taking 2. To educate on basic squint evaluation techniques 3. To provide practical knowledge about the defects involved in vision 4. To learn objective refraction through retinoscopy 5. To acquire knowledge on different methods of subjective refraction
Unit I	History taking.
Unit II	Extraocular motility - Cover test, Alternating cover test - Hirschberg test - Modified Krimsky - Maddox Rod.
Unit III	NPA (push up, RAF, Minus lens), NPC, Accommodative facility (+ 2.00 D) - Negative Fusional vergence - Positive Fusional Vergence - Schirmer's test.
Unit IV	Retinoscopy - Static, Dynamic and Cycloplegic Retinoscopy.
Unit V	Subjective Refraction – JCC - Clock Dial – Duochrome - Borish Delayed - Addition calculation.

Course Outcomes		**Knowledge level**
CO-1	Apply the knowledge on clinical procedures in history taking	K4
CO-2	Develop practical tests for phorias and tropias	K5
CO-3	Review through experiments on the far and near points of accommodation	K4
CO-4	Demonstrate the refraction and refractive errors in eye	K5
CO-5	Evaluation and management of refractive errors	K5

Course designed by **Aswathi S R**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
CO2	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
CO3	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
CO4	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
CO5	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
W.AV	**2**	**2**	**3**	**3**	**2**	**3**	**2**	**1**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M (2)	S (3)	S (3)	L (1)	M (2)
CO2	M (2)	S (3)	S (3)	L (1)	M (2)
CO3	M (2)	S (3)	S (3)	L (1)	M (2)
CO4	M (2)	S (3)	S (3)	L (1)	M (2)
CO5	M (2)	S (3)	S (3)	L (1)	M (2)
W.AV	**2**	**3**	**3**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

IV - Semester					
Allied	**Course code: 91446**	**Occupational Optometry & Community Optometry**	**T**	**Credits: 4**	**Hours: 4**
Pre-requisite	**Basic Knowledge of occupational & community health**		**Syllabus revised**		**2023- 24**
Course Objectives	1. To provide knowledge to the student on the general aspects of occupational health 2. To illustrate the ocular and visual problems of occupation 3. To impart knowledge on occupational hazards and remedial aspects through classroom teaching and field visits 4. To organize health education programs in the community 5. To elicit participation in national program of prevention of blindness				
Unit I	Introduction to Occupational health, hygiene and safety, international bodies like ILO, WHO, National bodies etc. Acts and Rules - Factories Act, WCA, ESI Act. Occupational diseases/occupational related diseases caused by physical agents, chemical agents and biological agents. Electromagnetic Radiation and its effects on Eye.				
Unit II	Light – Definitions and units, Sources, advantages and disadvantages, standards. Color – Definition, Color theory, Color coding, Color defects, Color Vision tests. Occupational hazards and preventive/protective methods. Task Analysis. Industrial Vision Screening – Modified clinical method and Industrial Vision test. Vision Standards – Railways, Roadways, Airlines. CVS. Visual Display Units. Contact lens and work.				
Unit III	Public Health Optometry: Concepts and implementation. Dimensions, determinants and indicators of health. Levels of disease prevention and levels of health care patterns. Epidemiology of blindness – Defining blindness and visual impairment. Eye in primary health care. Contrasting between Clinical and community health programs.				
Unit IV	Community Eye Care Programs. Community based rehabilitation programs. Nutritional Blindness with reference to Vitamin A deficiency. Vision 2020: The Right to Sight. Screening for eye diseases. National and International health agencies, NPCB. Role of an optometrist in Public Health. Organization and Management of Eye Care Programs – Service Delivery models.				
Unit V	Health manpower and planning &Health Economics. Evaluation and assessment of health programmes Optometrist role in school eye health programmes. Basics of Tele Optometry and its application in Public Health. Information, Education and Communication for Eye Care Programs.				

References

1. Seymour L Coblens: *Optometry and the Law,* American Optometric Association, St.Louis,1976
2. R.A.F. Cox (ed.) *fitness for work – the medical aspects* - Oxford University Press 2000, reprinted 2003
3. Newcomb R. D. & Jolley J L : *Public health & Community Optometry*, 1980
4. *Professional communication in eye care* – Carolyn Begley – Butterworth Heinemann
5. *5. Ophthalmic research and epidemiology* – Stanley Hatch – Butterworth Heinemann

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://pubmed.ncbi.nlm.nih.gov/

https://eyewiki.org/Main_Page

Course Outcomes		**Knowledge level**
CO-1	Identify and formulate visual requirements and standards for different jobs	K2
CO-2	Analyze occupational causes of visual and eye problems	K4
CO-3	Illustrate the effects of Physical, chemical and biological hazards on eye and vision	K2
CO-4	Apply the principles of community screening for the diagnosis of visual disorders	K3
CO-5	Apply the epidemiological principles to assess the risk factors and for the control of the diseases.	K4

Course designed by **Aswathi S R**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	S (3)	S (3)	L (1)	M (2)
CO2	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	S (3)	S (3)	L (1)	M (2)
CO3	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	S (3)	S (3)	L (1)	M (2)
CO4	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	S (3)	S (3)	L (1)	M (2)
CO5	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	S (3)	S (3)	L (1)	M (2)
W.AV	**1**	**1**	**1**	**1**	**3**	**1**	**3**	**3**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L (1)	M (2)	L (1)	S (3)	M (2)
CO2	L (1)	M (2)	L (1)	S (3)	M (2)
CO3	L (1)	M (2)	L (1)	S (3)	M (2)
CO4	L (1)	M (2)	L (1)	S (3)	M (2)
CO5	L (1)	M (2)	L (1)	S (3)	M (2)
W.AV	**1**	**2**	**1**	**3**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

IV - Semester					
DSE	**Course code: 91447A**	**Hospital Procedures**	**T**	**Credits: 4**	**Hours: 4**
Pre-requisite	**Basic Knowledge of Healthcare System**		**Syllabus revised**		**2023- 24**
Course Objectives	1. To provide technical knowledge about vital signs and how to take vital signs. 2. To educate about common clinical laboratory procedures and how to interpret them. 3. To provide technical knowledge in disinfection and sterilization techniques. 4. To demonstrate ophthalmic surgical instruments and to educate types of ophthalmic surgeries. 5. To educate about the infection and prevention control.				

Unit I	**Vital Signs:** The four main vital signs and their indications - TPR chart - Electrocardiogram - BP apparatus - Stethoscope - Hand hygiene - Demonstration of proper hand washing technique - Instilling of topical medications - Route of medication administration - Admission and discharge procedures - Blood collection and handling - Specimen collection and handling.
Unit II	**Common Clinical Laboratory Procedures:** Common Haematology Tests - Complete blood count, Differential white blood cell count, Coagulation tests, Blood smear analysis. Common Clinical Chemistry Tests - Basic metabolic panel, Comprehensive metabolic panel, Lipid profile, Thyroid function tests, Liver function tests. Common Microbiology Tests - Urine culture and sensitivity, Blood culture, Throat culture, Stool culture, Wound culture. Other Common Clinical Laboratory Procedures - Urinalysis, Faecal occult blood test, Glucose tolerance test, Pregnancy test, HIV test.
Unit III	**Disinfection and Sterilization Procedure:** Aseptic techniques - Scrubbing, gowning, gloving procedures - Correct steps of scrubbing, gowning and gloving - Demonstration of scrubbing, gowning and gloving. Location and setup of sterilization room, different autoclaves and mechanical indicators. Different sterilization steps and different techniques - Steam sterilization, Dry heat sterilization, Chemical sterilization, Gas sterilization, Radiation sterilization - How to choose the appropriate sterilant and sterilization method - The different methods of quality control for disinfection and sterilization.
Unit IV	**Ophthalmic Operating Room Procedures:** Surgical Instruments for cataract surgeries, glaucoma surgeries, strabismus surgeries - Care and handling of surgical instrument - Assisting surgeons-Cataract Surgery, Strabismus surgery, Glaucoma surgery, Retinal detachment surgery, Vitreous surgery, Laser surgery, Corneal transplantation, Eyelid surgery, Pterygium removal, Dacryocystorhinostomy, Enucleation and Evisceration - Eye dressings - Types of Anaesthesia.
Unit V	**Infection Prevention and Control:** Introduction to Infection Prevention and Control - Microorganisms and Infection - Standard Precautions and Other IPC Measures - IPC in Specific Settings - Surveillance, Outbreak Management, and Quality Improvement - Patient education and counselling on IPC.

References

1. Textbook of Clinical Nursing by S.K. Sharma and P.K. Sharma

2. National Guidelines for Infection Prevention and Control in Healthcare Facilities Manual (2020). Ministry of Health and Family Welfare: Government of India.

3. Practical Clinical Biochemistry by Harold Varley

4. Handbook of Ophthalmic Surgical Instruments by Herbert J. Ingraham and David D. Donaldson

5. Basic Techniques of Ophthalmic Surgery by Robert B. Welch and Mark J. Mannis

6. The Ophthalmic Assistant: A Textbook for Allied and Associated Ophthalmic Personnel by Harold A. Stein, Raymond M. Stein, and Melvin I. Freeman

7. Aseptic Technique: Principles and Practices by Peggy L. Gruneberg and Jeffrey L. Deal

Sterilization and Disinfection for the Ophthalmic Assistant by Jodi Luchs

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://ncdc.mohfw.gov.in/index1.php?lang=1&level=2&sublinkid=1019&lid=794

Course Outcomes		**Knowledge level**
CO-1	Demonstrate how to measure and evaluate vital signs	K3
CO-2	Understand about the different clinical laboratory tests	K2
CO-3	Discuss about the aseptic techniques and sterilization procedures	K4
CO-4	Demonstrate ophthalmic surgical instruments and understand ophthalmic surgeries	K4
CO-5	Understand about the infection prevention and control	K2

Course designed by **K Muhammed Kunhi**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	L (1)	S (3)	L (1)	L (1)	S (3)	S (3)	L (1)	M (2)	L (1)
CO2	L (1)	L (1)	S (3)	L (1)	L (1)	S (3)	S (3)	L (1)	M (2)	L (1)
CO3	L (1)	L (1)	S (3)	L (1)	L (1)	S (3)	S (3)	L (1)	M (2)	L (1)
CO4	L (1)	L (1)	S (3)	L (1)	L (1)	S (3)	S (3)	L (1)	M (2)	L (1)
CO5	L (1)	L (1)	S (3)	L (1)	L (1)	S (3)	S (3)	L (1)	M (2)	L (1)
W.AV	**1**	**1**	**3**	**1**	**1**	**3**	**3**	**1**	**2**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L (1)	S (3)	S (3)	S (3)	L (1)
CO2	L (1)	S (3)	S (3)	S (3)	L (1)
CO3	L (1)	S (3)	S (3)	S (3)	L (1)
CO4	L (1)	S (3)	S (3)	S (3)	L (1)
CO5	L (1)	S (3)	S (3)	S (3)	L (1)
W.AV	**1**	**3**	**3**	**3**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

IV - Semester					
DSE	**Course code: 91447B**	**Quality & Patient Safety**	**T**	**Credits: 4**	**Hours: 4**
Pre-requisite	**Basic Knowledge of Healthcare System**		**Syllabus revised**		**2023- 24**
Course Objectives	1. To familiarize basic concept of healthcare quality management. 2. To educate about quality assurance in hospital function. 3. To provide technical knowledge in biomedical waste management. 4. To educate about patient safety management. 5. To educate about the antibiotic resistance and strategies to combat antibiotic resistance.				
Unit I	**Healthcare Quality Management:** Overview of Quality in Healthcare - Basics of Quality Management - Quality Management Tools - Healthcare and Climate Change - Effective Communication for Quality Healthcare.				
Unit II	**Quality Assurance in Hospital Functions:** Quality Assurance in Medical Laboratories - Quality Assurance in Diagnostic Imaging Centers - Quality Assurance in Hospital Facility - Quality Assurance in Emergency Department.				
Unit III	**Biomedical Waste Management and Environment Safety:** Introduction to biomedical waste - Biomedical waste management regulations - Segregation of biomedical waste - Collection and storage of biomedical waste - Treatment and disposal of biomedical waste - Environmental impact of biomedical waste - Best practices for biomedical waste management.				
Unit IV	**Patient Safety Management:** Infection Prevention and Control - Patient Safety Framework - Monitoring of Clinical & Managerial Indicators - Clinician's Engagement in Quality & Patient Safety.				
Unit V	**Antibiotic Resistance:** Introduction to antibiotics and antibiotic resistance - Types of antibiotic resistance - Mechanisms of antibiotic resistance - Factors that contribute to antibiotic resistance - The consequences of antibiotic resistance -Strategies to combat antibiotic resistance.				

References

1. National Guidelines for Infection Prevention and Control in Healthcare Facilities Manual. (2020). Ministry of Health anf Family Welfare: Government of India.

2. Gyani. G.J. (2014). *Handbook for Healthcare Quality and Patient Safety*. (3rd Edition). Jaypee Brothers Medical Publishers

3. Introduction to Healthcare Quality Management, Second Edition by Patrice L. Spath

4. Patient Safety: Essential Knowledge for Healthcare Professionals by Mary E. Wilson

5. Biomedical Waste Management: A Comprehensive Guide, by P.C. Mishra, APH Publishing Corporation, 2013.

Related online content (MOOC, Swayam, NPTEL, Website etc.)

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https://main.mohfw.gov.in/sites/default/files/3203490350abpolicy%20%281%29.pdf

Course Outcomes		**Knowledge level**
CO-1	Understand the concepts of quality management and patient safety.	K2
CO-2	Understand about quality assurance in Hospital Functions.	K2
CO-3	Discuss about the impact of biomedical waste and its management.	K4
CO-4	Discuss about patient safety management.	K4
CO-5	Critically evaluate the recent development to manage antibiotic resistance.	K5

Course designed by **K Muhammed Kunhi**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	L (1)	S (3)	L (1)	L (1)	S (3)	S (3)	L (1)	M (2)	L (1)
CO2	L (1)	L (1)	S (3)	L (1)	L (1)	S (3)	S (3)	L (1)	M (2)	L (1)
CO3	L (1)	L (1)	S (3)	L (1)	L (1)	S (3)	S (3)	L (1)	M (2)	L (1)
CO4	L (1)	L (1)	S (3)	L (1)	L (1)	S (3)	S (3)	L (1)	M (2)	L (1)
CO5	L (1)	L (1)	S (3)	L (1)	L (1)	S (3)	S (3)	L (1)	M (2)	L (1)
W.AV	**1**	**1**	**3**	**1**	**1**	**3**	**3**	**1**	**2**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L (1)	S (3)	S (3)	S (3)	L (1)
CO2	L (1)	S (3)	S (3)	S (3)	L (1)
CO3	L (1)	S (3)	S (3)	S (3)	L (1)
CO4	L (1)	S (3)	S (3)	S (3)	L (1)
CO5	L (1)	S (3)	S (3)	S (3)	L (1)
W.AV	**1**	**3**	**3**	**3**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

V - Semester					
CC	**Course code: 91451**	**Contact Lens - I**	**T**	**Credits: 4**	**Hours: 5**
Pre-requisite	**Basic Knowledge of theoretical & practical aspects of contact lens**		**Syllabus revised**		**2023- 24**
Course Objectives	1. Understand the basics of contact lenses 2. To provide the suitable knowledge to the student both in theoretical and practical aspects of Contact Lenses 3. To impart knowledge on designing skills of various types of contact lens 4. To illustrate knowledge on fitting philosophies and recent development of contact lenses. 5. Identify and manage the adverse effects of contact lens				
Unit I	Corneal Anatomy and Physiology - Corneal Physiology and Contact Lens - Preliminary Measurements and Investigations - Slit lamp Biomicroscopy - Contact lens materials - Optics of Contact lenses.				
Unit II	Glossary of Terms: Contact Lenses - Indications and Contra Indications of Contact Lens - Rigid gas permeable contact lens design - Soft contact lens design – Keratometry - Placido's disc – Topography.				
Unit III	Introduction to Contact lens fitting - Handling of contact lenses - Fitting of spherical Soft Contact Lens and effects of parameter changes - Astigmatism; Correction options - Fitting spherical RGP CL - Low DK High DK - Effects of RGP CL parameter changes on lens fitting - Fitting in Astigmatism - Fitting in Keratoconus - Fitting in Aphakia, Pseudophakia.				
Unit IV	Lens care & Hygiene Instructions Compliance - Follow up post fitting examination - Follow up slit lamp examinations - Cosmetic Contact lenses - Fitting contact lens in children - Toric Contact lenses - Bifocal contact lenses - Continuous wear and extended wear lenses - Therapeutic lenses / bandage lenses - Contact lens following ocular surgeries - Disposable contact lenses - Frequent replacement and lenses.				
Unit V	Use of Specular Microscopy and Pachymetry in Contact Lens - Care of contact lenses - Contact lens solutions - Complications of Contact lenses - Contact lens modification of finished lenses - Instrumentation in contact lens practice - Checking finished lens parameters - Contact Lens for Special purposes – Swimming, Sports, Occupational etc., - Recent developments in Contact lenses - Review of lenses available in India				

References

1. *IACLE modules 1 - 10*
2. *CLAO Volumes 1, 2, 3*
3. Anthony J. Phillips : *Contact Lenses*, 5thedition, Butterworth-Heinemann, 2006
4. Elisabeth A. W. Millis: *Medical Contact Lens Practice*, Butterworth-Heinemann, 2004
5. E S. Bennett ,V A Henry :*Clinical manual of Contact Lenses*, 3rd edition, Lippincott Williams and Wilkins, 2008

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://iacle.org/

https://pubmed.ncbi.nlm.nih.gov/

Course Outcomes		**Knowledge level**
CO-1	Understand the history and basics of contact lenses	K2
CO-2	List the important properties of contact lenses.	K3
CO-3	Predict the contact lens design for various kinds of patients	K4
CO-4	Recognize various type of contact lens fitting	K5
CO-5	Hypothesize the contact lens care procedures for the awareness of the patients	K5

Course designed by **Nigin C Philipose**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	L (1)	S (3)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	M (2)
CO2	L (1)	L (1)	S (3)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	M (2)
CO3	L (1)	L (1)	S (3)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	M (2)
CO4	L (1)	L (1)	S (3)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	M (2)
CO5	L (1)	L (1)	S (3)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	M (2)
W.AV	**1**	**1**	**3**	**3**	**1**	**3**	**1**	**1**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M (2)	L (1)	S (3)	L (1)	M (2)
CO2	M (2)	L (1)	S (3)	L (1)	M (2)
CO3	M (2)	L (1)	S (3)	L (1)	M (2)
CO4	M (2)	L (1)	S (3)	L (1)	M (2)
CO5	M (2)	L (1)	S (3)	L (1)	M (2)
W.AV	**2**	**1**	**3**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

V - Semester					
CC	**Course code: 91452**	**Binocular Vision - I**	**T**	**Credits: 4**	**Hours: 5**
Pre-requisite	**Basic Knowledge of**		**Syllabus revised**		**2023- 24**

Course Objectives	1. To impart knowledge on the aspects and evolution of binocular vision 2. To review the anatomy and physiology of Extraocular muscles 3. To learn basic binocular vision tests 4. To educate on etiology, investigation and management of convergence and accommodation. 5. To demonstrate the qualitative and quantitative diagnosis of binocular vision and its treatment
Unit I	**Binocular Vision and Space perception -** Relative subjective visual direction, Retino motor value , Grades of BSV, SMP and Cyclopean Eye, Correspondence, Fusion, Diplopia, Retinal rivalry, Horopter, Physiological Diplopia and Suppression, Stereopsis, Panum's area, BSV, Stereopsis and monocular clues – significance, Egocentric location, clinical applications.
Unit II	**Anatomy of Extra Ocular Muscles -** Rectii and Obliques, LPS, Innervation & Blood Supply. **Physiology of Ocular movements -** Center of rotation, Axes of Fick, Action of individual muscle. **Laws of ocular motility -** Donder's and Listing's law, Sherrington's law, Hering's law. Uniocular & Binocular movements, fixation, saccadic & pursuits. Version & Vergence. Fixation & field of fixation.
Unit III	**Binocular vision test** - Test for simultaneous macular perception, test for fusion, test for stereopsis - synoptophore or stereoscope test, vectograph test, titmus stereo test, random dot stereogram test, simple motor task test based on stereopsis.
Unit IV	**Accommodation -** Definition and mechanism (process), Methods of measurement, Stimulus and innervations, Types of accommodation, Anomalies of accommodation - aetiology and management. **Convergence -** Definition and mechanism, Methods of measurement, Types and components of convergence, Tonic, accommodative, fusional, proximal, Anomalies of Convergence – aetiology and management.
Unit V	**Suppression -** Investigations & Management **Abnormal Retinal Correspondence -** Investigation and management **Amblyopia -** Classification, Etiology Investigation& Management

References

1. *Theory and Practice of Squint and Orthoptics* by A K Khurana
2. *R W Reading: Binocular Vision*- Foundations and Applications
3. Basic Science, A.A.O (section-6) *Pediatric Ophthalmology and Strabismus* 1992-1993
4. Pradeep Sharma: *Strabismus simplified*, New Delhi, First edition, 1999, Modern publishers
5. Von Noorden's *Binocular Vision and Ocular Motility* – Gunter K von Noorden, 2ne edition, C.V.Mosby & Co

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://pubmed.ncbi.nlm.nih.gov/

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Course Outcomes		**Knowledge level**
CO-1	Describe the evolution of binocular vision and its different parameters	K2
CO-2	In-depth knowledge of the gross anatomy and physiology relating to the Extraocular muscles	K3
CO-3	Explain the development of binocular vision and its neural aspects	K3
CO-4	Identify accommodation and convergence anomalies	K5
CO-5	Demonstrate the various treatments and analysis of suppression, amblyopia and ARC in binocular vision	K5

Course designed by **Aswathi S R**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	M (2)	S (3)	M (2)	L (1)	M (2)	L (1)	M (2)	L (1)	L (1)
CO2	L (1)	M (2)	S (3)	M (2)	L (1)	M (2)	L (1)	M (2)	L (1)	L (1)
CO3	L (1)	M (2)	S (3)	M (2)	L (1)	M (2)	L (1)	M (2)	L (1)	L (1)
CO4	L (1)	M (2)	S (3)	M (2)	L (1)	M (2)	L (1)	M (2)	L (1)	L (1)
CO5	L (1)	M (2)	S (3)	M (2)	L (1)	M (2)	L (1)	M (2)	L (1)	L (1)
W.AV	**1**	**2**	**3**	**2**	**1**	**2**	**1**	**2**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S (3)	L (1)	S (3)	L (1)	M (2)
CO2	S (3)	L (1)	S (3)	L (1)	M (2)
CO3	S (3)	L (1)	S (3)	L (1)	M (2)
CO4	S (3)	L (1)	S (3)	L (1)	M (2)
CO5	S (3)	L (1)	S (3)	L (1)	M (2)
W.AV	**3**	**1**	**3**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

V - Semester					
CC	**Course code: 91453**	**Pediatric & Geriatric Optometry**	**T**	**Credits: 4**	**Hours: 5**
Pre-requisite	**Basic Knowledge of**		**Syllabus revised**		**2023- 24**

Course Objectives	1. To train the optometrists to develop a systematic way of dealing with children below 12 2. To implement primary eye care and have better, specialized management of anomalies 3. To demonstrate practical aspects of diagnosis and management of eye conditions related to pediatric inhabitants 4. To impart knowledge on the common geriatric systematic and ocular diseases 5. To provide knowledge about ocular physiological changes of ageing
Unit I	**Pediatric optometry -** The Development of Eye and Vision, History taking Paediatric subjects, Assessment of visual acuity, Normal appearance, pathology and structural anomalies of a) Orbit, Eye lids, Lacrimal system b) Conjunctiva, Cornea, Sclera, Anterior chamber, Uveal tract, Pupil c) Lens, vitreous, Fundus , Oculomotor system
Unit II	Refractive Examination, Compensatory treatments for - Myopia, Pseudo myopia , Hyperopia , Astigmatism, Anisimetropia , Amblyopia . Determining binocular status. Determining sensory motor adaptability. Remedial and Compensatory treatment of Strabismus and Nystagmus. Vergence and accommodation.
Unit III	**Paediatric eye disorders -** Cataract, Retinopathy of Prematurity, Retinoblastoma, Neuromuscular conditions (myotonic dystrophy, mitochondrial cytopathy), and Genetics. Anterior segment dysgenesis, Aniridia, Microphthalmos, Coloboma, Albinism. Spectacle dispensing for children. Paediatric contact lenses. Low vision assessment in children
Unit IV	**Geriatric Optometry -** Structural, and morphological changes of eye in elderly. Physiological changes in eye in the course of aging. Introduction to geriatric medicine – epidemiology , need for optometry care, systemic diseases (Hypertension, Atherosclerosis, coronary heart disease, congestive Heart failure, Cerebrovascular dis. ease, Diabetes, COPD). Optometric Examination of the Older Adult.
Unit V	Ocular diseases common in old eye, with special reference to cataract, glaucoma, macular disorders, vascular diseases of the eye.Contact lenses in elderly. Pharmacological aspects of aging. Low vision causes, management and rehabilitation in geriatrics. Spectacle dispensing in elderly – Considerations of spectacle lenses and frames.

References

1. Jerome Rosner: *Pediatric Optometry*, Butterworths, London, 1982
2. Hirsch M J & Wick R E: *Vision of the Aging Patient,* An Optometric Symposium, 1960
3. *Vision and Aging* - A.J. Rossenbloom Jr & M.W.Morgan, Butterworth-Heinemann,1993
4. *Clinical Geriatric Eye Care* – Sheree Aston, Joseph Maino – Butterworth Heinemann
5. *Paediatric Optometry* – William Harvey/ Bernard Gilmartin, Butterworth –Heinemann, 2004

Related online content (MOOC, Swayam, NPTEL, Website etc.)

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Course Outcomes		**Knowledge level**
CO-1	Understand the principal theories of childhood and visual development	K2
CO-2	Analyse a thorough paediatric history which encompasses the relevant developmental, visual, medical and educational issues	K4
CO-3	Attain clear knowledge on the accommodative-vergence system to assess the paediatric eye disorders	K3
CO-4	Analyse the techniques for examining visual function of children of all ages and an understanding varied management concepts of paediatric vision disorders	K4
CO-5	Identify and investigate the age related changes in the eyes and demonstrate dispensing contact lens, low vision aids and referral to the surgeon	K5

Course designed by **Aswathi S R**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M (2)	S (3)	S (3)	M (2)	M (2)	L (1)	L (1)	M (2)	L (1)	L (1)
CO2	M (2)	S (3)	S (3)	M (2)	M (2)	L (1)	L (1)	M (2)	L (1)	L (1)
CO3	M (2)	S (3)	S (3)	M (2)	M (2)	L (1)	L (1)	M (2)	L (1)	L (1)
CO4	M (2)	S (3)	S (3)	M (2)	M (2)	L (1)	L (1)	M (2)	L (1)	L (1)
CO5	M (2)	S (3)	S (3)	M (2)	M (2)	L (1)	L (1)	M (2)	L (1)	L (1)
W.AV	**2**	**3**	**3**	**2**	**2**	**1**	**1**	**2**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S (3)	L (1)	S (3)	L (1)	M (2)
CO2	S (3)	L (1)	S (3)	L (1)	M (2)
CO3	S (3)	L (1)	S (3)	L (1)	M (2)
CO4	S (3)	L (1)	S (3)	L (1)	M (2)
CO5	S (3)	L (1)	S (3)	L (1)	M (2)
W.AV	**3**	**1**	**3**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

V - Semester					
CC	**Course code: 91454**	**Dispensing Optics**	**T**	**Credits: 4**	**Hours: 4**
Pre-requisite	**Basic Knowledge of onstruction, design application and development of Lenses and frames**		**Syllabus revised**		**2023- 24**
Course Objectives	1. Different types of materials used to make lenses and its characteristics 2. Spectacle frames –manufacture process & materials 3. Art and science of dispensing spectacle lens and frames based on the glass 4. Prescription. 5. Lens verification and axis marking and fitting of all lens types 6. Troubleshooting complaints and handling patient's questions				
Unit I	Components of spectacle prescription & interpretation, transposition, Add and near power relation. Neutralization –Hand &lensometer, axis marking, prism marking.Measuring Inter-pupillary distance (IPD) for distance & near, bifocal height.				
Unit II	Spectacle Frames: Types and parts- Classification of spectacle frames-material, weight, temple position,- Coloration-Frame construction- Frame selection –based on spectacle prescription, professional requirements, age group, face shape- Spectacle frame measurements and markings – Datum & Boxing system				
Unit III	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)				
Unit IV	Tinted & Protective Lenses- Characteristics of tinted lenses Absorptive Glasses -Polarizing Filters,- Photochromic & Reflecting filters- Safety lenses-Toughened lenses, Laminated Lenses, CR 39, Polycarbonate lenses -Antireflection coating, Mirror coating, Hard Multi Coating [HMC], Hydrophobic coating				
Unit V	Multifocal Lenses: Introduction, history and development, types- Bifocal lenses, Trifocal & Progressive addition lenses-Patients selection- fitting Multifocal lenses - Selection of designs- Progressive Markings –Trouble Shooting of PALs. Recent developments in Spectacle Frames and Lenses - Special purpose frames - Safety wear Miscellaneous Spectacle: Iseikonic lenses- Spectacle magnifiers- Recumbent prisms- Fresnel prism and lenses- Lenticular &Aspherical lenses - High Refractive index glasses-Monocles - Ptosis crutches - Industrial safety glasses - Welding glasses-Frame availability in Indian market-FAQ's by customers and their ideal answers				

References

1) Jalie MO: *Ophthalmic lens and Dispensing*, 3rd edition, Butterworth –Heinemann, 2008
2) Troy E. Fannin, Theodore Grosvenor: *Clinical Optics*, 2nd edition, Butterworth – Heinemann, 1996
3) C W Brooks, IM Borish: *System for Ophthalmic Dispensing*, 3rdedition, Butterworth - Heinemann, 2007
4) Michael P Keating: Geometric, Phisical& *Visual Optics*, 2nd edition, Butterworth – Heinemann, 2002
5) *Dispensing Optics*, Ajay Kumar Bhootra, JP Medical Ltd, 2015

Related online content (MOOC, Swayam, NPTEL, Website etc.)

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Course Outcomes		**Knowledge level**
CO-1	Describe the ophthalmic materials in dispensing optics and its verification	K2
CO-2	Explain the special practices in handling the lenses and frames	K2
CO-3	Illustrate the procedures and process involved in the manufacturing of lenses.	K4
CO-4	Demonstrate the use of dispensing instruments in lens measurements and frame fittings	K4
CO-5	Analyze various factors involved in the instrumentation for the selection of lenses. Identify and select the right frame designs and fittings for the patients.	K5

Course designed by **Nigin C Philipose**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	L (1)	L (1)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	L (1)
CO2	L (1)	L (1)	L (1)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	L (1)
CO3	L (1)	L (1)	L (1)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	L (1)
CO4	L (1)	L (1)	L (1)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	L (1)
CO5	L (1)	L (1)	L (1)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	L (1)
W.AV	**1**	**1**	**1**	**3**	**1**	**3**	**1**	**1**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L (1)	L (1)	S (3)	L (1)	L (1)
CO2	L (1)	L (1)	S (3)	L (1)	L (1)
CO3	L (1)	L (1)	S (3)	L (1)	L (1)
CO4	L (1)	L (1)	S (3)	L (1)	L (1)
CO5	L (1)	L (1)	S (3)	L (1)	L (1)
W.AV	**1**	**1**	**3**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

V - Semester					
CC	**Course code: 91455**	**Practical – Clinical Optometry - I**	**P**	**Credits: 3**	**Hours: 6**
Pre-requisite	**Basic Knowledge of**		**Syllabus revised**		**2023- 24**
Course Objectives	1. To learn basic screening tests 2. To impart knowledge on keratometry and Lacrimal syringing 3. To educate on basic visual field testing 4. To acquire knowledge on slit lamp bio-microscopy 5. To learn insertion and removal of soft and RGP contact lenses				
Unit I	Color Vision – Contrast sensitivity - Stereopsis				
Unit II	Keratometry (NITBUT) - Lacrimal syringing				
Unit III	Confrontation test - Visual Field chart interpretation Both kinetic and Static (Amsler and Bjerrum)				
Unit IV	Slit lamp examination – TBUT, tear meniscus level, HVID				
Unit V	Contact lens insertion and removal				

Course Outcomes		**Knowledge level**
CO-1	Evaluate basic screening tests to investigate retinal and optic nerve diseases.	K5
CO-2	Evaluate anterior curvature and power of cornea and related tests using keratometry. Understand Lacrimal passage.	K5
CO-3	Analyze gross visual field defects.	K4
CO-4	Detailed examination of ocular structures and clinical tests using slit lamp.	K5
CO-5	Common handing of soft and RGP contact lenses.	K3

Course designed by **Aswathi S R**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
CO2	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
CO3	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
CO4	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
CO5	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
W.AV	**2**	**2**	**3**	**3**	**2**	**3**	**2**	**1**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M (2)	S (3)	S (3)	L (1)	M (2)
CO2	M (2)	S (3)	S (3)	L (1)	M (2)
CO3	M (2)	S (3)	S (3)	L (1)	M (2)
CO4	M (2)	S (3)	S (3)	L (1)	M (2)
CO5	M (2)	S (3)	S (3)	L (1)	M (2)
W.AV	**2**	**3**	**3**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

V - Semester					
DSE	**Course code: 91456A**	**Research Methodology**	**T**	**Credits: 4**	**Hours: 4**
Pre-requisite	**Basic Knowledge of Research Studies**		**Syllabus revised**		**2023- 24**
Course Objectives	1. To familiarize basic information about research methodology. 2. To make the students with basic features of research design. 3. To impart skills by preparing a research. 4. To make them awareness of report writing. 5. To impart information about data collection methods.				
Unit I	**Research Methodology –** Introduction – Meaning of research – Objectives of research – Types of research – Criteria of good research – Research process.				
Unit II	**Defining the Research Problem** – Selecting the problem – Techniques involved in defining problem – Processing and analysis of data – Processing operation – Types of analysis – Testing of hypothesis – Chi-square test.				
Unit III	**Research Design** – Meaning of research design – Need for research design – Features of a good design – Different research design – Basic principles of experimental design – Sampling design – Census and sample survey – Characteristics of a good sample design – Different types of sample designs.				
Unit IV	**Data Collection -** Methods of data collection – Collection of primary data – Observation method – Interview method – Collection of data through questionnaire – Collection of data through schedule – Difference between questionnaire and schedule – Collection of secondary data.				
Unit V	**Interpretation and Report writing –** Meaning of interpretation – Technique of interpretation – Significance of report writing – Different steps in writing report – Layout of the research report – Types of report.				

References

1. *Research methodology* – C R Kothari – 2004
2. *Research methodology: A step by step guide for beginners* – Renjith Kumar – 5th edition
3. *Research design: qualitative, quantitative and mixed methods approaches* - Jhon W Creswell, J David Creswell
4. *Research methods for beginners* – Dr. R Naveen Kumar
5. *Research Methodology* – Lakshmi Narain Agarwal

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://research-methodology.net/

Course Outcomes		**Knowledge level**
CO-1	Understand the basic concepts in research methodology.	K2
CO-2	Analyze the methods of data collection.	K4
CO-3	Acquire the knowledge of report writing.	K2
CO-4	Acquire the knowledge of research design.	K2
CO-5	Evaluate the difference between questionnaire and schedule.	K5

Course designed by **Mini M V**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	S (3)
CO2	L (1)	L (1)	L (1)	L (1)	L (1)	M (2)	M (2)	S (3)	L (1)	S (3)
CO3	L (1)	L (1)	L (1)	L (1)	L (1)	M (2)	M (2)	S (3)	L (1)	S (3)
CO4	L (1)	L (1)	L (1)	L (1)	L (1)	M (2)	M (2)	S (3)	L (1)	S (3)
CO5	L (1)	L (1)	L (1)	L (1)	L (1)	M (2)	M (2)	S (3)	L (1)	S (3)
W.AV	**1**	**1**	**1**	**1**	**1**	**1.8**	**1.8**	**3**	**1**	**3**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L (1)	L (1)	L (1)	L (1)	S (3)
CO2	L (1)	M (2)	M (2)	M (2)	S (3)
CO3	L (1)	M (2)	M (2)	M (2)	S (3)
CO4	L (1)	M (2)	M (2)	M (2)	S (3)
CO5	L (1)	S (3)	S (3)	S (3)	S (3)
W.AV	**1**	**2**	**2**	**2**	**3**

S –Strong (3), M-Medium (2), L- Low (1)

V - Semester					
DSE	**Course code: 91456B**	**Biostatistics**	**T**	**Credits: 4**	**Hours: 4**
Pre-requisite	**Basic Knowledge of Biostatistics**		**Syllabus revised**		**2023- 24**

Course Objectives	1. To advance statistical science and its application to problems of human health and disease, with the ultimate goal of advancing the public's health. 2. Defining the type and quantity of data that need to be collected, Organizing and summarizing the data, Analyzing the data, and drawing conclusions from it. 3. To develop resources for excellent biostatistics consultancy and improved research. 4. To build biostatistical capacity among biomedical researchers and biostatistics professionals. 5. To work for efficiency improvement in biomedical research through better biostatistical inputs.
Unit I	**Biostatistics:** Introduction – Data - Variables - Statistics - Collection of Data - Scales of Measurement - Presentation Including Classification and diagrammatic representation.
Unit II	**Sampling:** Definition - Types of Sampling – Necessity of Methods and Techniques - Statistical significance - Sample size determination - Probability – sample ideas.
Unit III	**Measures:** Central Tendency - Dispersion - Mortality - Frequency Distribution - Correlation and regression (Linear).
Unit IV	**Theoretical Distributions:** Binomial - Normal - Polynomial - Chi-Square test.
Unit V	**Hospital Statistics:** Collection of Hospital Statistical Presentation – Analysis of daily hospital services – Monthly and annual reports - Computation of percentages in the Patient census, and bed occupancy rate.

References

1. Thomas Glover, Kevin Mitchell (2008).*An Introduction to Biostatistics.*
2. Raymond E. Hampton, John Edward Havel, (2006).*Introductory Biological Statistics*.
3. Ronald N. Forthofer, Eun Sul Lee(1995).*Introduction to Biostatistics:* A Guide to Design, Analysis and Discovery.
4. Health Forum (2021).*AHA Hospital Statistics*: Health Forum LLC, 2021.
5. Steven K. Thompson (2012).*Sampling (3rd Ed):* Wiley.
6. P. Mariappan (2013).*Biostatistics*: Pearson Education India.

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://academic.oup.com/biostatistics

https://www.qualtrics.com/au/experience-management/research/sampling-methods/

Course Outcomes		**Knowledge level**
CO-1	Understand the fundamental concepts of Biostatistics.	K2
CO-2	Discuss Sampling techniques and Distributions.	K3
CO-3	Analyze the recent methods of Sampling in medical field.	K4
CO-4	Gain an understanding of research methodology.	K2
CO-5	Receive a comprehensive assessment of current environmental trends.	K4

Course designed by **Joel Jaison**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	S (3)
CO2	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	S (3)
CO3	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	S (3)
CO4	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	S (3)
CO5	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	L (1)	S (3)
W.AV	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**3**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L (1)	L (1)	L (1)	L (1)	S (3)
CO2	L (1)	L (1)	L (1)	L (1)	S (3)
CO3	L (1)	L (1)	L (1)	L (1)	S (3)
CO4	L (1)	L (1)	L (1)	L (1)	S (3)
CO5	L (1)	L (1)	L (1)	L (1)	S (3)
W.AV	**1**	**1**	**1**	**1**	**3**

S –Strong (3), M-Medium (2), L- Low (1)

VI - Semester					
CC	**Course code: 91461**	**Contact Lens - II**	**T**	**Credits: 4**	**Hours: 5**
Pre-requisite	**Basic Knowledge of Contact Lenses, raw materials and pre-fitting examination**		**Syllabus revised**		**2023- 24**
Course Objectives	1. To assist in the ability to manage patients with disposable and/or extended wear lenses 2. To be prepared to be able to exhibit decision-making capabilities in advanced rigid and soft contact lens design, fitting, and problem-solving to include toric, bifocal, and irregular cornea designs. 3. To be prepared to have a successful contact lens practice 4. To impart knowledge on designing skills of various types of contact lens 5. To illustrate knowledge on fitting philosophies and recent development of contact lenses				
Unit I	SCL Materials & Review of manufacturing techniques - Comparison of RGP vs. SCL - Pre-fitting considerations for SCL - Fitting philosophies for SCL - Fit assessment in Soft Contact Lenses: Types of fit – Steep, Flat, Optimum- Manufacturing Soft Contact Lenses – various methods – advantages & disadvantages- Special points for in pre-fitting examination of Soft Contact Lenses.				
Unit II	Soft Toric CL - Stabilization techniques - Parameter selection - Fitting assessment				
Unit III	Review of RGP Lens fitting - RGP Lens Fit Assessment and fluroscein pattern - Special RGP fitting (Aphakia, pseudo phakia&Keratoconus) - RGP over refraction and Lens flexure - Examination of old RGP Lens - RGP Lens parameters selection				
Unit IV	Care and Maintenance of Soft lenses - Components of Lens Care systems for Soft Contact Lenses - Cleaning agents & Importance - Rinsing agents & Importance - Disinfecting agents & importance - Lubricating & Enzymatic cleaners - Insertion & Removal Techniques - Do's and Dont's - Follow up visit examination - Complications of Soft & RGP lenses - Contact lens solutions – composition, necessity, advantages.				
Unit V	Therapeutic contact lenses - Indications & Fitting consideration Specialty fitting - Aphakia - Pediatric - Post refractive surgery - Management of Presbyopia with Contact lenses - Ortho-Keratology and Myopia Control				

References

1) *IACLE modules 1 - 10*

2) *CLAO Volumes 1, 2, 3*

3) Anthony J. Phillips : *Contact Lenses*, 5thedition, Butterworth-Heinemann, 2006

4) Elisabeth A. W. Millis: *Medical Contact Lens Practice*, Butterworth-Heinemann, 2004

5) E S. Bennett ,V A Henry :*Clinical manual of Contact Lenses*, 3rd edition, Lippincott Williams and Wilkins, 2008

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://iacle.org/

https://pubmed.ncbi.nlm.nih.gov/

Course Outcomes		**Knowledge level**
CO-1	To illustrate Knowledge on fitting philosophies and recent development of contact lenses	K3
CO-2	To impart knowledge on designing skills of various types of Specialty contact lens	K3
CO-3	Predict the contact lens design for various kinds of patients	K4
CO-4	Recognize various type of contact lens fitting	K4
CO-5	Hypothesize the contact lens care procedures for the awareness of the patients	K5

Course designed by **Nigin C Philipose**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	L (1)	S (3)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	M (2)
CO2	L (1)	L (1)	S (3)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	M (2)
CO3	L (1)	L (1)	S (3)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	M (2)
CO4	L (1)	L (1)	S (3)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	M (2)
CO5	L (1)	L (1)	S (3)	S (3)	L (1)	S (3)	L (1)	L (1)	L (1)	M (2)
W.AV	**1**	**1**	**3**	**3**	**1**	**3**	**1**	**1**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M (2)	L (1)	S (3)	L (1)	M (2)
CO2	M (2)	L (1)	S (3)	L (1)	M (2)
CO3	M (2)	L (1)	S (3)	L (1)	M (2)
CO4	M (2)	L (1)	S (3)	L (1)	M (2)
CO5	M (2)	L (1)	S (3)	L (1)	M (2)
W.AV	**2**	**1**	**3**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

VI - Semester					
CC	**Course code: 91462**	**Binocular Vision - II**	**T**	**Credits: 4**	**Hours: 5**
Pre-requisite	**Basic Knowledge of Orthoptics and squint**		**Syllabus revised**		**2023- 24**

Course Objectives	1. To impart knowledge on orthoptic instruments and investigations. 2. To illustrate the types and procedures of strabismus and orthoptic procedures 3. To demonstrate the qualitative and quantitative diagnosis of binocular vision and its treatment 4. Provide a detailed explanation of, and differentiate between the etiology, investigation and management of binocular vision anomalies 5. Adapt skills and interpret clinical results following investigation of binocular vision anomalies appropriately and safely
Unit I	**Orthoptic instruments**: Prism Bar, Synoptophore, Maddox Wing, Maddox Rod, Red Green Goggles, Hess Screen, Risley Prisms. **Investigative procedures: Motor signs in squint -** Head position: Face turn, chin position, Head tilt. Cover test & cover-uncover tests. Maddox wing to assess heterophoria. **Assessment of degree of squint** - Hirschbag test, Prism bar test, Krimskey test, Synoptophore test. **Assessment of ocular motality status** - Hess chart, Diplopia testing, Bielschowskys Head tilt test.
Unit II	**Convergent strabismus: Accommodative convergent squint –** Classification, Investigation and Management. **Non accommodative Convergent squint –** Classification, Investigation and Management. **Divergent Strabismus -** Classification, A& V phenomenon, Investigation and Management. **Vertical strabismus -** Classification, Investigation and Management.
Unit III	**Paralytic Strabismus:** Acquired and Congenital, Clinical Characteristics, Distinction from comitant and restrictive Squint, Investigations, Non surgical Management of Squint.
Unit IV	**Restrictive Strabismus:** Musculo fascical anomalies, Duane's Retraction syndrome, Clinical features and management, Brown's Superior oblique sheath syndrome, Strabismus fixus , Congenital muscle fibrosis, Surgical management
Unit V	**Vision therapy:** Role of vision therapy in orthoptics management, VTPs for Amblyopia, Suppression, ARC, Convergence insufficiency.

References

1. *Theory and Practice of Squint and Orthoptics* by A K Khurana
2. *R W Reading: Binocular Vision*- Foundations and Applications
3. Basic Science, A.A.O (section-6*) Pediatric Ophthalmology and Strabismus* 1992-1993
4. Pradeep Sharma: *Strabismus simplified*, New Delhi, First edition, 1999, Modern publishers
5. Von Noorden's *Binocular Vision and Ocular Motility* – Gunter K von Noorden, 2ne edition, C.V.Mosby & Co

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://pubmed.ncbi.nlm.nih.gov/

https://eyewiki.org/Main_Page

Course Outcomes		**Knowledge level**
CO-1	Assement of ocular motility and squint	K3
CO-2	Understand etiology, investigation and management of concomitant strabismus	K4
CO-3	Illustrate the visually guided behavior in the diagnosis of binocular vision and its AV phenomena	K4
CO-4	Analyze various types of strabismus and non-surgical management in binocular vision	K4
CO-5	Identify the orthoptic procedures involved in the treatment of binocular vision	K5

Course designed by **Aswathi S R**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	M (2)	S (3)	M (2)	L (1)	M (2)	L (1)	M (2)	L (1)	L (1)
CO2	L (1)	M (2)	S (3)	M (2)	L (1)	M (2)	L (1)	M (2)	L (1)	L (1)
CO3	L (1)	M (2)	S (3)	M (2)	L (1)	M (2)	L (1)	M (2)	L (1)	L (1)
CO4	L (1)	M (2)	S (3)	M (2)	L (1)	M (2)	L (1)	M (2)	L (1)	L (1)
CO5	L (1)	M (2)	S (3)	M (2)	L (1)	M (2)	L (1)	M (2)	L (1)	L (1)
W.AV	**1**	**2**	**3**	**2**	**1**	**2**	**1**	**2**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S (3)	L (1)	S (3)	L (1)	M (2)
CO2	S (3)	L (1)	S (3)	L (1)	M (2)
CO3	S (3)	L (1)	S (3)	L (1)	M (2)
CO4	S (3)	L (1)	S (3)	L (1)	M (2)
CO5	S (3)	L (1)	S (3)	L (1)	M (2)
W.AV	**3**	**1**	**3**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

VI - Semester					
CC	**Course code: 91463**	**Low Vision Aids**	**T**	**Credits: 4**	**Hours: 5**
Pre-requisite	**Basic Knowledge of Low vision management**		**Syllabus revised**		**2023- 24**

Course Objectives	1. To provide knowledge the concepts of low vision diagnosis and its evaluation in demonstrating aids 2. To impart knowledge on the need for teaching and guiding the patients with low vision 3. To illustrate the testing the methods of low vision, lens and devices for rehabilitation 4. To impart knowledge on training for Low Vision subjects with Low vision devices 5. To acquire knowledge to refer and manage low vision patient.
Unit I	**Introduction:** Definitions & classification of Low vision, Grades of low vision, Statistics/ Epidemiology. Relation between disorder, impairment & handicapped. Model of low vision service. **Pre-clinical evaluation of low vision patients:** prognostic & psychological factors; psycho-social impact of low vision
Unit II	**Magnification:** relative distance/ relative size/ approach/angular. **Types of low vision aids**: optical aids, non-optical aids & electronic devices. Optics of Galilian & Keplarian telescope- advantage/disadvantage, significance of exit & entrance pupil. Optics of spectacle magnifier/ determination/ calculation/ disadvantage/advantage. Optics of stand magnifier, significance of equivalent viewing distance & calculations. Telescope- distance/ near/ telemicroscope/ monocular/ binocular/ bioptic. Hand held magnifier-illuminated/ non-illuminated. Spectacle magnifier / half eye/ prism correction/ bar magnifier/ CCTV/ / low vision imaging system or V-max / contact lens & IOL telescope.
Unit III	**Clinical evaluation:** assessment of visual acuity, visual field, selection of low vision aids, instruction & training. Pediatric Low Vision care. Low vision aids – dispensing & prescribing aspects. **Non- optical devices**: pen/umbrella/ bold line note book/ illumination/ letter writer/ environmental modification/ signature guide/ needle threader/ eccentric viewing strategies,Visual rehabilitation & counseling.
Unit IV	**Overview of Rehabilitation Services:** definition/ implementation/ vocational guidance/ educational guidance/ mobility & orientation training / special teacher/ special school/ Braille system/ integrated system/referral center- activity/ support/ loan
Unit V	**Overview of systematic / retinal diseases in relation to low vision:** acromatopsia/down syndrome/ retinitis pigmentosa/ diabetic retinopathy/ optic atrophy/ albinism/ aniridia. Counseling of low vision patient/ parents/ guardians/relatives. Case Analysis.

References

1. *Low vision aids* by Monica Chaudhry, Jaypee publications
2. C.Dickinson : *Principles and Practice of Low Vision*, Butterworth- Heinemann Publication, 1998
3. *Low Vision Aids Practice*, 2nd Edition 2007, Ajay Bhootra
4. *Low Vision Care* -Edwin B. Mehr & Allan N.Freid The Professional Press, Chicago 1975
5. *5. Art and practice of Low Vision* - Second Edition -Paul freeman, Butterworth Heinemann

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://pubmed.ncbi.nlm.nih.gov/

https://eyewiki.org/Main_Page

Course Outcomes		**Knowledge level**
CO-1	Identify the diagnostic procedures in low vision patients and case management	K5
CO-2	Analyze the evaluation techniques and demonstrating aids in low vision diagnosis	K4
CO-3	Illustrate the need for taking care of the patients with teaching and guidance	K3
CO-4	Describe the pathological conditions and to administer the patients with low vision care	K4
CO-5	Identify the right optical devices for the rehabilitation of the visually handicapped	K5

Course designed by **Aswathi S R**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S (3)	M (2)	S (3)	S (3)	L (1)	L (1)	L (1)	M (2)	L (1)	M (2)
CO2	S (3)	M (2)	S (3)	S (3)	L (1)	L (1)	L (1)	M (2)	L (1)	M (2)
CO3	S (3)	M (2)	S (3)	S (3)	L (1)	L (1)	L (1)	M (2)	L (1)	M (2)
CO4	S (3)	M (2)	S (3)	S (3)	L (1)	L (1)	L (1)	M (2)	L (1)	M (2)
CO5	S (3)	M (2)	S (3)	S (3)	L (1)	L (1)	L (1)	M (2)	L (1)	M (2)
W.AV	**3**	**2**	**3**	**3**	**1**	**1**	**1**	**2**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M (2)	L (1)	S (3)	L (1)	M (2)
CO2	M (2)	L (1)	S (3)	L (1)	M (2)
CO3	M (2)	L (1)	S (3)	L (1)	M (2)
CO4	M (2)	L (1)	S (3)	L (1)	M (2)
CO5	M (2)	L (1)	S (3)	L (1)	M (2)
W.AV	**2**	**1**	**3**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

VI - Semester					
CC	**Course code: 91464**	**Practical – Clinical Optometry - II**	**P**	**Credits: 3**	**Hours: 6**
Pre-requisite	**Basic Knowledge of**		**Syllabus revised**		**2023- 24**
Course Objectives	1. To learn IOP measurement using Schiotz and applanation tonometer 2. To study parts and procedures of ophthalmoscopy 3. To impart knowledge on A scan and B scan 4. To acquire knowledge on pre-fitting assessment and prescription of contact lens 5. To educate on low vision evaluation and vision therapy				
Unit I	IOP assessment with Schiotz and AT				
Unit II	Ophthalmoscope - Direct & Indirect				
Unit III	B scans Interpretation - A scan chart				
Unit IV	Soft & RGP Contact lens - insertion and removal, fitting assessment, Over-refraction - Special Contact lenses				
Unit V	Low vision evaluation – Clinical assessments, Magnification calculation, LVA trial – Synoptophore - Vision Therapy				

Course Outcomes		**Knowledge level**
CO-1	Acquire skill to measure IOP using different tonometers	K3
CO-2	Evaluation and diagnosis of fundus using ophthalmoscopy	K5
CO-3	Interpretation of A scan and B scan reports	K4
CO-4	Contact lens fitting assessment and dispensing of contact lens	K5
CO-5	Assessment and dispensing of low vision. Orthoptic exercise and vision therapy	K5

Course designed by **Aswathi S R**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
CO2	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
CO3	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
CO4	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
CO5	M (2)	M (2)	S (3)	S (3)	M (2)	S (3)	M (2)	L (1)	L (1)	M (2)
W.AV	**2**	**2**	**3**	**3**	**2**	**3**	**2**	**1**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M (2)	S (3)	S (3)	L (1)	M (2)
CO2	M (2)	S (3)	S (3)	L (1)	M (2)
CO3	M (2)	S (3)	S (3)	L (1)	M (2)
CO4	M (2)	S (3)	S (3)	L (1)	M (2)
CO5	M (2)	S (3)	S (3)	L (1)	M (2)
W.AV	**2**	**3**	**3**	**1**	**2**

S –Strong (3), M-Medium (2), L- Low (1)

VI - Semester					
CC	**Course code: 91465**	**Systemic Diseases Affecting the Eye**	**T**	**Credits: 4**	**Hours: 5**
Pre-requisite	**Basic Knowledge about Systemic Diseases**		**Syllabus revised**		**2023- 24**

Course Objectives	1. To identify different forms of systemic diseases affecting the eye. 2. To manage different forms of systemic diseases affecting the eye. 3. To prevent complications arising from systemic diseases. 4. To evaluate the effectiveness of care and treatment. 5. To identify danger signs of systemic diseases and take appropriate action.
Unit I	**Hypertension:** Definition – Classification – Pathophysiology – Clinical examination – Diagnosis – Complications and management – Hypertensive retinopathy. **Acquired heart diseases:** Embolism – Endocarditis - Rheumatic heart diseases – Definition, Pathophysiology, Classification, Etiology, Diagnosis, Complications and Treatment – Heart diseases and ophthalmic considerations. **Tuberculosis:** Etiology – Pathophysiology – Clinical features – Classification – Diagnosis – Complications – Treatment – Tuberculosis and eye.
Unit II	**Diabetes mellitus:** Pathophysiology – Etiology – Classification – Clinical features – Diagnosis – Complications and Management – Diabetic retinopathy. **Thyroid disorders:** Anatomy and physiology of thyroid gland – Hyperthyroidism – Hypothyroidism – Thyroiditis – Thyroid tumors – Etiology, Clinical features, Diagnosis, Management – Graves's ophthalmopathy.
Unit III	**Neurological disorders:** Classification – Pathophysiology – Etiology – Clinical features – Diagnosis and Management – Demyelinating diseases – Papilloedema – Neurologic disorders and eye. **Genetic disorders:** Sickle cell anaemia – Down syndrome – Definition, Classification, Clinical examination, Diagnosis and Management - Malignancy – Grading and staging – Ophthalmic considerations.
Unit IV	**Connective tissue diseases:** Arthritis – Anatomy, Pathophysiology, Etiology, Clinical features, Diagnosis – Complications and Management – Arthritis and eye. **Vitamin Deficiency:** Classifications – Ophthalmic involvement.
Unit V	**Tropical diseases:** Hepatitis – Typhoid – Dengue – Leprosy – Syphilis – Malaria – Etiology, Pathophysiology, Clinical features, Diagnosis, Classifications, Complications and Management – Tropical diseases and eye.

References

1. *Davidson's principles and practice of medicine* – Ed John Macleod – 19th Edition - Churchill Livingstone, 2002.
2. *Systemic diseases and the eye; signs and differential diagnosis* – Jack J Kanski – Mosby, 2001.
3. *The eye in systemic diseases* – Daniel H. Gold, Thomas A. Weingeist - Lippincott Williams and Wilkins, 1990

Related online content (MOOC, Swayam, NPTEL, Website etc.)

http://med.virginia.edu

www.academia.edu

Course Outcomes		**Knowledge level**
CO-1	Develop critical skills in their practice.	K3
CO-2	Predict the onset of diseases.	K4
CO-3	Identify the different types of systemic diseases.	K2
CO-4	Able to diagnose and manage diseases.	K5
CO-5	Aware people how to improve their health.	K3

Course designed by **Dr. Fathimath Shamna**

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	S (3)	S (3)	L (1)	L (1)	L (1)	L (1)	M (2)	L (1)	L (1)
CO2	L (1)	S (3)	S (3)	L (1)	L (1)	L (1)	L (1)	M (2)	L (1)	L (1)
CO3	L (1)	S (3)	S (3)	L (1)	L (1)	L (1)	L (1)	M (2)	L (1)	L (1)
CO4	L (1)	S (3)	S (3)	L (1)	L (1)	L (1)	L (1)	M (2)	L (1)	L (1)
CO5	L (1)	S (3)	S (3)	L (1)	L (1)	L (1)	L (1)	M (2)	L (1)	L (1)
W.AV	**1**	**3**	**3**	**1**	**1**	**1**	**1**	**2**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L (1)	L (1)	M (2)	L (1)	L (1)
CO2	L (1)	L (1)	M (2)	L (1)	L (1)
CO3	L (1)	L (1)	M (2)	L (1)	L (1)
CO4	L (1)	L (1)	M (2)	L (1)	L (1)
CO5	L (1)	L (1)	M (2)	L (1)	L (1)
W.AV	**1**	**1**	**2**	**1**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

VI - Semester					
DSE	**Course code: 91466A**	**Medical Law and Ethics**	**T**	**Credits: 4**	**Hours: 4**
Pre-requisite	**Basic Knowledge of medical law**		**Syllabus revised**		**2023- 24**
Course Objectives	1. To understand the fundamental principles of medical ethics and code of conduct, with a focus on their historical development and application 2. To grasp the core principles of medical ethics, including confidentiality, professional boundaries, and the legal aspects of patient-provider relationships in the Indian healthcare system. 3. To explore the rights of patients and the concept of autonomy in Indian healthcare, emphasizing the importance of informed consent and ethical decision-making 4. To examine the medico-legal aspects of medical records in the Indian context, including ownership, confidentiality, and compliance with Indian legal regulations. 5. To develop the knowledge and skills necessary for professionalism, risk management, and ethical practice in the Indian healthcare industry, with a focus on optometry.				
Unit I	Introduction to Medical Ethics and Code of Conduct: Medical ethics: Definition, Goal, and Scope, Historical development of medical ethics, The Oath and its relevance, Code of conduct in healthcare professions, Ethical theories: Deontology, Utilitarianism, Virtue Ethics, Ethical decision-making models				
Unit II	Basic Principles of Medical Ethics: Confidentiality in healthcare, Professional boundaries and relationships, Malpractice and negligence in healthcare, Rational and irrational drug therapy, Legal aspects of patient-provider relationships				
Unit III	Patient Rights and Autonomy: Autonomy and its importance in healthcare, Informed consent: Definition and process Right of patients to refuse treatment, Care of the terminally ill and discussions on euthanasia				
Unit IV	Medico-Legal Aspects of Medical Records: Medical records: Importance and components, Types of medico-legal cases, Ownership of medical records Confidentiality and privilege communication, Release of medical information and unauthorized disclosure, Retention of medical records				
Unit V	Professionalism and Risk Management: Professional indemnity insurance policy, Developing standardized protocols to prevent near-miss or sentinel events, Obtaining informed consent: Best practices, Ethical dilemmas in optometry practice, Emerging legal and ethical issues in healthcare				

References

1. Carol D Tambo, *Medical Law, Ethics, & Bioethics for the Health Professions* (6 th edition)
2. Tom L Beauchamp, *Principles of biomedical ethics* (4 th edition)
3. Purushottam Behera, *Essentials of Medical Law and Ethics*, Mittal Publications
4. Bonnie F. Fremgen, *Medical Law and Ethics*
5. 5. *Medical Law and Ethics* in India by T.K. Shanmugam (9th Edition, 2021)

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://www.wma.net/wp-content/uploads/2016/11/Ethics_manual_3rd_Nov2015_en.pdf

https://ima-india.org/windata/Docforcomment.pdf

Course Outcomes		**Knowledge level**
CO-1	Demonstrate an understanding of the historical development of medical ethics and apply ethical principles in the Indian healthcare context.	K2
CO-2	Analyze and apply core principles of medical ethics, including confidentiality and professional boundaries, within the framework of Indian healthcare.	K3
CO-3	Assess and advocate for patient rights and autonomy in the Indian healthcare system,	K3

	with a focus on informed consent.	
CO-4	Capable of evaluating and adhering to the medico-legal requirements related to medical records, ensuring compliance and confidentiality.	K2
CO-5	Possess the knowledge and skills necessary to uphold professionalism, manage risks, and make ethical decisions in the context of the Indian healthcare industry, specifically in optometry practice.	K2
Course designed by **K Muhammed Kunhi**		

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L (1)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	L (1)	S (3)	L (1)
CO2	L (1)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	L (1)	S (3)	L (1)
CO3	L (1)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	L (1)	S (3)	L (1)
CO4	L (1)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	L (1)	S (3)	L (1)
CO5	L (1)	L (1)	L (1)	L (1)	L (1)	S (3)	L (1)	L (1)	S (3)	L (1)
W.AV	**1**	**1**	**1**	**1**	**1**	**3**	**1**	**1**	**3**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L (1)	S (3)	L (1)	S (3)	L (1)
CO2	L (1)	S (3)	L (1)	S (3)	L (1)
CO3	L (1)	S (3)	L (1)	S (3)	L (1)
CO4	L (1)	S (3)	L (1)	S (3)	L (1)
CO5	L (1)	S (3)	L (1)	S (3)	L (1)
W.AV	**1**	**3**	**1**	**3**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

VI - Semester					
DSE	**Course code: 91466B**	**Clinical Psychology**	**T**	**Credits: 4**	**Hours: 4**
Pre-requisite	**Basic Knowledge of Psychology**		**Syllabus revised**		**2023- 24**

Course Objectives	1. Develop a comprehensive grasp of psychology, encompassing fundamental principles, historical viewpoints, and research methodologies. 2. Acquire knowledge of the biological basis of behaviour, including brain structure and function, nervous system involvement, and the role of sensation and perception. 3. Comprehend the importance of medical psychology in healthcare, recognizing its impact on health, illness, and the bio psychosocial model of care. 4. Describe the objectives of clinical psychology, understand the assessment and diagnosis of mental disorders, and identify common therapeutic approaches in clinical psychology. 5. Apply psychological principles to real-world healthcare scenarios, gaining skills in health promotion, pain management, behavioural interventions, and end-of-life care.
Unit I	Introduction to Psychology: Historical Perspectives in Psychology, Understanding the Basics of Psychology, Definition and scope of psychology, Key Concepts: Mind, Behavior, and Mental Processes, Research Methods in Psychology
Unit II	Biological Foundations of Behaviour: Brain Structure and Function, Neurons and neurotransmitters, Nervous System and Its Role in Behavior, Sensation and Perception, Sensory systems (vision, hearing, taste, smell, touch), Perception and its role in interpreting the world, Learning and Memory, Classical and operant conditioning, Types of memory and memory processes
Unit III	Medical Psychology: Abnormal Psychology, Psychological disorders and their classification, Causes and treatment of mental disorders, Health Psychology, Mind-body connection and psychosomatic disorders, Coping with stress and illness, Patient-Provider Communication
Unit IV	Clinical Psychology: Major theoretical orientations in clinical psychology, Psychological assessment techniques and tools, Clinical interviewing and case history, Overview of psychotherapy modalities (individual, group, family) Evidence-based practices in clinical psychology, The role of clinical psychologists in mental health care, Collaborative approaches with other healthcare professionals
Unit V	Applied Medical Psychology: Psychology in Healthcare Settings, Pain Management and Behavioral Medicine, Health Promotion and Behavioral Interventions, End-of-Life Issues and Palliative Care

References

1. Atkinson & Hilgard's *Introduction to Psychology*, 15th Edition
2. David G. Myers, *Psychology* (9 th edition)
3. Barkway, P. (2013). *Psychology for Health Professionals*. (2nd Edition). Elsevier.
4. R. Sreevani, *Applied Psychology for Nurses* (2019), Jaypee Brothers Medical Publishers
5. 5. Dominic Upton, *Introducing Psychology for Nurses and Healthcare Professionals* (2010) Pearson

Related online content (MOOC, Swayam, NPTEL, Website etc.)

https://dokumen.pub/qdownload/psychology-themes-and-variations-11nbsped-2020924191-9780357374825.html

https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/health_extension_trainees/ln_intro_psych_final.pdf

Course Outcomes		**Knowledge level**
CO-1	Understand psychology as a science and the practical application of psychological principles in allied health professions.	**K2**
CO-2	Demonstrate an understanding of the neural basis of behavior and its relevance to healthcare practices.	**K4**
CO-3	Appreciate the significance of psychological factors in health, effectively communicate with patients, and contribute to holistic healthcare.	**K3**

CO-4	Understand of clinical psychology, enabling them to describe the scope, theoretical orientations, assessment methods, and treatment modalities within the field. They will also be prepared to navigate the ethical, legal, and collaborative aspects of clinical psychology in healthcare settings.	**K2**
CO-5	Ability to integrate psychological principles into healthcare practices, promoting patient well-being and enhancing the quality of care.	**K4**
Course designed by **K Muhammed Kunhi**		

Mapping Course Outcome VS Programme Outcomes

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M (2)	L (1)	L (1)	L (1)	L (1)	M (2)	L (1)	L (1)	M (2)	L (1)
CO2	M (2)	L (1)	L (1)	L (1)	L (1)	M (2)	L (1)	L (1)	M (2)	L (1)
CO3	M (2)	L (1)	L (1)	L (1)	L (1)	M (2)	L (1)	L (1)	M (2)	L (1)
CO4	M (2)	L (1)	L (1)	L (1)	L (1)	M (2)	L (1)	L (1)	M (2)	L (1)
CO5	M (2)	L (1)	L (1)	L (1)	L (1)	M (2)	L (1)	L (1)	M (2)	L (1)
W.AV	**2**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**2**	**1**

S –Strong (3), M-Medium (2), L- Low (1)

Mapping Course Outcome VS Programme Specific Outcomes

CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	L (1)	S (3)	L (1)	S (3)	L (1)
CO2	L (1)	S (3)	L (1)	S (3)	L (1)
CO3	L (1)	S (3)	L (1)	S (3)	L (1)
CO4	L (1)	S (3)	L (1)	S (3)	L (1)
CO5	L (1)	S (3)	L (1)	S (3)	L (1)
W.AV	**1**	**3**	**1**	**3**	**1**

S –Strong (3), M-Medium (2), L- Low (1)