Centurion University of Technology and Management, Odisha

School of Paramedics and Allied Health Sciences

Bachelor of Science in Optometry (four years)

2024
Syllabus

Preface:

Optometry means a health care profession that is autonomous and concerned especially with examining the eye for defects and faults of refraction, with prescribing correctional lenses or eye exercises, with diagnosing diseases of the eye, and with treating such diseases or referring them for treatment. Optometry as a profession has the primary public health responsibility for eliminating uncorrected refractive error (the leading cause of vision impairment globally). As primary eye care practitioners, optometrists have a vital role in detecting potentially serious eye diseases such as cataract, glaucoma and age-related maculopathy, as well as general health conditions such as hypertension and diabetes, which means optometrists can also help alleviate the burden of other causes of blindness through diagnosis, referral and in some cases co-management. optometry can and should play a leading role in eye care provision at the primary level, and can also assist at secondary and tertiary levels where possible, working with ophthalmologists and other eye care providers towards the unified goal of combating blindness.

Course Objective

At the end of optometry training the graduate shall be able to;

- Perform all the optometric techniques
- Use discretely the essential laboratory services
- Manage all types of clinical diagnostic ophthalmic methods
- Demonstrate skills in handling the modern optometric instruments in laboratory test.
- Develop leadership qualities to function effectively as a leader in the laboratory environment
- Render services to the laboratory set up and to communicate effectively with the ophthalmologists and the hospital management.
- Development of skill and competency in data processing, reporting and maintenance of records & ophthalmic investigations

Programme: bachelor of science in optometry (b.sc. Optometry)

Duration: four-year programmed (including 1 year internship in the last year)

Eligibility: Pass in +2 Science from a recognized board of the country, with individually pass in the subjects of Physics, Chemistry, Biology and/or Mathematics and have secured minimum of 50% marks in Physics, Chemistry Biology or Mathematics taken together (40% for SC/ST and 45% for candidates)Physically

Examination: examination rules will be as per guideline of CUTM examination hand book.

Degree: The degree of bachelor of science in optometry course of the university shall bec onferred on the candidates who have pursued the prescribed course of study for not less four academic years and have passed examinations as prescribed under the relevant scheme and completed 1 year of compulsory internship in the last year. On successful completion of four years programme, with a minimum course credit of 180 credits, the
Candidates will be awarded with "bachelor of science in optometry (b. Sc optometry) from centurion university

Internship: A candidate must undergo an internship for a period of 1 year in a govt. Hospital/ private hospital/ organization/ tertiary center, which fulfill the norms decided by the university. Internship is a phase of training wherein a graduate is expected to conduct actual practice of clinical optometry and acquires skills under supervision so that he /she may become capable of functioning independently

Project work: Each bachelor of science in optometry (bsc.optometry) students will carry out project work under the supervision of a faculty member (as a primary guide). The progress of project work will be monitored regularly by the guide.

Programme structure

Bachelor of Science in Optometry

Choice-Based Credit System (CBCS) Structure

Category	Minimum Credits to be completed	Minimum Credits to be completed
School (Core)	**16**	**180**
Discipline (Core)	**108**	
Skill Basket#	**12**	
Value Added**	**6**	
AECC	**6**	
Summer Internship##	**4**	
Project	**14**	
Internship	**14**	

Programme Outcomes:

Allied Health courses have emerged as an important branch of medical science, in discovering greater realms of human health. The objective of these courses is to propagate the technology in Allied Health sector. The Programme focuses on educating students by imparting quality training and conducting research. It provides skills and establishes the students in Community Health Practice in the Diagnostic division.

PO	Outcomes
PO1	Possess a strong foundation of knowledge in the core concepts, theories, and principles of allied health.
PO2	Demonstrate competence in performing a range of clinical procedures and techniques.
PO3	Collaborate with professionals from different healthcare disciplines, demonstrating teamwork.
PO4	Exhibit professionalism, integrity, and ethical conduct in their interactions with patients, colleagues.
PO5	Apply critical thinking skills to analyze complex healthcare scenarios and solve problems.
PO6	Demonstrate leadership qualities and possess basic knowledge of healthcare management principles.
PO7	Provide compassionate and comprehensive patient care.
PO8	Embrace a commitment to lifelong learning and professional development.
PO9	Demonstrate effective verbal and written communication skills.
PO10	Promote health and wellness by educating individuals and communities about healthy lifestyles, disease prevention strategies, and the importance of early intervention.
PO11	Respect and appreciate the cultural diversity of patients and communities.
PO12	Understand the importance of research in advancing allied health practice.

Programme Specific Outcomes:

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PSO1.	To demonstrate a high level of clinical expertise in optometry should be able to perform comprehensive eye examinations refractive problems diagnosis and treatment.
PSO2.	To develop graduates' research skills and their ability to critically evaluate scientific literature, they should be able to conduct research in Optom and work in the private, semi-governmental, optometry field.
PSO3.	To demonstrate strong commitment to ethical practice and professional conduct

Basket I
School core courses

Sl. No.	**Code**	**Subject**	**Subject type (T+P+Pj)**	**Credits**
SC-1	CUTM1729	Cell Biology	2+0+1	3
SC-2	CUTM1757	General Anatomy	3+2+0	5
SC-3	CUTM1759	Biochemistry	2+1+0	3
SC-4	CUTM1758	General Physiology	3+2+0	5
SC-5	CUTM1721	Research Methodology	2+0+1	3
			Total credit	**19**

Basket II
Discipline core courses

Sl.no.	**Code**	**Subject**	**Subject type** (T+P+PJ)	**Credits**
DC-1	CUTM1781	Geometric Optics	3+2+0	5
DC-2	CUTM1742	Basic Computer And Information Science	0+2+0	2

DC-3	CUTM1782	Ocular Anatomy	3+1+0	4
DC-4	CUTM1783	Ocular Physiology	3+1+0	4
DC-5	CUTM1785	Introduction To Optometry	1+1+0	2
DC-6	CUTM1784	Physical Optics	3+1+0	4
DC-7	CUTM1768	Visual Optics-I	3+2+0	5
DC-8	CUTM1787	Optometric Optics–I	3+2+0	5
DC-9	CUTM4264	Ocular Diseases–I	3+0+1	4
DC-10	CUTM1789	Ocular Microbiology & Pathology	3+1+0	4
DC-11	CUTM1790	Clinical Examination Of Visual System Lab	0+2+0	2
DC-12	CUTM1792	Optometric Optics–II & Dispensing Optics	3+2+0	5
DC-13	CUTM1794	Ocular Diseases–II	3+0+1	4
DC-14	CUTM1793	Contact Lenses-I	3+2+0	5
DC-15	CUTM1795	Contact Lenses-II	3+2+0	5
DC-16	CUTM1796	Binocular Vision–I	3+2+0	5
DC-17	CUTM1797	Low Vision & Rehabilitation	3+1+0	4
DC-18	CUTM1798	Basic & Ocular Pharmacology	3+0+1	4
DC-19	CUTM1799	Binocular Vision–II	3+2+0	5
DC-20	CUTM1800	Pediatric & Geriatric Optometry	3+1+0	4
DC-21	CUTM1801	Systemic Diseases & Eye	3+0+1	4
DC-22	CUTM1802	Occupational Optometry	2+0+1	3
DC-23	CUTM1784	Medical Law And Ethics	2+0+1	3
DC-24	CUTM4265	Public Health & Community Optometry	2+0+2	4
DC-25	CUTM1803	Optometric Instruments	3+2+0	5
DC-26	CUTM1791	Visual Optics-II	3+2+0	5
DC-27	CUTM2954	Psychology And Sociology	3+0+1	4
DC-28	CUTM1809	Project	0+0+14	14
DC-29	CUTM4266	Internship	0+14+0	14

Note: along with the school core and disciple core subjects, the students need to opt for aecc courses, skill/ domain/ elective courses and value- added courses from the university basket, asper the requirement by the university.

Value added courses: students can choose any suitable skill course offered by the university in semester ii/iii/iv note: skill course & value-added course, to be opted by the student along with the regular courses, as suggested in the syllabus.

Basket I
School core courses

Cell Biology

Subject name	Code	Type	T + P + Pj	Credits
Cell Biology	CUTM1729	Theory+ Project	2+0+1	4

Course Objective

- Determine the parts of the cell membrane and the cell wall
- Distinguish the types and mechanism of mutation
- Compare and contrast the events of cell cycle and its regulation
- Understand the dynamic character of cellular organelles

Course Outcome:

After completion of the course the students will be able to:

COs	Statements	COs with POs and PSOs Mapping
CO1	Describe the fundamental principles of cellular biology.	PO1, PSO1, PSO2
CO2	Understand the cells growth, division and death.	PO1, PO2, PO5, PSO1, PSO3

CO3	Utilize the skill in the mechanism of cell signaling and how it regulates cellular functions.	PO5, PO6, PSO2
CO4	Relate the knowledge with how cellular dysregulation can lead to disease condition.	PO4, PO10, PO12, PSO1, PSO3
CO5	Identify cellular dysregulation.	PO5, PO12, PSO3

Course outline:

Module I:

Overview of cells: history and cell theory key historical developments and basic principles. Structure and function of cell and its organelles: biological membranes: structure and function. Nucleus: nuclear envelope, nucleolus. Mitochondria: structure, function, and marker enzymes. Chloroplasts: structure and function. Lysosomes, glyoxysomes, and peroxisomes: structure, function, and marker enzymes.

Endoplasmic reticulum: rough and smooth er, functions. Ribosomes: structure and function. Golgi complex: structural organization, function, and marker enzymes.cell types:prokaryotes vs. Eukaryotes: key differences and characteristics.from single cell to multicellular organisms: overview of cellular evolution. Different molecules of the cell: water, salt, and mineral ions: importance and roles.

Module II:

Cell cycle and its regulation: phases of the cell cycle: g0/g1, s, g2, and m phases.cell division: mitosis, meiosis, and cytokinesis. Regulation of the cell cycle: key regulatory mechanisms. Cellular communication and mobility:

Cell adhesion: roles of different adhesion molecules. Gap junctions: function and importance. Extracellular matrix (ecm): structure and function.

Cell-cell interaction and cell-ecm interaction: mechanisms and significance.

The cytoskeleton: components and functions. Microtubule-based movement and microfilament-based movement: mechanisms and roles.

Module III:

Cell signaling: hormones and their receptors: types and functions. Cell surface receptors: overview and types. Signaling through g-protein coupled receptors (gpcr): mechanisms and pathways. Tyrosine kinase receptors: structure and function. Signal transduction pathways: key pathways and their roles.

Second messengers: types and functions. Regulation of signaling pathways: mechanisms and importance. Bacterial and plant two-component systems: overview and examples. Bacterial chemotaxis: mechanisms and significance.

Module IV:

Programmed cell death (apoptosis): intrinsic pathway: mechanisms and key components. Extrinsic pathway: mechanisms and key components. Caspase enzymes: roles and functions. Regulation of apoptosis: importance in health and disease.

Module V:

Cancer biology: development and causes of cancer: overview and basic concepts.tumor viruses: types and mechanisms. Oncogenes: functions and roles in cancer.tumor suppressor genes: functions and roles in cancer.

Suggested Readings:

- The cell a molecular approach (4th edition) by cooper & hausman
- Https://www.thebiomics.com/books/cell-biology/cell-molecular-approach- cooper-and-hausmn-4th-ed.html
- Molecular biology by friefelder david, publisher narosawww.alibris.com/molecular-biology- david.
- Introduction to cell biology by john k young, world scientific publishing company
- www.overdrive.com/.../introduction-to-cell-biology
- Introduction to biology,3rd tropic edition by d g maackean www.amazon.com/introduction-biology-d-g-mackean

General Anatomy

Subject name	Code	Type	T + P + PJ	Credits
General anatomy	CUTM1757	Theory+ practice	3+2+0	5

Course Objective

- Understand human body structure
- Explore organ system organization
- Learn anatomical terminology
- Relate anatomy to clinical practice.

Course Outcome:

After completion of this course the students will be able to:

COs	Statements	COs with POs and PSOs Mapping
CO1	Understand the structure and position of different organs.	PO1, PO5, PO7, PSO1, PSO2, PSO3
CO2	Apply the knowledge on how the body maintains homeostasis.	PO1, PO5, PO7, PSO2, PSO3
CO3	Compare inter-relationships, gross, functional and applied anatomy of various structures in the human body.	PO1, PO5, PO2, PSO1, PSO2
CO4	Make decisions on radiographic identification of different joints, structures and position of bones from skeleton.	PO5, PO9, PSO1, PSO3
CO5	To be able to apply anatomical knowledge on real subjects.	PO2, PO4, PO7, PSO2, PSO3

Course Outline

Module I

Sub-division of anatomy, terms and terminology, systems of the body. Skeleton: bones: function of bones, classification of bones, parts of young bone, development of bone, classification of bones, blood supply bone, cartilage, clinical anatomy

Module II

Muscle: types of muscles, structure of striated muscle, naming of muscle, fascicular architecture of muscle, actions of muscle, nerve supply.
Joints: classification, structures of joints, movements, mechanism of lubrication, biomechanics, levers, blood supply, nerve supply, and applied anatomy.

Practice: -
Identification of different joints and bones from charts and human skeleton.

Module III

Circulatory system: types of circulation of blood, arteries, veins, capillaries, end arteries, applied aspect. Lymphatic system: components, lymph nodes, clinical anatomy skin: structure of skin, superficial facia, deep facia, clinical aspects

Module IV

Upper extremity: bony architecture joints – structure, range of movement muscles – origin, insertion, actions, nerve supply major nerves – course, branches and implications of nerve injuries development of limb bones, muscles and anomalies radiographic identification of bone and joints applied anatomy
Lower extremity: bony architecture joints – structure, range of movement muscles – origin, insertion, actions, nerve supply major nerves – course, branches and implications of nerve injuries development of limb bones, muscles and anomalies radiographic identification of bone and joints applied anatomy

Module V

Thorax: skeleton of thorax, intercostal spaces, pleura, lung, mediastinum, heart: morphology, blood supply, interior of heart, general information about upper respiratory tract (trachea, esophagus, pharynx, and larynx) clinical anatomy.
Abdomen: anterior and posterior abdominal wall, general information about viscera: stomach, liver, pancreas, duodenum, kidney, ureter, urinary bladder, uterus, and its adnexa.

Module VI

Nervous system: parts of nervous system, neurons, peripheral nerves, spinal nerves, summary of cranial nerves, parasympathetic nervous system.
Special sense organs: structure and function of visual system, auditory system, gustatory system, olfactory system.

Module VII :
Head and neck: scalp, facial muscles, cranial skeleton, triangles of neck, parotid region, temporomandibular joint, muscles of mastication, applied.
Central nervous system: general idea about spinal cord, brainstem, cerebrum, cerebellum, ventricular system, diencephalon, blood supply of brain and its applied, meninges and cerebrospinal fluid.

Practice: -

- Identification of structure and different parts of central nervous system from chart.
- Identification of different blood supply in brain from ppt.
- Demonstration of dissected parts (upper extremity, lower extremity, thoracic & abdominal viscera, face, and brain).
- Identification of structure, position, and different parts of lungs, heart, kidney from charts, models.

Suggested Readings:

- Text book anatomy & physiology for nurses by evelyn pearce, publisher faber amp; faber.
- Text book anatomy and physiology for nurses by sears, publisher edward arnold.
- Anatomy & physiology- by ross and wilson, publisher elsevier.
- Anatomy amp; physiology: understanding the human body by clark, publisher jones & bartlett.
- Anatomy and physiology for nurses by pearson, publisher marieb& hoehn.
- Anatomy and physiology by n murgesh, publisher satya.

GENERAL PHYSIOLOGY

Subject Name	Code	Type of course	T-P-Pj	Credit
General Physiology	CUTM1758	Theory+ Practical	3-2-0	5

Course Objective

- To learn and understand the fundamental scientific concepts relating to a broad range of topics in human physiology.
- To obtain Knowledge about the general physiological systems and physiological terminology.
- To develop investigative skills and to become familiar with standard techniques of measurement.
- To help the students to gain practice and confidence in applying this knowledge, in a quantitative manner where appropriate, to actual experiment

Course Outcome:
After completion of the course, the students will be able to

CO	Statements	CO with POs & PSOs Mapping
CO1	Understand the mechanism of human body function.	PO1, PO5
CO2	Interpret the functionality of different physiological systems.	PO1, PO5, PSO3
CO3	Break down complex physiological processes, such as metabolic pathways and hormonal regulation, to understand the interactions between different organ systems.	PO1, PO5, PO7
CO4	Analyze the interrelationships between different organ systems and their roles in maintaining overall body function and homeostasis.	PO1, PO5, PO7,PSO3
CO5	Assess and interpret physiological data from laboratory experiments or clinical case studies to evaluate body function	PO1, PO5, PO6, PSO2

Course Outline:

Module I

Structure and properties of cardiac muscle, Cardiac cycle, Conductive system, ECG, Heart sounds, Heart rate and regulation, Cardiac output and regulation, Blood pressure and regulation, Coronary Circulation, Effect of exercise in Cardio vascular system.

Module II

Structure and function of respiratory system. Mechanics of respiration – Muscles of respiration, Lung & Chest wall compliance, V/Q Ratio, Surfactant. Transport of gases- O2 & CO2. Nervous and Chemical regulation of respiration. Hypoxia, Cyanosis, Dyspnea. Acid Base Balance. Principles of Lung Function Test – Spiro meter, Lung volumes and capacities. Effect of exercise on respiratory system. Defense mechanism of lungs

Module III

Structure and function of GI system. Mastication and Deglutition. Saliva – composition, function, regulation. Gastric secretion – composition, phases of secretion, function. Pancreatic secretion – composition, function, regulation. Bile – composition and function. Movements of small and large intestine. Digestion in mouth, stomach, intestine and Defecation

Structure and function of kidney and Nephron.Formation of urine – Filtration, Reabsorption, Secretion and Micturation

Module IV

General organization of endocrine glands. General metabolism – Carbohydrate, Fat, Protein. Physiological action, regulation, disorder of hormones –Adrenal, Pancreatic, Parathyroid, Thyroid. Menstrual cycle and its different phases.

Structure of muscle – Macroscopic & Microscopic (Myofibril, Myoneural junction) Properties of skeletal muscle Sliding filament theory. Effect of exercise on muscular system

Module V

General organization of nervous system. Structure, type and function of neuron. Properties of neurons. Synapse and synaptic transmission. Neurotransmitters. Reflex – Properties and types.

Sensory – Receptors, sensory pathway, pain pathway, referred pain, modulation of pain. Motor – Basal ganglia, Cerebellum, Cortex –Function & Effect of lesion. Ascending and Descending pathway. Posture and Equilibrium. Muscle tone. ANS – organization, function of SNS & PSNS. CSF – composition, formation, circulation, function

Practice:

1. Identification of different organs and systems from charts
2. Identification of different blood cell, their normal and abnormal morphology fromslides.
3. Examination of pulse, B.P., Respiratory rate.
4. Reflexes
5. Spirometry to measure various lung capacities & volumes, Respiratory rate, Tidal volume, IRV, IC,
6. ERV, EC, residual volume on Spirometry.

Suggested Readings: -

1. Textbook of medical physiology – Guyton Arthur
2. Textbook of Physiology – A.K.Jain.
3. Principles of Anatomy and Physiology,16thed by G.J. Tortora
4. Essential of Medical Physiology- K. Sembulingam

Biochemistry

Subject name	Code	Type	T + p + pj	Credits
Biochemistry	CUTM4286	Theory+ Practice	2+1+0	3

Course Objective

- To understand the concept of metabolism of carbohydrates
- To understand the significance of amino acids, proteins
- Use of enzymes in enhancing metabolic reactions
- Role of lipids

Course Outcome:

After completion of the course, the students will be able to:

COs	Statements	COs with POs and PSOs Mapping
CO1	List out the biochemical pathways leading to metabolism in the human body.	PO1, PO5 PSO1
CO2	Understand the significance of biomolecules in metabolic activities.	PO1, PO5, PSO1
CO3	To implement the knowledge of transformation of energy by the cells.	PO1, PO2, PO5, PSO1
CO4	Detects an abnormal range of these molecules from patient samples.	PO5, PO5, PO7, PSO2
CO5	Evaluate the biochemical analysis of the patient samples.	PO1, PO2, PO4, PO5, PO7, PO9, PSO1, PSO2, POS3

Course Outline

Module I:

Structure of enzyme: apoenzyme and cofactors, prosthetic group-tpp, coenzyme nad, metal cofactors, classification of enzymes.

Mechanism of action of enzymes: active site, transition state complex and activation energy. Lock and key hypothesis, and induced fit hypothesis.

Enzyme inhibition, enzyme kinetics.

Diagnostic value of serum enzymes: creatinine kinase, alkaline phosphatase, acid phosphatase, ldh, sgot, sgpt, amylase, lipase, carbonic anhydrase etc.

Practice:

Study of effect of temperature on enzyme activity study of effect of ph on enzyme activity

Module II:

Carbohydrates: biomedical importance & properties of carbohydrates, classification, families of monosaccharides: aldoses and ketoses, trioses, tetroses, pentoses, and hexoses. Stereo isomerism of monosaccharides, epimers, haworth projection formulae for glucose; chair and boat forms of glucose.

Practice:

Estimation of glucose in urine

Module III:

Metabolism: glycogenesis & glycogenolysis, glycolysis, citric acid cycle & its significance, components of respiratory chain, energy relationships during cell respiration, types of respiration. Hmp shunt & gluconeogenesis, regulation of blood glucose level.

Practice: .

Estimation of glucose in blood

Module IV:

Amino acids: classification, essential & non-essential amino acids. Chemistry of proteins & their related metabolism, classification, biomedical importance.

Metabolism: ammonia formation & transport, transamination, decarboxylation, urea cycle, metabolic disorders in urea cycle, catabolism of amino acids.

Practice:

Estimation of protein in urine estimation of protein in blood

Module V

Chemistry of lipids & their related metabolism: classification, biomedical importance, essential

fatty acids. Brief out line of metabolism: beta oxidation of fatty acids, fatty liver, ketogenesis, cholesterol & it's clinical significance, lipoproteins in the blood composition & their functions in brief, atherosclerosis.

Diabetes mellitus: its types, features, gestation diabetes mellitus, glucose tolerance test, glycosuria, hypoglycemia & its causes.

Practice: estimation of bile pigment in urine estimation of bile salts in urine

Suggested Readings:

- Victor w. Rodwell, david a. Bender, kathleen m. Botham, peter j. Kennelly, p. Anthony weil(2018) harper's illustrated biochemistry. Mc graw hill.
- (e-book link: https://www.pdfdrive.com/harpers-illustrated-biochemistry-d176838999.html)
- Nelson dl and cox mm. (2008). Lehninger principles of biochemistry, 5th ed., w.h. freeman and company.
- E-booklink: https://www.pdfdrive.com/lehninger-principles-of-biochemistry-5th-edition- d164892141.html)
- Donald voet, judith g. Voet (2011) biochemistry 4th edition. Wiley publishers.
- (e-book link: https://www.pdfdrive.com/biochemistry-4th-edition-e165192126.html)
- Jeremy m. Berg, john l. Tymoczko, lubertstryer. Biochemistry 7th edition. W.h. freemanand company, new york.
- (e-booklink:https://www.pdfdrive.com/biochemistry-seventh-edition- e167675390.html)

RESEARCH METHODOLOGY

Subject Name	Code	Type	T + P + Pj	Credits
Research Methodology	CUTM1721	Theory+ Project	2+0+1	3

Course Objective

- To gain a solid understanding of the fundamental concepts, types, and importance of research in scientific inquiry and academic fields.
- To learn how to formulate research problems, hypotheses, and objectives, as well as how to design and structure research projects.
- To understand and apply various methods of data collection, including surveys, experiments, interviews, and observation, while ensuring accuracy and reliability.
- To become proficient in using statistical tools and techniques for analyzing and interpreting data.

Course Outcome:
After completion of the course, the students will be able to,

CO	**Statements**	**CO with POs & PSOs Mapping**
CO1	Identify the key components of research, including its definition, scope, limitations, types, and objectives	PO1, PO6, PO12, PSO3
CO2	Understand the steps involved in developing a health research proposal.	PO2, PO3, PO4, PO9, PSO3
CO3	Implement the methods of data collection.	PO1, PO2, PO10, PO11, PSO2
CO4	Interpret the concepts of sampling designs, the theory of estimation and hypothesis testing, and the significance tests based on t, F, Z, and Chi-Square tests	PO2, PO5, PO13, PSO2, PSO3
CO5	Evaluate the importance of tabulation, coding, editing, interpretation, and report writing in the research process.	PO7, PO9, PO12, PSO3

Course Outline:

Module- I

Introduction to Research: Definition, scope, limitations, and types of research. Objectives of Research: Types and importance. Research Process: Basic steps involved in the health research proposal development process. Literature Review: Importance, sources, strategies for accessing information, library and computer search techniques.

Project Topics:

1. Impact of Digital Library Systems on Literature Review Effectiveness in Health Research
2. Evaluating the Scope and Limitations of Research in Rural Healthcare Development
3. Comparative Study of Traditional vs. Modern Research Methods in Public Health

Module- II

Research Title and Objectives: Criteria for selecting a research title. Formulation of Research Objectives: Types and qualities of research objectives. Research Designs: Different types of research designs and their applicability to various research contexts.

Project Topics:

1. Exploring Factors Influencing Research Title Selection in Epidemiological Studies
2. Formulating Research Objectives for Preventing Lifestyle Diseases Among Urban Youth
3. Analyzing the Applicability of Experimental vs. Observational Research Designs in Community Health Projects

Module- III

Data Collection Methods: Secondary and primary data collection techniques. Scaling Techniques: Concept, types, rating scales, ranking scales, scale construction techniques, and multi-dimensional scaling. Sampling Designs: Concepts, types, techniques, and sample size determination.

Project Topics:

1. Effectiveness of Primary Data Collection Techniques in Monitoring Pandemic Outbreaks
2. Assessing Multi-Dimensional Scaling in Consumer Preferences for Health Products
3. Sampling Techniques in Determining Prevalence Rates of Non-Communicable Diseases

Module-IV

Research Hypothesis: Definition, qualities, importance, and types of hypotheses. Theory of Estimation: Testing of hypothesis, small and large sample tests. Statistical Tests: Tests of significance based on t, F, Z, and Chi-Square tests.

Project Topics:

1. Hypothesis Testing for the Impact of Yoga on Mental Health in Adolescents
2. Statistical Analysis of Health Outcomes in Smokers vs. Non-Smokers Using Chi-Square Tests

3. Small and Large Sample Testing to Study Vaccination Rates in Urban vs. Rural Areas

Module- V

Designing Questionnaire & Interviewing: Techniques for effective data collection. Tabulation, Coding, Editing: Organizing and processing research data. Interpretation and Report Writing: How to analyze results and prepare research reports.

Project Topics:

1. Designing Questionnaires to Assess Public Awareness of Reproductive Health
2. Developing an Interview Framework to Study Health-Seeking Behavior in Low-Income Communities
3. Tabulation and Statistical Interpretation of Survey Data on Patient Satisfaction in Hospitals

Suggested Readings:

1. Research Methodology by C.R. Kothari (3rd Ed)
2. Research Methodology In the Medical & Biological Sciences by Petter Laake et al.
3. Essentials of Research Design and Methodology by Geoffrey Marczyk et al.
4. WHO, Health Research Methodology: A guide for training in research Methods, 2nd Edition, WHO

Basket II

Discipline Core Course

Ocular Anatomy

Subject Name	Code	Type	T + P + Pj	Credits
Ocular anatomy	CUTM1782	Theory+ Practice	3+1+0	4

Course Objective

- Understand the Structure of the Eye
- Explore the Functions of Ocular Components
- Examine the Development of the Eye
- Apply Anatomical Knowledge to Clinical Practice

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	Cos with POs and PSOs Mapping
CO 1	understand the basic principles of ocular embryology.	PO1, PO 5, PO 8, PO 12, PSO 1
CO 2	demonstrate microscopic structures of various tissues in the eye and correlate the structure with the functions.	PO1, PO2, PO 5, PO 8, PO 12, PSO 3
CO 3	analyze the normal disposition, inter-relationships, gross, functional, and applied anatomy of various structures in the eye and adnexa.	PO 1, PO 2, PO5, PO 7, PO 4, PO 9, PO 12, PSO 1
CO 4	appraise the basic structure and connections between the various parts of the central nervous system andthe eye to understand the neural connections and distribution.	PO 1, PO5, PO9, PO 11, PO 12, PSO 1
CO 5	design the eye model with a better understanding of visual information.	PO 1, PO 3, PO 4, PO 5, PO 6, PO 7, PO 9, PO 10, PO 11, PO 12,PSO 1 . PSO 2, PSO 3

Course Outline:

Module I:

Embryology of the eye: formation of optic vesicle & optic stalk, formation of lens vesicle

Formation of optic cup, development of retina, optic nerve, crystalline lens, cornea, sclera, choroid, ciliary body, iris, vitreous.

Development of accessory structures: eyelids, lacrimal apparatus, extraocular muscles, orbit milestones in eye development

Skull & orbit: size, shape, and relations of the orbit, walls, base, and apex of the orbit, orbital fascia and spaces, contents of the orbit

Module II:

Ocular adnexa: structures of the lids: skin, subcutaneous areolar layer, striated muscle layer, submuscular areolar tissue, fibrous layer, conjunctiva

Glands of the lids: meibomian glands, glands of zeis, glands of moll blood supply, lymphatic drainage, and nerve supply of the lids conjunctiva: palpebral conjunctiva, bulbar conjunctiva, conjunctival fornix microscopic structure: epithelium, substantia propria

Conjunctival glands: krause's glands, wolfring's glands, henle's glands, manz glands blood supply and nerve supply

Caruncle and plica semilunaris

Lacrimal system: lacrimal gland: structure, ducts, blood supply, nerve supply, lacrimal passages

Module III:

Cornea: layers and peculiarities, blood supply and nerve supply, corneal transparency sclera: episclera, sclera proper, lamina fusca, blood supply and nerve supply measuring corneal diameter

Module IV:

Uveal tract: iris: macroscopic and microscopic appearance, ciliary body: macroscopic structure, choroid: macroscopic structure

Blood supply: short and long posterior arteries, anterior artery, venous drainage pupillary muscles

Aqueous & vitreous humors: composition, formation, and drainage of aqueous humor angle of the anterior chamber, trabecular meshwork, canal of schlemm, schwalbe's line main masses of vitreous, base of the vitreous, hyaloidean vitreous, vitreous cells

Module V:

Retina: gross anatomy and microscopic structure of fovea centralis, blood-retinal barrier

Optic nerve and visual pathway: anatomy of optic nerve, optic chiasma, optic tracts, lateral geniculate body, optic radiations, visual cortex, arrangement of nerve fibers, blood supply of visual pathways (arterial circle of willis and its branches)

Ocular motor system:

Extraocular muscles, nerve supply, motor nuclei, supranuclear motor centres

Cranial nerve innervation: optic, oculomotor, trochlear, abducens, trigeminal, facial nerves

Practice:

- Identifying orbital bones and landmarks using a skull
- Measuring palpebral fissure height
- Eye dissection of bull's eye
- Crystalline lens:
- Structure: capsule, anterior epithelium, lens fibres
- Ciliary zonules: structure and arrangement
- Measuring pupil diameter

Suggested Readings:

- Basic and clinical science course
- American academy of ophthalmology (aao), 1992-93/1993- 94.
- Stephen j.h. miller: parsons diseases of the eye churchill livingstone. (pde)
- Jack j. Kanski: clinical ophthalmology, 2003, butterworths.

Geometric optics

Subject name	Code	Type	T + P + Pj	Credits
Geometric optics	CUTM1781	Theory+ Practice	3+2+0	5

Course Objective

- To develop a thorough understanding of how light behaves as it travels through various media, focusing on the fundamental principles of geometric optics.
- To investigate the imaging properties of optical systems comprising various surfaces and lenses, including the principles of lens design and function.
- To examine the role of aperture stops in optical systems, focusing on how they control the amount of light entering the system and influence the overall image quality.
- To develop Skills in Optical System Design and Analysis.

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	Gain knowledge on properties of light.	PO 1, PO 5, PO 8, PO 9, PO 12, PSO 1, PSO 2
CO 2	Analyze distribution of light under various conditions.	PO 1, PO 5, PO 10, PSO 1, PSO 2
CO 3	Evaluate properties of the images formed on the retina by the optics of the eye	PO 1, PO 2, PO 7, PO 11, PSO 1
CO 4	Investigate orientation and position of the line images and their relation to the cylinder power	PO 1, PO 5, PSO 1, PSO 3
CO 5	Design basic optical concept for visual function.	PO 1, PO 6, PO 9, PO 12, PSO 1, PSO 3

Course Outline:
Module I:

Fundamentals of light and wave properties

Nature of light

Light as electromagnetic oscillation sinusoidal oscillations: amplitude and phase speed of light in vacuum and other media

Refractive index and its wavelength dependence

Wave fronts and rays

Types of wave fronts: spherical, elliptical, and plane curvature, vergence, convergence, and divergence of rays vergence at a distance

Module II:

Reflection, refraction, and basic optical devices

Principles

Fermat's and huygens principles

Derivation of reflection and refraction laws (snell's law)

Mirrors

Plane mirrors: height and rotation effects

Spherical mirrors: paraxial approximation, sign convention, and vergence equation imaging by concave and convex mirrors.

Module III:

Optical properties and prisms reflectivity and transmissivity definitions and implications snell's law and refraction at a plane surface glass slabs and prisms

Glass slab: displacement without deviation and dispersion thick prisms: angle, deviation, and refractive index

Prisms: angular dispersion, dispersive power, and abbe's number

Module IV:

Advanced optical materials and surfaces

Optical glasses

Crown and flint glasses, high refractive index materials

Thin prisms

Definition and properties

Prism diopter and deviation dependence on refractive index

Nodal planes and sag formula definitions and applications **spherical surfaces**

Paraxial approximation, vergence equation imaging by positive and negative powered surfaces introduction to spherical aberration

Module V:

Lens systems and applications, Thin lenses, Special case of thick lenses, sign conventions

Imaging by thin convex and concave lenses: image properties for various object positions

Lens systems, Prentice's rule, Systems of two or more thin lenses, Front and back vertex powers, equivalent power, and cardinal points equivalent power calculation using magnification formula

Practice

- Thick prism – determination of prism angle and dispersive power; calculation of the refractive index
- Thin prism – measurement of deviation; calculation of the prism diopter
- Image formation by spherical mirrors
- Convex lens - power determination using lens gauge, power determination using distant object method; power determination using the vergence formula
- Concave lens – in combination with a convex lens – power determination.
- Construction of a tabletop telescope – all three types of telescopes.
- Construction of a tabletop microscope
- Imaging by a cylindrical lens – relationship between cylinder axis and image orientation
- Imaging by two cylinders in contact – determination of the position of clc; verification of clc using a spherical lens with power equal to the spherical equivalent; orientations and position of the
- Line images and their relation to the cylinders' powers and orientations
- Imaging by a spherocylindrical lens – sphere and cylinder in contact – determination of theposition of clc; verification of clc using a spherical lens with power equal to the spherical equivalent; orientations and position of the line images and their relation to the cylinder's power and orientation.

Suggested Readings:

- "Optics and Optical Systems: Fundamentals and Applications"
- "Geometric and Physical Optics: A Comprehensive Guide"
- "Principles of Optics and Instrumentation"
- "Wave Optics and Optical Materials: Theory and Practice"
- "Advanced Optics in Vision and Imaging"

BASIC COMPUTER AND INFORMATION SCIENCE

Subject Name	Code	Type of course	T-P-Pj	Credit
Basic Computer and Information Science	CUTM 1742	Practice	0-2-0	2

Course Objective

- To gain knowledge about the roles and operations of various computer hardware components.
- To identify the key considerations for individuals and organizations when selecting and acquiring computer hardware based on specific needs and budgets.
- To learn methods for maintaining computer equipment and resolving common hardware issues to ensure optimal functionality and longevity.
- To understand how hardware and software collaborate to perform computing tasks, alongside the principles of software development, categorization, and upgrading.

Course Outcome:
After completion of the course, the students will be able to

CO	Statements	CO with POs & PSOs Mapping
CO1	Understand the fundamental hardware components.	PO1, PO5, PSO3
CO2	Apply the concept in preparing documents.	PO8, PO9, PSO1,PSO3
CO3	Organize data's available digitally.	PO5, PO9, PSO3
CO4	Create presentations, formatting and enhancing texts	PO5, PO9, PSO3
CO5	Utilize the concepts and software skills in data handling.	PO5, PO8, PSO1, PSO2

Course Outline:

Module- I

Introduction to computer: introduction, characteristics of computer, block diagram of computer, generations of computer. Types of Input output devices. Processor and memory: The Central

Processing Unit (CPU), main memory. Storage Devices.

Module-II

Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs. Introduction to power- point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.

Module- III

Introduction to MS-DOS: History of DOS, features of MS-DOS, MS-DOS Commands (internal and external). Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).

Module IV

Computer networks: introduction, types of networks (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid).

Module V

Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.

Suggested readings: -

1. Objective Computer Awareness
2. Computer Networking (Global Edition)

OCULAR PHYSIOLOGY

Subject Name	Code	Type	T + P + Pj	Credits
Ocular Physiology	CUTM1783	T + P	3 + 1 + 0	4

Course Objective

- Understand the Anatomy and Function of the Eye
- Explore the Mechanisms of Vision
- Examine Ocular Homeostasis and Regulation
- Analyze Visual Disorders and Their Physiological Basis

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	understand the normal functioning of all structures of the eye and their interactions.	**PO 1, PO 7, PO 9 PSO 1**
CO 2	implement physiological aspects of normal growth and development of the eye.	**PO 1, PO 5, PO 8, PO 10, PSO 1**
CO 3	examine the phenomenon of vision.	**PO 1, PO 5, PO 9, PO 12, PSO 1, PSO 2**
CO 4	evaluating the physiological principles underlying pathogenesis and treatment of diseases of the eye.	**PO 1, PO 5, PO 7, PO 12, PSO 1, PSO 2**
CO 5	judge the abnormal physiology of eye.	**PO 1, PO 4, PO 5, PO 7, PO 9, PSO 1, PSO 3**

Course outline:

Module I:
Basic ocular physiology and associated structures anterior segment posterior segment

Module II:
Protective mechanisms and ocular movements

Protective mechanisms:

Blinking: muscles and reflexes

Lacrimation: glands, tear film chemistry, dynamics

Ocular movements: extraocular muscles, function, nerve supply, mechanics and physiology of ocular movements

Practice:

- Eye movements
- Blink rate measurement

Module III:

Cornea: ultra and histological structure, corneal transparency and hydration, regulation and vascularization maurice theory and goldman's theory

Lens: basic structure and function, transparency and changes with aging, cataract overview uveal tract: overview and uveal meshwork, uveo-scleral drainage, schlemm's canal

Aqueous and vitreous humor physiology: aqueous humor: formation, drainage, and circulation, rates of production and flow.

Vitreous humor: composition and distribution, physiology and function, optical role

Practice:

External eye examination using torchlight pupil examination

Module IV:

retina, optic nerve, and ocular circulation retina: structure and organization, functions of rods and cones optic nerve: physiology, papilledema, optic atrophy

Ocular circulation: vascular structure, blood-ocular barriers regulation

Module V:

accommodation, color vision, and visual physiology accommodation: mechanisms, nervous control, changes with age (presbyopia)

Color vision: physiological, photochemical, neurological basis, theories (granit, young-helmholtz), color defects and blindness

Visual physiology: visual acuity, contrast sensitivity, light and dark adaptation

Suggested Readings:

- Basic and clinical science course, american academy of ophthalmology (aao), 1992-93/1993- 94.
- Stephen j.h. miller: parsons diseases of the eye, churchill livingstone. (pde)
- Jack j. Kanski: clinical ophthalmology, 2003, Butterworths.

INTRODUCTION TO OPTOMETRY

Subject name	Code	Type	T + p + pj	Credits
Introduction to optometry	CUTM1785	Theory + practice	1+1+0	2

Course Objective

- Understand the Scope and History of Optometry
- Learn Basic Ocular Anatomy and Physiology
- Develop Skills in Vision Testing and Diagnosis
- Examine Common Ocular Conditions and Their Management

Course Outcome:

After completion of this course the students will be able to:

CO	**Statements**	**COs with POs and PSOs Mapping**
CO 1	understand optometry as a profession and its scope in future awareness of the terms used in optometry.	PO 1, PO 8, PO 11, PSO 3
CO 2	apply knowledge to test visual acuity of people and handle retinoscope comfortably.	PO 1, PO 2, PO 7, PSO 1
CO 3	value the concept of vision screening and the purpose of different instruments used in optometry.	PO 1, PO 7, PO 10, PSO 1
CO 4	evaluate the professional standards in health practice.	PO 4, PO 6, PO 9, PSO 3

CO 5	reconstruct the skills of enquiry in specific subjects and develop different approaches to problem- solving as well as identify the limitations of knowledge.	PO 5, PO 8, PO 12, PSO 2

Course outline:

Module I:

Historical Foundations and Principles of Optometry

Historical development of optometry as a profession.

Fundamental principles guiding the field of optometry.

Introduction to professional ethics in optometry.

Practice:

Case discussions highlighting significant milestones in the history of optometry.

Role-play sessions to explore ethical dilemmas in optometry practice.

Module II:

Ethics, Terminology, and Professional Scope

Ethical considerations in optometry practice.

Key terminologies and their application in optometric communication.

Scope and roles of optometrists in healthcare.

Practice:

Group activity: Create a glossary of essential optometry terms.

Seminar on the scope of optometry in different countries and contexts.

Module III:

Professional Associations and Optometric Practices

Roles and significance of state, national, and international optometry associations.

Impact of professional groups on policy, practice, and education in optometry.

Practice:

Research and presentation on notable optometry associations, such as the American Academy of Optometry and World Council of Optometry.

Debate on the importance of professional membership in optometry.

Module IV:

Visual Assessment and Instrumentation

Components and techniques involved in visual assessment.

Overview of optometry instruments like phoropters, lensometers, and auto refractometers.

Basics of vision screening methods.

Practice:

Hands-on training with essential instruments, including calibration and maintenance.

Vision screening drills using Snellen and LogMAR charts.

Module V:

Clinical Techniques: Visual Acuity, Retinoscopy, and Refractometry

Visual acuity testing: Construction standards for visual acuity charts and their application.

Retinoscopy: Principles, reflex characteristics, and techniques.

Refractometry: Introduction to refractometry using instruments such as trial boxes and optometers.

Practice:

Construction of visual acuity charts in a workshop setting.

Practical sessions to perform retinoscopy and analyze reflex patterns.

Training in refractDINGometry using auto refractometers and manual methods.

Suggested Readings: -

1. "Clinical Optics" by Troy E. Fannin and Theodore Grosvenor
2. "Borish's Clinical Refraction" by William J. Benjamin

3. "Ethics and Law in Modern Medicine" by Dominic Wilkinson and Julian Savulescu

Physical Optics

Subject name	Code	Type	T + p + pj	Credits
Physical optics	CUTM1784	Theory+practice	3+1+0	4

Course Objective

- Understand the Principles of Light Behavior
- Explore Wave Optics and Interference
- Analyze Diffraction and Its Applications
- Investigate Polarization and its Uses
-

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	gain knowledge on properties of light.	**PO 1, PO 8, PSO 1**
CO 2	able to analyze distribution of light under various conditions.	**PO 1, PO 5, PO 7, PSO 1**
CO 3	apply the knowledge of waves, colour, frequency, photon energy, phase difference, opticalcoherence and coherent sources using monochromatic light sources of light.	**PO 1, PO 2, PO 5, PO 12, PSO 2**
CO 4	evaluate resolution of an instrument.	**PO 2 PO 5, PO 6, PSO 1**
CO 5	develop skills in refractive and reflective surfaces	**PO 1, PO 2, PO 7, PO 9, PSO 1**

Course Outline:

Module I:

Fundamentals of light and electromagnetic waves

Nature of light

Light as electromagnetic oscillation

Wave equation and sinusoidal oscillations transverse nature of light

Concepts of frequency, wavelength, amplitude, and phase

Sources of light

Introduction to the electromagnetic spectrum

Module II:

Polarization of light **polarized light** linearly polarized light

Circularly polarized light intensity of polarized light malus's law

Polarizers, analyzers, and methods of producing polarized light brewster's angle

Module III:

Birefringence and interference

Birefringence

Ordinary and extraordinary rays

Relationship between amplitude and intensity.

Module IV:

1. Interference phenomena

Coherence and interference constructive and destructive interference fringes and fringe width

Interference in double slits, multiple slits, and gratings.

Module V:

Diffraction and optical resolution

Diffraction

Diffraction by a circular aperture airy's disc

Resolution of optical instruments

Resolution criteria such as raleigh's criterion

Scattering and lasers

Raleigh scattering and tyndall effect

Basics of fluorescence, phosphorescence, and lasers

Coherence, population inversion, spontaneous emission, and einstein's theory of lasers

Radiometry

Solid angle and radiometric units

Photopic and scotopic luminous efficiency and efficacy curves photometric units

Inverse square law of photometry and lambert's law

Other units of light measurement

Retinal illumination and practical applications practice:

Gratings – determination of grating constant using sodium vapour lamp; determination ofwavelengths of light from mercury vapor lamp

Circular apertures – measurements of airy's disc for apertures of various sizes verification of malus' law using a polarizer – analyzer combination demonstration of birefringence using calcite crystals

Measurement of the resolving power of telescopes. Newton's rings

Demonstration of fluorescence and phosphorescence using crystals and paints

Suggested Readings:

1. Pedrotti l. S, pedrotti sr. F. L, optics and vision, prentice hall, new jersey, usa, 1998.
2. Keating nm. P, geometric, physical and visual optics, butterworth-heinemann,massachusetts, usa, 2002.
3. Subrahmanyan n, brijlal, a text book of optics, s. Chand co ltd, new delhi, india,2003.

Visual Optics I

Subject name	Code	Type	T + p + pj	Credits
Visual optics I	CUTM1786	T + p	3+2+0	5

Course Objective

- Understand the Basic Principles of Geometrical Optics
- Examine the Anatomy and Function of the Human Eye
- Learn Refractive Error and Correction
- Analyze Image Formation in Optical Systems

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	understand the knowledge of mirrors and lenses.	PO 1, PO 8, PSO 1
CO 2	apply skills in refractive and reflective surfaces	PO 2, PO 5, PO 7, PSO 1
CO 3	implement properties of the images formed on the retina by the optics of the eye.	PO 1, PO 5, PO 12, PSO 1
CO 4	evaluate different types of lenses and frames.	PO 2, PO 6, PO 7, PO 9, PSO 3
CO 5	develop different types of lenses	PO 1, PO 2, PO 12, PSO 2

Course outline:

Module I

Fundamentals of geometrical optics and light

Review of geometrical optics: vergence and power, conjugacy, object space and image space, sign convention, spherical refracting surface

Optical elements: spherical mirror; catoptric power, cardinal points, magnification, light and visual function

Practice:

Vergence and Power Exercises, Optical Element Demonstrations, Light and Visual Function Experiments

Module II

Optical phenomena and clinical relevance

Optical phenomena: fluorescence, interference, diffraction, polarization, birefringence, dichroism

Aberrations: aberration and application, spherical and chromatic.

Practice:

Exploration of Optical Phenomena, Aberration Analysis

Module III:

Optics of ocular structures and measurements

Ocular structures: cornea and aqueous, crystalline lens, vitreous, schematic and reduced eye

Measurements of optical constants: corneal curvature and thickness, keratometry, curvature of the lens and ophthalmophakometry, axial and axis of the eye.

Practice:

Measurement Techniques Eye Model Experiments

Module IV:

Vision science and visual performance

Basic aspects of vision: visual acuity, light and dark adaptation, color vision, spatial and temporal resolution, color vision & theories

Measuring visual performance: science of measuring visual performance and application to clinical optometry, contrast sensitivity.

Practice:

Visual Acuity Testing, Contrast Sensitivity Measurements, Color Vision Analysis, Adaptation Experiments

Module v:

Refractive anomalies and conditions

Refractive anomalies: etiology, contributing variability and their ranges, population distributions, optical component measurements, growth of the eye in relation to refractive errors

Refractive conditions: emmetropia, ametropia types, correction of refractive errors, myopia, hyperopia, astigmatism types, axial versus refractive ametropia

Practice:

Refraction Techniques, Refractive Error Assessment

Suggested Readings: -

- Clinical optics, andrew r elkington& helena j frank - blackwell scientific publications oxford – london
- Clinical visual optics arthur g bennett ronald b rabbetts -butterworth- heinemann second edition 1989
- Visual optics and refraction- a clinical approach david d michaels: the c.v. mosby co., 1985.
- Optics and refraction a user-friendly guide david miller 1991 gower medical publishing.

Optometric Optics I

Subject name	Code	Type	T + p + pj	Credits
Optometric optics I	CUTM1787	T + p	3+2+0	5

Course Objective

- Understand the theory, materials, types, advantages, and disadvantages of spectacle lenses and frames.
- Learn when and how to prescribe spectacles, including the considerations for different types of lenses and frames.
- Gain knowledge on the construction, design, and application of lenses, with a focus on the methods of calculating their power and optical effects.
- Mastering Optical Instrumentation and Measurements

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	understand techniques such as measurement of lens power, lens centration using conventional techniques. Transposition of various types of lenses.	PO 1, PO 2, PO 5, PSO 1
CO 2	identify different forms of lenses (equi-convex, planoconvex, periscopic, etc.)	PO 1, PO 7, PO 8, PSO 3
CO 3	implement concept of final checking of finished spectacle with frame adjustments, delivery, and follow-up	PO 2, PO 6, PO 7, PO 9, PSO 1
CO 4	develop lens verification and axis marking and fitting of all lens	PO 2, PO 5, PO 12, PSO 1
CO 5	design basic optical concept for visual function	PO 1, PO 5, PO 12, PSO 2

Course outline:

Module I:

Fundamentals of optics: introduction to light, mirror, reflection, refraction, and absorption basic principles and applications in optometry

Module II:

Prisms and their applications

Prisms- definition, properties, and refraction through prisms

Thickness difference, base-apex notation, uses, nomenclature, and units sign conventions, fresnel's prisms, rotary prisms

Practice:

prismatic effects.

Module III:

Lenses and lensometry

Lenses- definition, units, and terminology

Introduction to spectacle lenses, forms of lenses, spherical, cylindrical, and spherocylindrical lenses vertex distance and vertex power, effectivity calculations

Practice:

lensometry, hand neutralization.

Module IV:

Transpositions and prismatic effects transpositions and prismatic effects

Simple, toric, and spherical equivalent transpositions prismatic effect, centration, decentration, and prentice rule prismatic effect of plano-cylinder and sphero-cylinder lenses

practice: simple & toric transpositions.

Module V:

Advanced lens concepts and aberrations

Advanced lens concepts, spherometer & sag formula, edge thickness calculations, magnification in high plus lenses, minification in high minus lenses, tilt-induced power in spectacles, aberrations in ophthalmic lenses

Practice:

spherometer, edge thickness calculations

Suggested Readings: -

1. Clinical optics: t e fannin& t grosvenor, 2nd edition
2. M. Jalie: principles of ophthalmic lenses, edn. 3, 1994.
3. Clifford w brooks & irvin m borish: system for ophthalmic dispensing

Ocular Diseases I

Subject name	Code	Type	T + p + pj	Credits
Ocular diseases I	CUTM1788	Theory +practice	3+0+1	4

Course Objective

- Understand the theory, materials, types, advantages, and disadvantages of spectacle lenses and frames.
- Learn when and how to prescribe spectacles, including the considerations for different types of lenses and frames.
- Gain knowledge on the construction, design, and application of lenses, with a focus on the methods of calculating their power and optical effects.
- Mastering Optical Instrumentation and Measurements

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	understand etiology, epidemiology, symptoms, signs, course sequelae of ocular diseases.	**PO 1, PO 5, PO 12, PSO 1**
CO 2	investigate different eye health	**PO 1, PO 2, PO 12, PSO 2**
CO 3	implement diagnostic approach, and management of ocular diseases.	**PO 2, PO 5, PO 7, PSO 1, PSO 3**
CO 4	evaluate many ocular eye diseases.	**PO 1, PO 5, PO 12, PSO 1**
CO 5	create awareness among people for many infectious eye disease.	**PO 9, PO 10, PO 11 PSO 3**

Course outline:

Module I:

Orbit and periorbital disorders- applied anatomy of the orbit: structure and function proptosis: classification, causes, investigations

Orbital conditions: enophthalmos developmental anomalies (craniosynostosis, craniofacial

dysostosis, hypertelorism, median facial cleft syndrome) orbital inflammations (preseptal cellulitis, orbital cellulitis, orbital periostitis, cavernous sinus thrombosis) grave's ophthalmopathy

Orbital tumors (dermoids, capillary hemangioma, optic nerve glioma) orbital trauma and fractures

Orbital surgery (orbitotomy) approach to a patient with proptosis

practice:

Slit lamp examination of the adnexa

Module II:

Eyelids and lacrimal system applied anatomy of the eyelids:

Structure and function

Eyelid conditions: congenital anomalies (ptosis, coloboma, epicanthus, distichiasis, cryptophthalmos) edema (inflammatory, solid, passive), inflammatory disorders (blepharitis, external hordeolum, chalazion, internal hordeolum, molluscum contagiosum), position anomalies (trichiasis, ectropion, entropion, symblepharon, blepharophimosis, lagophthalmos, blepharospasm, ptosis), tumors (papilloma, xanthelasma, hemangioma, basal cell carcinoma, squamous cell carcinoma, sebaceous gland melanoma)

Lacrimal system: applied anatomy, tear film and dry eye (sjogren's syndrome), the watering eye (etiology, clinical evaluation), dacryocystitis, swelling of the lacrimal gland (dacryoadenitis)

practice:

Slit lamp examination of the adnexa

Module III:

Conjunctiva and cornea (part i) conjunctiva: applied anatomy

Inflammations (bacterial, chlamydial, viral conjunctivitis; allergic and granulomatous conjunctivitis) degenerative conditions (pinguecula, pterygium, concretions), symptomatic conditions (hyperemia, chemosis, ecchymosis, xerosis, discoloration) cysts and tumors

Cornea: applied anatomy and physiology, congenital anomalies (megalocornea, microcornea, cornea plana, congenital cloudy cornea), inflammations (topographical classifications: ulcerative)

Practice:

Slit lamp examination of the cornea.

Module IV:

Corneal inflammation: etiological classifications: infective, allergic, trophic, traumatic, idiopathic corneal degenerations: classifications and examples (arcus senilis, vogt's white limbal girdle, hassall- henle bodies, lipoid keratopathy, band-shaped keratopathy, salzmann's nodular degeneration, droplet keratopathy, pellucid marginal degeneration)

Corneal dystrophies: examples (reis-bückler dystrophy, recurrent corneal erosion syndrome, granular dystrophy, lattice dystrophy, macular dystrophy, cornea guttata, fuchs' endothelial dystrophy, congenital hereditary endothelial dystrophy)

Additional corneal conditions: keratoconus, keratoglobus, corneal edema, corneal opacity, corneal vascularization, corneal surgery: penetrating keratoplasty.

Module V:

uveal tract and sclera

Uveal tract:applied anatomy, classification and etiology of uveitis, pathology of uveitis types of uveitis: anterior, posterior, purulent, endophthalmitis, panophthalmitis, pars planitis tumors (melanoma)

Sclera: episcleritis and scleritis, clinical examination: examination techniques for uveitis and scleritis

Suggested Readings: -

1. Basic and clinical science course, american academy of ophthalmology (aao), 1992-93/1993- 94.
2. Stephen j.h. miller: parsons diseases of the eye, churchill livingstone. (pde)
3. Jack j. Kanski: clinical ophthalmology, 2003, butterworths.

Ocular Microbiology and Pathology

Subject Name	Code	Type	T + p + pj	Credits
Ocular microbiology and pathology	CUTM1789	Theory	3+1+0	4

Course Objective

- Understanding the Microbial Flora of the Eye
- Identifying Ocular Infections and Pathologies
- Microbiological Techniques in Ocular Disease Diagnosis
- Treatment and Management of Ocular Infections

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	understand the insights of general microbiology and pathology.	PO 1, PO 5, PO 12, PSO 1
CO 2	apply the knowledge in identification of pathogenic diseases of eye	PO 2, PO 5, PO 7, PSO 3
CO 3	examine conditions associated with ocular infections	PO 1, PO 2, PO 7, PO 12, PSO 1
CO 4	evaluate systemic diseases of retina.	PO 1, PO 5, PO 7, PO 12, PSO 1
CO 5	investigate different microscopical examinations	PO 1, PO 2, PO 12, PSO 2

Course outline:

Module I:

Introduction to microbiology and microbial growth introduction to microbiology

Types of microorganisms physiology of microorganisms microbial growth and control

Nutrition, enzymes, metabolism, and energy microbial growth

Sterilization and disinfection in the laboratory

Control of microbial growth (antimicrobial methods and chemotherapy)

Microbes vs. Humans: infection development, disease process, pathogenicity, and virulence.

Module II:

General pathology and ocular infections general pathology principles pathophysiology of ocular angiogenesis ocular infections

Pathology of cornea and conjunctiva pathology of uvea and glaucoma

Pathology of retina.

Module III:

Ocular bacteriology gram-positive bacteria staphylococcus aureus staphylococcus epidermis streptococcus

Propionic bacterium actinomyces nocardia

Gram-negative bacteria pseudomonas haemophilus

Brucella neisseria moraxella

Module IV:

Pathology and systemic disease impact on eyes pathology related to systemic diseases

Pathology of retina in systemic diseases/disorders pathology of eyelids and adnexa

Pathology of orbital space-occupying lesions pathology of the optic nerve

Retinoblastoma pathology of lens

Module V:

Microbial and parasitic infections affecting eyes spirochetes and treponema

Classification of viruses in ocular disease

Rubella, adenovirus, oncogenic viruses (hpv, hbv, ebv, retroviruses), hiv fungi and parasites

Suggested Readings: -

1. Microbiology: m j pelczaretal., 1999
2. Burton g.r.w: microbiology for the health sciences, st. Louis, j.p. lippincott

co.,3rdedn.,1988.
3. Pathology: corton kumar and robins (v edition) pathological basis of the disease, 2004.
4. Pathology of the eye & orbit: k s ratnagar, 1997
5. Mackie &mc cartney practical medical microbiology
6. Sydney m. Finegold & ellen jo baron: diagnostic microbiology (dm)
7. Sherris medical microbiology- editors kenneth j ryan /c.george ray :an introduction to infectious diseases 4th edition 2003
8. Corton kumar and robins (iv edition) : pathological basis of the disease, 1994
9. S r lakhani susan ad & caroline jf: basic pathology: an introduction to the mechanism of disease, 1993.
10. Anderson j. R: muir's text book of pathology, edn. 12, 1987.
11. Rominic and sood: clinicalpathology, medical laboratory technical.

Clinical Examination of Visual System Lab

Subject name	Code	Type	T + p + pj	Credits
Clinical examination of visual system lab	CUTM1790	Practice	0 + 2 + 0	2

Course Objective

- Mastering Ocular and Visual System Assessment Techniques
- Understanding Diagnostic Tools and Instruments
- Performing Comprehensive Patient History and Symptom Evaluation
- Developing Skills for Detecting Visual System Abnormalities**.**

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping

CO 1	understand the purpose of each test, its indications and contraindications.	**PO 1, PO 5, PO 7, PSO 1**
CO 2	apply various clinical tests in step-by-step procedures	**PO 2, PO 7, PO 9, PSO 1**
CO 3	organize environment and documentation of the findings.	**PO 4, PO 6, PO 9, PSO 3**
CO 4	evaluate the patient care performance independently	**PO 2, PO 5, PO 7, PSO 1**
CO 5	design and develop different kinds of tests used in identifying underlying eye conditions	**PO 1, PO 5, PO 12, PSO 2**

Course outline:

Module I:

History taking and external examination

History taking: patient history related to ocular symptoms and medical background.

External examination: hirschberg's corneal light reflex (hbt), facial symmetry and head position evaluation.

Module II:

Pupil examination and stereopsis testing pupil examination: swinging flashlight test (rapd). Stereopsis testing: titmus fly test

Module III:

Tear film and macular function tests

Tear film tests: shrimers i & ii, tear break-up time (tbut), non-invasive tear break-up time (nibut), roplas, fluorescein disappearance test (fddt), and tear meniscus height (tmh) tests macular tests: amsler grid test, photostress test

Worth 4 dot test

Visual field: confrontation technique

Suggested Readings: -

1. Clinical procedures in primary eye care, book by david b elliot, 5th edition
2. Primary care optometry: anomalies of refraction and binocular vision, book by theodore p. Grosvenor.

Optometric Optics II & Dispensing Optics

Subject Name	Code	Type	T + p + pj	Credits
Optometric optics II & dispensing optics	CUTM1792	T + p	3+2+0	5

Course Objective

- Advanced Understanding of Optical Principles and Systems
- Application of Lens Materials and Coatings
- Mastering the Dispensing Process
- Problem Solving and Troubleshooting in Dispensing

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	understand different types of materials used to make lenses and its characteristics	**PO 1, PO 2, PO 5, PO 7, PSO 1**
CO 2	operate the tool power for grinding process	**PO 2, PO 4, PO 5, PSO 1**
CO 3	compare different lens designs–bifocals, progressive lens, tinted, protective & special lenses, spectacle frames –manufacture process & materials	**PO 1, PO 2, PO 5, PO 9, PSO 1**
CO 4	develop spectacle prescription, counselling the patient, lens edge thickness calculation& lens measurements and selection.	**PO 2, PO 4, PO 5, PSO 1, PSO 3**
CO 5	design basic optical concept for visual function.	**PO 1, PO 5, PO 7, PSO 1**

Course Outline:

Module I:

Introduction to lens manufacture and prescription basics

Introduction to lens manufacture

Ophthalmic blanks surfacing, polarising, glazing

Lens designs compatible with contemporary eye frames

Components of spectacle prescription

Components and transposition add and near power relation

Module II:

Measurements and frame selection

Measurements for spectacles

Measuring inter-pupillary distance (ipd) for distance & near bifocal height

Frame selection

Based on spectacle prescription

Professional requirements, age group, face shape.

Module III:

Lens and frame markings, ordering, and neutralization

Lens and frame markings

Pupillary centers, bifocal heights, progressive markings

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

Neutralization

Hand neutralization & lensometer use axis marking

Module IV:

Dispensing and counseling

Final checking and dispensing of spectacles

Counseling on wearing & maintaining spectacles

Accessories: bands, chains, boxes, selvets, cleaners, screwdriver kit.

Module v:

Faults, repairs, and special types of spectacles

Faults in spectacles

Detection and correction of lens and frame fitting issues patient complaints: description, detection, and correction spectacle repairs tools, methods, soldering, riveting, frame adjustments **Special types of spectacle frames** industrial safety glasses, welding glasses

Practice

Lensometer use: sphere-cylinder, bifocals, prisms frame measurements

Ipd measurements & pupilometer

Lens measurements and selection: single vision, bifocal facial measurements

Find out the meridian & optical center of ophthalmic lens frame availability in indian market

Visit to lens manufacturing workshops

Suggested Readings:

Clifford w brooks & irvin m borish: system for ophthalmic dispensing.

M.jalie: ophthalmic lenses and dispensing.

Clinical optics: t e fannin& t grosvenor, 2nd edition

M. Jalie: principles of ophthalmic lenses, edn. 3,

Jalie mo: ophthalmic lens and dispensing, 3rd edition, butterworth –heinemann,2008

Troy e. Fannin, theodore grosvenor: clinical optics, 2nd edition, butterworthheinemann, 1996

C w brooks, im borish: system for ophthalmic dispensing, 3rdedition, butterworth

- heinemann, 2007

Michael p keating: geometric, phisical& visual optics, 2nd edition, butterworth –heinemann, 2002

Ocular Diseases - II

Subject Name	Code	Type	T + p + pj	Credits
Ocular diseases II	CUTM1794	Theory	3+0+1	4

Course Objective

- Understand the pathophysiology, clinical presentation, and diagnostic approaches for common posterior segment ocular diseases.
- Develop skills in the management
- Treatment of retinal disorders, choroidal diseases, and optic nerve pathologies.
- Analyze the impact of systemic diseases on the posterior segment and their ocular manifestations.

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	understand etiology, epidemiology, symptoms, signs, course sequelae of ocular diseases.	**PO 1, PO 2, PO 5, PO 7, PSO 1**
CO 2	implement diagnostic approach, and management of ocular diseases.	**PO 2, PO 5, PO 7, PO 4, PSO 1, PSO 3**
CO 3	investigate different eye health.	**PO 1, PO 5, PO 9, PSO 1**
CO 4	evaluate many ocular eye diseases.	**PO 2, PO 5, PO 7, PSO 1, PSO 3**
CO 5	awareness among people for many infectious eye diseases.	**PO 10, PO 9, PO 11, PO 7, PSO 2**

Course outline:

Module I:

retina and vitreous

Applied anatomy and congenital disorders:

Optic disc: coloboma, drusen, hypoplasia, medullated nerve fibers. Persistent hyaloid artery.

Inflammatory disorders: retinitis: acute purulent, bacterial, viral, mycotic, retinal vasculitis (eales's

Types, advantages, and disadvantages.

Explore the crucial role that optometrists play within optical settings, including their responsibilities in lens selection, fitting, and patient education.

Course Outcome:

After completion of this course the students will be able to:

- **Co 1:** understand different types of materials used to make lenses and its characteristics co 2: operate the tool power for grinding process
- **Co 3:** compare different lens designs–bifocals, progressive lens, tinted, protective & special lenses, spectacle frames –manufacture process & materials
- **Co 4:** develop spectacle prescription, counselling the patient, lens edge thickness calculation& lens measurements and selection.
- **Co 5:** design basic optical concept for visual function.

Course Outline:

Module I:

Introduction to lens manufacture and prescription basics

Introduction to lens manufacture

Ophthalmic blanks surfacing, polarising, glazing

Lens designs compatible with contemporary eye frames

Components of spectacle prescription

Components and transposition add and near power relation

Module II:

Measurements and frame selection

Measurements for spectacles

Measuring inter-pupillary distance (ipd) for distance & near bifocal height

Frame selection

Based on spectacle prescription

Professional requirements, age group, face shape.

Module III:

Lens and frame markings, ordering, and neutralization

Lens and frame markings

Pupillary centers, bifocal heights, progressive markings

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

Neutralization

Hand neutralization & lensometer use axis marking

Module IV:

Dispensing and counseling

Final checking and dispensing of spectacles

Counseling on wearing & maintaining spectacles

Accessories: bands, chains, boxes, selvets, cleaners, screwdriver kit.

Module V:

Faults, repairs, and special types of spectacles

Faults in spectacles

Detection and correction of lens and frame fitting issues patient complaints: description, detection, and correction spectacle repairs

Tools, methods, soldering, riveting, frame adjustments

Special types of spectacle frames industrial safety glasses, welding glasses **practice**

Lensometer use: sphere-cylinder, bifocals, prisms frame measurements

Ipd measurements & pupilometer

Lens measurements and selection: single vision, bifocal facial measurements

Find out the meridian & optical center of ophthalmic lens frame availability in indian market

Visit to lens manufacturing workshops

Suggested readings:

1. Clifford w brooks & irvin m borish: system for ophthalmic dispensing.
2. M.jalie: ophthalmic lenses and dispensing.
3. Clinical optics: t e fannin& t grosvenor, 2nd edition
4. M. Jalie: principles of ophthalmic lenses, edn. 3,
5. Jalie mo: ophthalmic lens and dispensing, 3rd edition, butterworth –heinemann,2008
6. Troy e. Fannin, theodore grosvenor: clinical optics, 2nd edition, butterworthheinemann, 1996
7. C w brooks, im borish: system for ophthalmic dispensing, 3rdedition, butterworth-heinemann, 2007
8. Michael p keating: geometric, phisical& visual optics, 2nd edition, butterworth – heinemann, 2002.

Contact Lens- I

Subject Name	Code	Type	T + p + pj	Credits
Contact lens I	CUTM1793	Theory+ practice	3+2+0	5

Course Objective:

Understand the basics of contact lenses

List the important properties of contact lenses and finalize the cl design for various kinds of patients

Recognize various types of fitting and explain all the procedures to patient.

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	explain the basic skills in fitting contact lens.	**PO 1, PO 2, PO 4, PO 5, PO 7, PSO 1**
CO 2	identify and manage the adverse effects of contact lens	**PO 2, PO 4, PO 5, PO 7, PO 10, PSO 3**
CO 3	differentiate between different contact lens and their uses in different practices.	**PO 1, PO 2, PO 5, PO 7, PSO 1**
CO 4	evaluate the contact lens design for various kinds of patients	**PO 2, PO 5, PO 7, PSO 1, PSO 3**
CO 5	create awareness about advantages of contact lenses over spectacles	**PO 9, PO 10, PO 11, PSO 2, PSO 3**

Course Outline:

Module I:

Introduction to contact lenses **introduction to contact lenses** definition, classification/types history of contact lenses **optics of contact lenses**

Review of anatomy & physiology tear film, cornea, lids & conjunctiva

Module II:

Contact lens materials and properties

Contact lens materials introduction and properties **physiological properties** dk, lonicity, water content **physical properties**

Elasticity, tensile strength, rigidity

Optical properties

Transmission, refractive index.

Module III:

Indications, contraindications, and pre-fitting examination

Indications and contraindications parameters/designs of contact lenses & terminology rgp contact

lens materials

Manufacturing rigid and soft contact lenses (various methods)

Pre-fitting examination

Module IV:

astigmatism correction and contact lens fitting

Correction of astigmatism with rgp lenses

Types of fit: steep, flat, optimum (spherical and toric cornea) calculation and finalizing contact lens parameters ordering contact lenses and writing a prescription

Checking and verifying contact lenses

Module V:

Handling, maintenance, and follow-up

Handling instructions

Insertion & removal techniques care and maintenance cleaning agents & importance rinsing agents & importance

Disinfecting agents & importance lubricating & enzymatic cleaners follow-up visit examination complications of rgp contact lenses practice:

Practice:

Measurement of ocular dimensions (cornea, pupil, and lid characteristics)

Slit lamp examination of tear film – blink rate and tbut, schirmer's test

History taking for contact lenses

Vertex distance calculations

Selection of contact lens parameters

Use of keratometer

Fitting and assessment of soft contact lenses (steep, flat, optimal fit)

Writing contact lens prescriptions

Do's and don'ts of contact lens handling

Insertion & removal of soft contact lenses

Teaching patients to insert and remove contact lenses

Contact lens handling, cleaning, & maintenance

Case discussions on follow-up visits and complications

Suggested Readings:

1. Iacle module s 1 – 10
2. Clao volumes 1, 2, 3
3. Anthony j. Phillips: contact lenses, 5thedition, butterworth-heinemann, 2006
4. Contact lens practise., nathan efron, elsevier, third edition.

Contact Lenses II

Subject Name	Code	Type	T + p + pj	Credits
Contact lenses ii	CUTM1795	Theory+ practice	3+2+0	5

Course Objective:

- Students will gain in-depth theoretical understanding of contact lenses, covering topics such as polymer chemistry.
- Integration of theoretical learning with clinical practice by integrating theoretical knowledge with clinical practice
- Students learn to apply their understanding to real-world scenarios.
- This integration ensures that students are well-prepared to provide effective optometric care involving contact lenses.

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	understand the advanced skills in fitting contact lens.	**PO 1, PO 2, PO 4, PO 5, PO 7, PSO 1**

CO 2	identify and manage the adverse effects of contact lens.	**PO 2, PO 4, PO 5, PO 10, PSO 3**
CO 3	differentiate between different contact lens and their uses in different practices.	**PO 1, PO 2, PO 5, PO 7, PSO 1**
CO 4	evaluate the contact lens design for various kinds of patients	**PO 2, PO 5, PO 7, PSO 1, PSO 3**
CO 5	create awareness about advantages of contact lenses over spectacles	**PO 9, PO 10, PO 11, PSO 2, PSO 3**

Course Outline:

Module I:

Contact lens materials, design, and gas transmission soft contact lens polymer chemistry

Detailed study

Contact lens terminology and design revision and overview

Aspheric, toric, multifocal designs

Gas transmission through contact lenses dk, dk/t, eop (edge oxygen permeability)

Critical study of measuring techniques and applications adaptive symptoms of rgp contact lenses.

Module II:

Pre-fitting considerations and fitting techniques

Pre-fitting considerations for soft contact lenses (scl) fitting philosophies for soft contact lenses

Fitting toric lenses

Rgp and soft contact lenses.

Module III:

Contact lens parameters, bifocal lenses, and post-fitting care calculation and finalizing soft contact lens (scl) parameters fitting bifocal lenses

Post-fitting care and follow-up.

Module IV:

Advanced contact lens types and techniques soft toric contact lenses

Stabilization techniques and parameter selection.

Module V:

Specialty fittings and management

Diffractive vision and aspheric contact lenses

Therapeutic contact lenses contact lenses as prosthetics cosmetic contact lenses different types of contact lenses

Extended wear, disposable and frequent replacement contact lenses scleral and transition contact lenses

Specialty fittings

Pediatric and geriatric contact lens fitting
Post-refractive surgery and post-corneal grafting contact lens fitting corneal scars contact lens fitting, orthokeratology
Management of presbyopia with contact lenses.

Practice:

Fitting and assessment of soft toric contact lenses - axis stabilization

Selection of rgp contact lens parameters

Static and dynamic fitting and assessment of contact lenses - steep, flat, optimal fit

Insertion & removal of rgp contact lenses

Teaching techniques of rgp, scleral lens, contact lens handling, cleaning & maintenance

Special rgp fittings case discussions (aphakia, pseudophakia, keratoconus)

Writing contact lens prescriptions

Bifocal contact lens fitting

Suggested Readings:

- Iacle module s 1 - 10
- Clao volumes 1, 2, 3
- Anthony j. Phillips: contact lenses, 5thedition, butterworth-heinemann, 2006
- Contactlenspractise., Nathan efron, elsevier, third edition.

Binocular Vision I

Subject Name	Code	Type	T + p + pj	Credits
Binocular vision I	CUTM1796	Theory + practice	3+2+0	5

Course Objective

- Understand the theoretical aspects of normal binocular vision, space perception, and their clinical applications.
- Study the gross anatomy and physiology of extraocular muscles and their role in binocular movement coordination.
- Learn about binocular optical defects and how they affect vision
- Strategies for their diagnosis and management.

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	understand the concepts of grades of binocular vision and fundamentaltheories of binocular vision.	**PO 1, PO 2, PO 4, PO 5, PO 7, PSO 1**
CO 2	apply knowledge in binocular muscle coordination and integration of motor andsensory system into binocular vision.	**PO 2, PO 4, PO 5, PO 7, PO 10, PSO 3**
CO 3	identify non strabismic anomalies related to accommodation	**PO 1, PO 2, PO 5, PO 7, PSO 1**
CO 4	evaluate different types of strabismic anomalies - horizontal, vertical, torsional,paralytical& mechanical restrictive.	**PO 2, PO 5, PO 7, PSO 1, PSO 3**
CO 5	create differential binocular visual condition practice in daily basis.	**PO 9, PO 10, PO 11, PSO 2, PSO 3**

Course Outline:

Module I:

Fundamentals of binocular vision and space perception basics of binocular vision

Space perception, cyclopean eye, evolution and advantages of binocular vision grades of binocular vision: simultaneous perception, fusion, stereopsis

Visual direction, retino-motor value, egocentric localization corresponding points and normal retinal correspondence.

Practice: synoptophore for fusion, stereopsis, and simultaneous perception.

Module II:

Binocular vision anomalies and testing binocular vision anomalies

Horopter and panum's fusional area

Physiologic diplopia, fixation disparity, and theories of binocular vision physiologic basis of fusion, binocular rivalry, suppression, and confusion blind spot syndrome, eccentric fixation

Practice: worth four dot test, red filter test, bagolini test.

Module III:

Stereopsis and depth perception stereopsis and depth perception

Neurophysiology of stereopsis, local and global stereopsis, and fusion depth perception: non-stereoscopic clues, monocular cues and their types influence of accommodation and convergence on depth perception

Practice: stereopsis evaluation tests, near point of accommodation (npa), near point of convergence (npc).

Module IV:

Ocular movements and binocular integration ocular movements and anatomy

Integration of motor and sensory systems into binocular vision anatomy of extraocular muscles: rectii, obliques, and lps innervation and blood supply of extraocular muscles

Physiology of ocular movements: center of rotation, axes of fick, actions laws of ocular motility: donder's, listing's, sherrington's, hering's laws **practice:** extraocular motility test, hirschberg test.

Module V:

Binocular defects and management binocular defects

Influence of binocular optical defects: visual acuity, anisometropia, aniseikonia, geometric optical effects of spectacles

Binocular muscular coordination: orthophoria, uniocular and binocular movements fixation and its field, saccadic and pursuit movements, versions and vergence amblyopia: classification, etiology, investigation, and management

Nystagmus: classification, etiology, investigation, and management

Practice: bruckner test, saccades and pursuit test, neutral density filters

Suggested Readings:

Scott b steinman; barbara a steinman; ralph p garzia: foundations ofbinocular visiona clinical perspective, 2000, new york: mcgraw-hill publishers

Pradeep sharma: strabismus simplified, first edition,1999, modern publishers.

Fiona j. Rowe: clinical orthoptics, second edition, 2004, blackwell science ltd

Gunter k. V. Nooden: binocular vision & ocular motility_ theory and management of strabismus, sixth edition, 2002, mosby company

Mitchell scheiman; bruce wick: clinical management of binocular vision heterophoric, accommodative, and eye movement disorders, 2008, lippincot williams & wilkins publishers

Low Vision and Rehabilitation

Subject Name	Code	Type	T + p + pj	Credits
Low vision and rehabilitation	CUTM1797	Theory + practice	3+1+0	4

Course Objective

- Understand the epidemiology of visual impairment and the different types of low vision devices, including their optical principles.
- Learn the clinical approach to managing low vision patients, including the use of assistive devices for those who are totally visually challenged.
- Master the art of prescribing low vision devices.
- Training patients in their use, and implementing other rehabilitation measures.

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	define low vision and clinical examination of low vision subjects, optical,non-optical, electronic, and assistive devices.	**PO 1, PO 2, PO 5, PO 7, PSO 2**
CO 2	identify low vision subjects with low vision devices.	**PO 2, PO 5, PO 7, PO 10, PSO 1**
CO 3	execute identification of low vision patients.	**PO 1, PO 2, PO 5, PO 7, PSO 3**
CO 4	evaluate low vision patients with low vision devices.	**PO 2, PO 5, PO 7, PSO 10, PSO 1**
CO 5	construct proper skills and abilities	**PO 1, PO 2, PO 6, PO 8, PSO 3**

Course Outline:

Module I:

Introduction to low vision and examination techniques introduction

Definition & classification of low vision causes of low vision

Optometrist's role in low vision management examination of a low-vision patient

Case history and visual acuity (distant and near) charts, measurement, and documentation refraction: significance and technique diagnostic procedures in low vision examination

Pre-clinical evaluation: prognostic & psychological factors; psycho-social impact

Practice: case history, visual acuity measurement & documentation, refraction and recording

Module II:

Low vision aids and magnification types of low-vision aids

Optics & characteristics of low vision aids magnification principles

Galilean vs. Keplerian telescopes

Spectacle magnifiers, hand magnifiers, stand magnifiers, cctv, bioptic telescopes accessory low-vision aids

Practice: application, trial & selection of devices (optical and non-optical)

Module III:

Selection and training for low-vision aids selection and training

Selection of low vision aids for distance, intermediate & near guidelines & training for using various aids

Practice: training patients to use low-vision aids effectively.

Module IV:

Pathological conditions and specific low-vision aids pathological conditions

Choices of tests & aids for various pathological conditions causing overall blurring of the visual field conditions causing central and peripheral field defects light, glare, and contrast management in low-vision care rehabilitation for children with low vision

Practice: pediatric and geriatric low-vision care

Module V:

Genetics, rehabilitation, and special investigations genetics and rehabilitation

Genetics and the rehabilitation of visually handicapped individuals common conditions leading to low vision and their special investigations rehabilitation methods

Practice: selection, trial & dispensing of visual aids, special investigations, and rehabilitation methods

Suggested Readings:

Christine dickinson: low vision: principles and practice low vision care, 4thedition, butterworth-heinemann, 1998

Sarika g, sailaja mvse vaithilingam: practice of low vision –aguide book, medical research foundation, 2015.

Richard l. Brilliant: essentials of low vision practice,butterworth-heinemann,1999

Helen farral: optometric management of visual handicap, blackwell scientific publications, 1991

A j jackson, j s wolffsohn: low vision manual, butterworth heinnemann,2007.

Basic & ocular pharmacology

Subject Name	Code	Type	T + p + pj	Credits
Basic & ocular pharmacology	CUTM1798	Theory + project	3+0+1	4

Course objective

- Understand the fundamental principles of pharmacology as applied to ophthalmic medications.
- Identify and classify common drugs used in the treatment of ocular conditions.
- Demonstrate knowledge of mechanisms of action
- Side effects, and contraindications of ophthalmic drugs.

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	understand the basic principle of pharmacokinetics & pharmacodynamics.	**PO 1, PO 5, PO 7, PSO 1, PSO 2**
CO 2	implement commonly used ocular drugs, mechanism, indications,contraindications, drug dosage in disease treatment.	**PO 2, PO 5, PO 7, PO 10, PSO 1, PSO 3**
CO 3	analyze various drugs mechanisms and their reactions.	**PO 5, PO 7, PO 12, PSO 2, PSO 3**
CO 4	relate pharmacology in treatment of many ocular diseases.	**PO 1, PO 2, PO 5, PO 7, PSO 1**
CO 5	create awareness about the usage of ocular drugs	**PO 9, PO 10, PO 11, PSO 1, PSO 3**

Course outline:

Module I:

Drug absorption distribution metabolism excretion

Module II:

Pharmacodynamics, Drug handling drug effects, Concentration-response relationship.

Module III :

Ocular pharmacology and drug delivery, Ocular drug handling conjunctival sac residence drug vehicles, Advanced delivery systems

Module IV:

Ocular drugs and effects, Anti- glaucoma medication tear substitutes, Ocular diagnostics drugs anti-infection drugs

Module V:

Sympathetic and parasympathetic drug, Neurotransmitters glucocorticoids immunosuppressive agents local anesthetics

Ocular toxicity

Projects:

Pharmacokinetics of drugs

Pharmacodynamics of drugs

Drug receptor interactions

Different types of delivery methods of ocular medications

Ocular drugs and its effects on parasympathetic nervous system

Ocular drugs and its effects on sympathetic nervous system

Drugs used for iop

Suggested Readings:

Zimmerman: text book of ocular pharmacology,1999

Bartlett and jaanus: clinical ocular pharmacology

S p rang, m dale, ritter – pharmacology, ed.3 churchill 1995.

K d tripathi: essentials of medical pharmacology. 4th ed.,2003

T s mauger & e l craig - mosby's - ocular drug handbook

Clinical ocular pharmacology – 5th edition - jimmy d. Bartlett, siret d. Jaanus.

Binocular Vision II

Subject Name	Code	Type	T + p + pj	Credits
Binocular vision II	CUTM1799	Theory + practice	3 + 2 + 0	5

Course Objective

- Understand the classification and etiology of both strabismus and non-strabismus binocular vision anomalies.
- Learn the necessary investigations and diagnostic procedures for identifying binocular vision anomalies.
- Gain knowledge on the management and treatment options for both strabismus.
- To detect Non-strabismus binocular vision anomalies.

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	identify non strabismic anomalies related to accommodation & convergence	**PO 1, PO 2, PO 5, PO 7, POSO 1, PSO 3**
CO 2	differentiate different types of strabismic anomalies - horizontal, vertical,torsional, paralytical & mechanical restrictive	**PO 1, PO 2, PO 5, PO 4, PSO 1, PSO 3**
CO 3	evaluate necessary investigations & its interpretation	**PO 1, PO 5, PO 10, PSO 1, PSO 2**
CO 4	provide the appropriate management of the anomalies	**PO 2, PO 4, PO 7, PO 10, PSO 1, PSO 3**
CO 5	create differential binocular visual condition practice in daily basis.	**PO 1, PO 3, PO 5, PO 8, PSO 1, PSO 3**

Course Outline:

Module I:

Neuro-muscular anomalies and horizontal strabismus neuro-muscular anomalies

Classification and etiological factors

Factors affecting heterophoria and heterotropia

Horizontal strabismusesotropia: classification, investigations, diagnosis, management, and treatment exotropia: classification, investigations, diagnosis, management, and treatment

A-v phenomenon, microtropia

Practice: 4 prism base out test, krimsky test, modified krimsky

Module II:

Vertical and torsional strabismus vertical strabismus

Classification, investigations, diagnosis, management, and treatment torsional strabismus

Classification, investigations, diagnosis, management, and treatment

Practice: maddox wing, maddox rod, double maddox rod

Module III:

Paralytic and restrictive strabismus paralytic strabismus

Acquired and congenital

Cn iii, iv, vi palsies: nerve pathways, clinical characteristics, investigations, management, and treatment

Practice: bielschowsky park 3 step test restrictive strabismus

Musculo-fascial anomalies

Mobius syndrome, brown superior oblique sheath syndrome, duane's retraction syndrome, strabismus fixus, congenital muscle fibrosis.

Module IV:

Binocular investigations and non-strabismic anomalies binocular investigations for differential diagnosis history and symptoms, compensatory head posture

Diplopia charting, hess chart, synoptophore, cover test, forced duction test, forced generation test

P**ractice**: diplopia charting, hess screen, cover/uncover test, alternate cover test, 9 gaze prism non-strabismic anomalies

Accommodation & convergence: types, methods of measurement anomalies of accommodation: aetiology and management components of convergence: methods of measurement anomalies of convergence: aetiology and management

ac/a, ca/c ratio, nra, pra, npa, npc, nfv, pfv, af, vf, dynamic retinoscopy.

Module V:

Comprehensive management and advanced testing comprehensive management
Integrated approaches for managing neuro-muscular anomalies and strabismus tailored treatment plans for individual cases based on differential diagnosis advanced testing and rehabilitation
Use of advanced diagnostic tools and techniques rehabilitation strategies for complex cases
Case studies and real-world applications

Practice: comprehensive evaluation and management plan

Suggested Readings:

1. Scott B. Steinman; barbara a steinman; ralph p garzia: foundations ofbinocular visiona clinical perspective, 2000, new york: mcgraw-hill publishers
2. Pradeep sharma: strabismus simplified, first edition,1999, modern publishers.
3. Fiona j. Rowe: clinical orthoptics, second edition, 2004, blackwell science ltd
4. Gunter k. V.nooden: binocular vision & ocular motility_ theory and management of strabismus, sixth edition, 2002, mosby company
5. Mitchell scheiman; bruce wick: clinical management of binocular vision heterophoric, accommodative, and eye movement disorders, 2008, lippincot williams & wilkins publishers.

Pediatric & Geriatric Optometry

Subject Name	Code	Type	T + p + pj	Credits
Pediatric & geriatric Optometry	CUTM1800	Theory +practice	3+1+0	4

Course Objective:

- Understand the general physiological changes associated with aging and their impact on

sensory and cognitive functions.

- Analyze age-related ocular changes, including presbyopia, dry eye syndrome, and susceptibility to common ocular conditions.
- Evaluate the relationship between systemic diseases like hypertension, diabetes, and cardiovascular conditions and their effects on ocular health.
- Develop knowledge of preventive and management strategies for age-related ocular and systemic health challenges.

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	gain theoretical knowledge and basic practical skill in handling the advancedinstruments.	**PO 1, PO 2, PO 5, PO 8, PSO 1, PSO 2**
CO 2	demonstrate knowledge and counsel the elderly	**PO 1, PO 7, PO 10, PO 11, PSO 3, PSO 1**
CO 3	support dispensing spectacles with proper instructions.	**PO 2, PO 7, PO 9, PO 10, PSO 1, PSO 3**
CO 4	prepare and dispense lenses.	**PO 2, PO 7, PO 10, PSO 1, PSO 3**
CO 5	develop practical knowledge for handling instruments independently	**PO 2, PO 3, PO 8, PSO 1, PSO 2**

Course Outline:

Module I:

Developmental anatomy and prenatal factors history and genetic factors

Prenatal systems and factors postnatal factors

Normal prenatal development and embryology tissue origin of various eye structures

Module II:

Anomalies of development and genetic disorders **anomalies of prenatal and postnatal**

development genetic origins of eye disorders

Albinism, nystagmus, buphthalmos, macular disorders, color deficiencies, retinitis pigmentosa, ectopia lentis

Acquired disorders

Microcornea, macrocornea, microphthalmos, ptosis, distichiasis, coloboma, aniridia, pupil displacement, retinopathy of prematurity, congenital glaucoma, congenital cataract.

Module III:

Visual assessment and ocular anatomy visual acuity testing in children objective and subjective methods

Normal anatomy and pathology of orbit, eyelids, lacrimal system, conjunctiva, cornea, sclera, anterior chamber, uveal tract, pupil, lens, vitreous, fundus, oculomotor system.

Module IV:

Refractive errors, binocular vision, and amblyopia measurement of the refractive system

Determining binocular status

Tests for strabismus, heterophoria, amblyopia, fixation disorders compensatory treatment and remedial therapy for

Myopia, pseudomyopia, hyperopia, astigmatism, anisometropia, amblyopia remedial and compensatory treatment for strabismus and nystagmus.

Module V:

Ocular aging and geriatric eye care structural and anatomical changes of the eye physiological changes of the eye

Management of common ocular diseases in the elderly cataract, glaucoma, macular disorders, vascular diseases special considerations in ophthalmic dispensing for the elderly management of visual problems related to aging

Use of contact lenses in the elderly

Practice

History taking of pediatric and geriatric patients vision assessment in children

Cycloplegic refraction and post-mydriatic tests

Suggested Readings:

1. Op sharma: geriatric care –a textbook of geriatrics and gerontology,viva books, newdelhi, 2005
2. Vs natarajan: an update on geriatrics, sakthipathipagam, chennai, 1998
3. De rosenblatt, vs natarajan: primer on geriatric care a clinicalapproach to the olderpatient, printers castle, cochin, 2002
4. Paediatric optometry - jerome rosner, butterworth, london 1982
5. Paediatric optometry –william harvey/ bernard gilmartin,butterworth – heinemann,2004
6. Binocular vision and ocular motility - von noorden g k burianvon noorden's,2nd ed.,
7. C.v. mosby co. St. Louis, 1980.assessing children's vision. By susan j leat, rosalyn h shute,
8. Carol a westall.45oxford: butterworth-heinemann, 1999.clinical pediatric optometry. Lj pbd moore, butterworth- heinemann,1993.

Systemic Diseases and Eye

Subject Name	Code	Type	T + p + pj	Credits
Systemic diseases and eye	CUTM1801	Theory	3+0+1	4

Course Objective:

- Understand the interplay between systemic diseases and ocular health.
- Explore the ocular effects of systemic medications and their mechanisms.
- Identify ocular complications associated with systemic diseases and treatments.
- Develop strategies to manage and prevent ocular complications linked to systemic conditions.

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	define common systemic conditions: diagnostic approach, completions, and management options	**PO 1, PO 5, PO 7, PO 8, PSO 1, PSO 2**
CO 2	identify ocular findings of the systemic conditions	**PO 1, PO 2, PO 5, PO 7, PO 9, PSO 1,PSO 3**
CO 3	demonstrate first aid knowledge in different health conditions	**PO 4, PO 5, PO 7, PO 8, PSO 3, PSO 1**
CO 4	examine different eye diseases related to systemic conditions.	**PO 1, PO 2, PO 5, PO 7, PSO 1, PSO 2**
CO 5	assemble the probable cause of abnormal function related to systemic health.	**PO 1, PO 5, PO 6, PO 7, PO 8, PSO 1, PSO 2**

Course Outline:

Module I:

hypertension and diabetes

Hypertension: definition, classification, epidemiology, clinical examination, complications, and management.

Hypertensive retinopathy: effects of hypertension on the eyes.

Diabetes mellitus: classification, pathophysiology, clinical presentations, diagnosis, management, and complications.

Diabetic retinopathy: effects of diabetes on the eyes.

Module II:

thyroid disease and ocular cancer

Thyroid disease: physiology, testing, hyperthyroidism, thyroiditis, thyroid tumors, and grave's Ophthalmopathy.

Ocular cancer: tumors of the retina (retinoblastoma) and eyelids (squamous cell carcinoma, basal cell carcinoma, malignant melanoma).

Module III:

ocular manifestations of infections

Viral infections: aids and ocular involvement, herpes and ocular manifestations. Bacterial infections: tuberculosis and ocular tuberculosis.

Parasitic infections: ocular cysticercosis, onchocerciasis.

Module IV:

Ocular manifestations of autoimmune diseases

Autoimmune diseases: connective tissue disease, rheumatoid arthritis, systemic lupus erythematosus, scleroderma, polymyositis and dermatomyositis, sjogren's syndrome, behcet's syndrome, eye and connective tissue disease.

Module V:

Nutritional deficiencies and other conditions

Nutritional deficiencies: xerophthalmia, deficiencies in vitamins a, d, e, k, b1, b2, c.

Other conditions: anemia (diagnosis, clinical evaluation, consequences, sickle cell disease, treatment, ophthalmologic considerations), ocular myasthenia gravis, kwashiorkor.

Projects

Hypertension & hypertensive retinopathy

Diabetes & diabetic retinopathy

Grave's ophthalmopathy

Ocular manifestations of viral infections

Ocular manifestations of bacterial infections

Ocular manifestations of parasitic infections

Ocular manifestations of nutritional deficiencies

Suggested Readings:

Ak khurana, textbook for ophthalmology

Parson's diseases of the eye

VISUAL OPTICS II

Subject Name	Code	Type	T + P + Pj	Credits
VISUAL OPTICS II	CUTM1791	T+P	3+2+0	5

Course Objective

- Develop an in-depth understanding of refractive errors.
- Master concepts of accommodation and presbyopia
- Integrate the principles of objective and subjective refraction
- Analyze the relationship between accommodation and convergence

Course Outcome:

After Completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	Understand the advanced knowledge of mirrors and lenses.	PO 1, PO 5, PSO 1, PSO 2
CO 2	Implement properties of the images formed on the retina by the optics of the eye.	PO 1, PO 5, PO 12, PSO 1, PSO 2
CO 3	Evaluate different types of lenses and frames.	PO 1, PO 2, PO 4, PO 7, PO 10, PO 11, PSO 1, PSO 2, PSO 3
CO 4	Develop different types of lenses	PO 1, PO 2, PO 4, PO 5, PO 8,PO 10, PSO 1, PSO 3
CO 5	Design basic optical concept for visual function.	PO 6, PO 7, PO 9, PSO 3, PSO 2

Course Outline:

Module I:

Recent myopia development, myopia control, pathological myopia, pseudo myopia Recent advancements in refractive errors Accommodation related to hyperopia & Presbyopia Different

types of refraction, drugs and administration Practice: Retinoscopy for simple, compound & Oblique astigmatism

Module-II:

Accommodation, Presbyopia Hypermetropia and accommodation Range and amplitude of accommodation, variation of accommodation with age. Anomalies of accommodation Accommodation: Far and near points of accommodation Practice: Practice of Retinoscopy in special cases - media opacities, irregular astigmatism

Module III:

Convergence types, measurement and anomalies. Relationship between accommodation & convergence, AC/A ratio. Ocular refraction versus spectacle refraction, Ocular accommodation versus spectacle accommodation, Spectacle magnification and relative spectacle magnification, Retinal image blur; depth of focus and depth of field

Module-IV

Objective Refraction: Static & Dynamic Streak retinoscopy Principle, procedure, difficulties and interpretation of findings Dynamic retinoscopy and near retinoscopy Cycloplegic refraction Practice: Presbyopia correction and methods: Accommodative reserve, balancing the relative accommodation and Cross Grid test

Module-V

Subjective Refraction: Review of subjective refractive methods, Finding out the astigmatism in different methods, Duo chrome, binocular balancing, Difficulties in subjective and objective tests and their avoidance Practice: Subjective Refraction, Binocular balancing. Anisometropia, Aniseikonia, Amblyopia, Aphakia and Pseudophakia Night myopioa and purkinje shift.

Suggested Readings:

1) Clinical Optics, Andrew R Elkington& Helena J Frank - Blackwell Scientific Publications Oxford – London

2) Optics and Refraction A User-friendly guide David Miller 1991 Gower Medical

3) Clinical Visual optics Arthur G Bennett Ronald B Rabbetts -Butterworth- Heinemann Second

edition 1989

4) Visual Optics and Refraction- A clinical approach David D Michaels: The C.V. Mosby Co., 1985

Occupational Optometry

Subject Name	Code	Type	T + p + pj	Credits
Occupational optometry	CUTM1802	Theory+ project	2+0+1	3

Course Objective:

- Understand the general aspects of occupational health and the specific visual function demands in various jobs.
- Learn to perform visual task analysis and understand the visual standards required for different occupations.
- Study occupational hazards, safety measures.
- the role of the optometrist in ensuring visual health across different occupations through classroom sessions and project presentations.

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	understand visual demands associated with various tasks and activities performedat work places.	**PO 1, PO 5, PO 7, PO 10, PSO 1, PSO 3**
CO 2	identify occupational causes of visual and eye problems	**PO 1, PO 2, PO 5, PO 11, PSO 1, PSO 3**
CO 3	evaluate occupational causes of visual and eye problems	**PO 1, PO 2, PO 5, PO 6, PO 7, PSO 1, PSO 2**

CO 4	make suitable corrective lenses and eye protective wear for visual requirements, standards for different jobs	**PO 2, PO 7, PO 9, PSO 1, PSO 3**
CO 5	create awareness among the different work areas.	**PO 1, PO 10, PO 11, PO 12, PSO 2, PSO 3**

Course Outline:

Module I:

Introduction to occupational health and safety introduction

Occupational health, hygiene, and safety international bodies: ilo, who, national bodies acts and rules: factories act, wca, esi act

Module II:

Occupational hazards and protective measures occupational hazards

Physical, chemical, and biological hazards recognition, evaluation, and control

Preventive and protective methods at the workplace accident analysis

Personal protective equipment: general and eye-specific

Module III:

Occupational ocular injuries and medical monitoring ocular injuries and disease prevention

Mechanical, non-mechanical, and chemical injuries prevention of occupational diseases

Medical examination and medical monitoring

Module IV:

Visual ergonomics and radiation effects visual ergonomics

Visual display units and ergonomics computer vision syndrome

Contact lens and work radiation and light

Electromagnetic radiation and its effects on the eye

Light: definitions, units, sources, advantages, disadvantages, and standards colour: definition, theory, coding, defects, vision tests

Welding and its effects on the eye.

Module V:

Vision standards, special groups, and industrial screening visual task analysis and standards

Visual task analysis and testing for vision standards driving and eye requirements

Industrial vision screening: modified clinical method and industrial vision test special occupational groups

Sports, chemical and mineral industries, goldsmiths, etc.

Role of optometrists in promoting general and visual health and safety at work

Projects:

Article presentation on computer vision syndrome and visual ergonomics

Presentation on hazards from mobile radiations and welding

Presentation on occupation screenings and eye protection for different jobs

Visual demands and role of optometrists in different occupations.

Suggested Readings:

1. Pp santanam, r krishnakumar, monica r. Dr. Santanam's textbook of occupational optometry. 1st edition, published by elite school of optometry, unit of medical research foundation, chennai, india, 2015
2. R v north: work and the eye, second edition, butterworth heinemann, 2001
3. G carson, s doshi, w harvey: eye essentials: environmental &occupational optometry, butterworth-heinemann, 2008
4. G w good: occupational vision manual available in the website: www.aoa.org.

Public Health & Community Optometry

Subject Name	Code	Type	T + p + pj	Credits
Public health & community optometry	CUTM4265	Theory+ practice	2+0+2	4

Course Objective:

- Gain an introduction to the foundational concepts and basic sciences underpinning public health optometry.
- Understand the epidemiology of vision problems, including the prevalence, causes, and

impact of various visual impairments.

- Emphasize the specific vision health challenges
- epidemiological trends related to vision problems within the indian context.

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	Understand community-based eye care in India	**PO 1, PO 3, PO 7, PO 10, PO 11, PSO 1, PSO 2**
CO 2	Solve various eye diseases	**PO 2, PO 5, PO 7, PO 12, PSO 1, PSO 3**
CO 3	Organize health education programmes in the community	**PO 3, PO 7, PO 10, PO 9, PSO 2**
CO 4	Support for optometry and its vast service.	**PO 4, PO 6, PO 12, PSO 3**
CO 5	Design communication materials on eye and vision care for the benefit of the public	**PO 9, PO 10, PO 5, PSO 2**

Course Outline:

Module I:

Public health optometry and disease prevention public health optometry

Concepts and implementation stages of diseases

Dimensions, determinants, and indicators of health disease prevention

Levels of disease prevention levels of healthcare patterns

Epidemiology of blindness: defining blindness and visual impairment

Module II:

Eye care in primary health and community programs primary health care

The role of the eye in primary health care contrasting clinical and community health programs community eye care programs

Community-based rehabilitation programs

Module III:

Nutritional blindness and screening initiatives nutritional blindness

Nutritional blindness with reference to vitamin a deficiency vision 2020: the right to sight

Screening for eye diseases

Strategies and methodologies for screening eye diseases

Module IV:

Health agencies and optometrist's role health agencies and programs

National and international health agencies

National programme for control of blindness (NPCB) role of an optometrist in public health

Organization and management of eye care programs service delivery models

Health manpower planning and health economics

Module V:

Evaluation, tele optometry, and school eye health evaluation and assessment

Evaluation and assessment of health programs optometrist’s role in school eye health programs tele optometry and communication

Basics of tele optometry and its application in public health information, education, and communication for eye care programs

Project –

Blindness

Npcb

Role of an optometrist in public health

Basics of tele optometry and its application in public health

Optometric Instruments

Subject Name	Code	Type	T + p + pj	Credits
Optometric instruments	CUTM1803	Theory	3+2+0	5

Course Objective

- Gain proficiency in the operation and application of essential optometric instruments for eye examinations.
- Understand the principles and mechanisms underlying various diagnostic tools used in optometry.
- Develop the ability to accurately interpret results from optometric instruments to diagnose and manage ocular conditions.

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	gain theoretical knowledge and basic practical skill in handling the advanced instruments.	**PO 1, PO 2, PO 5, PO 7, PSO 1, PSO 2**
CO 2	demonstrate knowledge and counsel the elderly	**PO 2, PO 7, PO 9, PO 11, PSO 1, PSO 3**
CO 3	support dispensing spectacles with proper instructions.	**PO 2, PO 4, PO 5, PO 10, PSO 1, PSO 3**
CO 4	prepare and dispense lenses.	**PO 2, PO 7, PO 5, PO 12, PSO 1, PSO 3**
CO 5	develop practical knowledge for handling instruments independently.	**PO 2, PO 5, PO 8, PSO 1, PSO 2**

Course Outline:

Module I:

basic optometric instrumentation

Slit lamp: types, mechanical design, illumination techniques, accessories, color coding. Color vision: theories, arrangement tests, interpretation, and clinical significance.

Auto kerato refractometer and aberrometer

Module II:

retinal diagnostics

Ophthalmoscopy: direct and indirect, optical principles, types, instrumentation, characteristics, and uses. Slit lamp ophthalmoscopy: (+90d, 78d), fundus photography, fundus biomicroscopy (direct and indirect), and oct.

B-scan and electrodiagnostic instruments: erg, vep, eog, ffa, amsler grid test.

Module III:

glaucoma diagnostics

Gonioscopy and tonometry: types, principles, standardization (schiotz, applanation, nct), measurement, documentation, and interpretation.

Perimetry: static and kinetic visual field examination, results, interpretation, and analysis with emphasis on hvf and octopus.

Pachymetry

Module IV:

corneal diagnostics

Keratometry: principles, types (bausch & lomb, javal-schiotz), measurement, documentation, and interpretation.

Corneal topography: principles, types, placido's disc, orbscan interpretation, and results.

Advanced corneal imaging: as-oct, specular microscopy, and introduction to refractive laser procedures.

Module V:

cataract and neuro imaging

Cataract diagnostics: a-scan, potential acuity meter, brightness acuity test. Neuro imaging: basics of ct and MRI scans.

Suggested Readings:

- Clinical procedures in primary eye care by david b. Elliott
- Optometry: science, techniques and clinical management by mark rosenfield and nicola logan
- Ocular disease: mechanisms and management by leonard a. Levin and daniel m. Albert

Medical Law and Ethics

Subject Name	Code	Type of course	T-p-pj	Credit
Medical law and ethics	CUTM1784	Theory+ project	2+0+1	**3**

Course Objective

- To provide students with a foundational understanding of ethics, with a particular focus on medical ethics, and to explore key ethical principles such as autonomy, which significantly influence medical law.
- To examine the general principles of medical law that govern the legal relationship between medical practitioners and their patients, ensuring that students grasp the legal dynamics in healthcare settings.
- To analyze the legal implications of providing medical advice, diagnosis, and treatment, enabling students to understand the legal responsibilities and potential liabilities in medical practice.
- To investigate selected medico-legal issues over the course of human life, including reproductive technologies, fetal rights, research on human subjects, organ donation, rights of the dying, and the legal definition of death.

Course Outcomes:

After completion of the course, the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO1	Understand the Legal Framework Governing Medical Practice.	PO4, PO5, PSO1
CO2	Recognize Professional Responsibilities and Legal Obligations of Medical Practitioners.	PO4, PO9, PSO1
CO3	Analyze different types of medical negligence.	PO4, PO5, PSO3
CO4	Evaluate Legal Processes in Medical Malpractice Litigation.	PO4, PO5, PO9, PSO3
CO5	Assess the Medico legal risks in Healthcare Practice	PO4, PO5, PO10, PSO1

Course Outline:

Module I:

The indian medical council act, Medical council of india (functions), 3. Functions of state medical councils. The declaration of geneva. Association of healthcare providers (ahpi) india

Module II:

1. Duties of medical practioners 2. Regarding red cross emblem 3. Professional secrecy

4. Privileged communication.

Module III:

1. Professional negligence 2. Medical mal occurrence 3. Contributory negligence 4. Criminal negligence 4. Corporate negligence 5. Ethical negligence 6. Precautions against negligence 7. Difference between professional negligence and infamous conduct.

Module IV:

1. Malpractice litigation involving various specialties 2. Prevention of medical negligence 3. Supremecourt of india guidelines on medical negligence 3. The therapeutic misadventure 4. Vicarious liability

Module V:

1.Products liability 2. Medical indemnity insurance 3. Medical records 4. Consent in medical practice, 4. Euthenesia 5. Deaths due to medical care 6. Malingering

Suggested Readings:-

1. Medical law and ethics by shaun d pattinson, 5 th edition, 2017.
2. Medical law and ethics in india" by kk singh, 1st edition (2018).
3. Medical ethics manual for students" by dr. Vijayaprasad gopichandran and dr. S.s. lal, 1st edition (2016)

PSYCHOLOGY AND SOCIOLOGY

Subject Name	Code	Type of course	T-P-Pj	Credit
Psychology and Sociology	CUTM2954	Theory+ Project	3+0+1	**4**

Course Objective

- To recognize and help with the psychological factors involved in disability, pain, disfigurement, unconscious patients, chronic illness, death, bereavement and medical-surgical patients/conditions.
- To understand the elementary principles of behaviour for applying in the therapeutic environment.
- To understand the role of family and community in the development of behaviours.
- To develop a holistic outlook towards the structure of society and community resources.

Course Outcome:

After completion of the course, the students will be able to

CO	Statements	COs with PO & PSOs Mapping
CO1	To describe the principle and philosophy behind the Sociology and Psychology	PO1, PO9, PSO1
CO2	To understand the specific psychological factors and effects in physical illness.	PO7, PO10, PSO1
CO3	Demonstrate the social and economic aspects of a community that influence the health of the people.	PO3, PO10, PO11, PSO1
CO4	Identification of social institutions and resources.	PO3, PO11, PSO3
CO5	To execute a holistic approach in their dealing with patients during admission, treatment, rehabilitation and discharge.	PO4, PO7, PO9, PSO1

Course Outline:

Module I

General Psychology: -Definition of Psychology: Definition of Psychology, information in relation to following schools' methods and branches, a) Schools: Structuralism, functionalism, behaviorism psychoanalysis, gestalt Psychology, b) Methods: Introspection,

observation, inventory and experimental method, c) Branches: General, child, social, abnormal industrial. Heredity and Environment: Twins, Relative importance of heredity and environment, their role in relation to physical characteristics, intelligence and personality, nature- nature controversy. Intelligence: Definitions, IQ, Mental Age, List of various intelligence tests- WAIS, WISC, Bhatia's performance test, Raven's Progressive Matrices test. Motivation Definitions: Motive, drive, incentive and reinforcement activity, air, avoidance of pain, attitude to sex. Psychological needs: Information, security, self-esteem, competence, love and hope Emotions Definitions: Differentiate from feelings, psychological changes of emotion. Personality: Definitions: List of components, Physical characteristics: character, abilities families and culture of personality characteristics, Personality assessment: Interview, standardized, non-standardized, Exhaustive and stress interviews, list and define inventories BAP, CPI and MMPI projective test Rorschach, TAT and sentence completion test.

Learning Definition: List the laws of learning as proposed by Thorndike. Types of learning: Briefly describe, Classical conditions, Operant conditioning, insigne observation and Trial and Error type list the effective ways to learn. Massed Vs spaced. Whole Vs. Part, Recitation Vs. Reading, Serial Vs. Free Recall. Knowledge of results. Association Organization, Mnerroic methods, incidental Vs Intentional learning, role of language Sensation, Attention and Perception: a) List of senses, Vision, Hearing, Olfactory, Gustatory and outdances sensation, movement, equilibrium and visceral sense. Define attention and list factors that determine attention, nature of stimulus intensity, colour, change, extensity, repetition, movement size, curiosity, primary motives, b)Define perception and list the principles of perception, figure fround, constancy, similarity, proximity, closure, continuity, values and interests, past experience context, needs, moods, religion and age, perceived susceptibility perceived seriousness perceived benefits and socio- economic status, c)Define illusion and hallucination, d)List visual, auditory, cutaneous, gustatory and olfactory mechanism. Defence Mechanisms of the ego, rationalization, projection,

reaction, formation, identification, repression, emotional insulations undoing, interjection, acting out.

Module II

Health Psychology: Psychological Reaction of a patient: Psychological reaction of a patient during admission and treatment anxiety, shock, denial, suspicious, questioning, loneliness, regression, shame, guilt, rejection, fear, withdrawl, depression, egocentricity, concern about small matters narrowed interests, emotional, anger reactions, Perpetual changes, confusion,

disorientation, hallucinations, depression, illusions, anger, hostility, loss of hope. Reactions to Loss: Reactions to loss, death and bereavement shock and disbelief, development of awareness, restitution, resolution. Stages of acceptance as proposed by Kubler-Ross. Stress: Physiological and Psychological relation to health and sickness psychosomatic, professional stress burnout.

Module III

Introduction: Definitions of sociology, sociology as a science of society, uses of the study of sociology, application of knowledge of sociology in physiotherapy and occupational therapy. Sociology & Health: Social factors affecting health status, social consciousness and perception of illness, social consciousness and meaning of illness, decision making in taking treatment. Institutions of health, their role in the improvement of the health of the people. Socialization: Meaning of Socialization, influence of social factor on personality, Socialization in hospitals, Socialization in the rehabilitation of patients. Social groups: Concept of social groups, influence of formal and informal groups on health and sickness, the role of primary groups and secondary groups in hospitals and rehabilitation setting.

Module IV

Family: Influence of family on human personality, discussion of changes in functions of a family, influence of family on individual's health, family and nutrition, the effects of sickness on family and psychosomatic disease. Culture: Components of culture. Impace of culture on human behavior, cultural meaning of sickness, response & choice of treatment (role of culture as social consciousness in molding the perception of reality), culture induced symptoms and disease, sub-

culture of medical workers. Caste system: Features of modern caste system and its trends. Social change: Meaning of social change, factors of social change, human adaption and social change, social change and stress, social change and deviation, social change and health programmes, the role of social planning in improvement of health and in rehabilitation.

Module V

Social Control: Meaning of social control, Role of norms, folkways, customs, morals, religion, law and other means of social control in the regulation of human behavior, social deviation and disease. Social Problems of the Disabled: Consequences of the following social problems in relation to sickness and disability, remedies to prevent these problems: a)

Population explosion b)Poverty and unemployment, c) Beggary, d) Juvenile delinquency, e) Prostitution, f) Alcoholism, g) Problems of women in employment. Social Security: Social security and social legislation in relation to the disabled. Social Worker: The role of medical social worker.

Suggested readings: -

1. Psychology and Sociology- Apllied to Medicine- Porter & Alder- W.B Saunders.
2. Behaviorial Sciences for Medical Undergraduates- Manju Mehta–Jaypee Brothers.
3. Parter & Alder – Psychology & Sociology applied to medicine – W.B Saunders.

Suggested Project Works:

1. Impact of Stress on Rehabilitation Outcomes in Physiotherapy Patients
2. The Role of Motivation in Recovery Among Patients Undergoing Physiotherapy
3. Psychological Factors Influencing Chronic Pain Management
4. The Relationship Between Anxiety and Functional Recovery Post-Injury
5. The Influence of Depressionon Recovery in StrokePatients Undergoing Physiotherapy
6. Psychological Preparedness and Its Impact on Outcomes in Rehabilitation
7. The Influence of Social Support Systems on Physiotherapy Outcomes
8. Socioeconomic Status and Access to Physiotherapy Services
9. The Role of Family Dynamics in Rehabilitation of Elderly Patients
10. Barriers to Seeking Physiotherapy Among Marginalized Communities

Project

Subject Name	Code	Type	T + p + pj	Credits
Project	CUTM1809	Project	0+0+14	14

Course Objective

- To contribute to the advancement of knowledge in the field of optometry by conductingoriginal research or exploring innovative approaches in vision science, ocular health, orclinical optometry.
- To apply theoretical knowledge gained during the academiccoursework to real-worldoptometry scenarios.
- To develop skills in data collection techniques, data analysis, andinterpretation, whichare essential for evidence-based practice in optometry.
- To present findings and results in a clear, concise, and professional manner.
- To develop effective communication skills through oralpresentations, written reports,and visual aids.

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	identify health gaps specific to a community.	PO 1, PO 5, PO 10, PO 11, PSO 1, PSO 3
CO 2	demonstrate critical thinking in solving eye related issues	PO 2, PO 5, PO 9, PSO 1, PSO 2
CO 3	recognize specific eye health and their prevalence.	PO 1, PO 4, PO 7, PO 10, PSO 1, PSO 3
CO 4	evaluate case studies.	PO 4, PO 5, PO 9, PO 12, PSO 2, PSO 3
CO 5	design and address a research problem.	PO 2, PO 5, PO 8, PO 12, PSO 2, PSO 3

Course Outline:

Ocular microbiology & pathology: -

Investigation of the epidemiology and pathology of ocular infectious diseases.

Emerging antibiotics resistance and treatment outcomes in any ocular microbial infection. Impact of biofilm on the recovery and treatment of ocular infections.

Mechanism of interspecies signaling in ocular infections.

Role of infection control and prevention in reducing ocularinfections and antibioticresistance.

General anatomy and nutrition:-

Vitamin 'a' deficiency sometime creates no. Of serious ocular disorders. Neurology is completely related with visualization.

'diabetes'/'hypertension' are the alarm for ocular disorder. Is nutrition play important role in ocular disorder

Ocular surface physiology and pathology.ocular diseases: -

Ocular allergy

Ocular surface innervation

Genetic predisposition to ocular disease. Animal models of ocular disease.

Retinal anatomy, physiology, and pathology.

Internship

Subject Name	Code	Type	T + p + pj	Credits
Internship	CUTM4266	-	0+14+0	14

Course Objective

- To gain hands-on clinical experience in conducting comprehensive eye examinations, including visual acuity testing, refraction, binocular visionassessments, and ocular healthevaluations. '
- To become familiar with advanced optometric instrumentation and technology used inthe field of optometry.

- To operate specialized diagnostic tools, imaging devices, and diagnostic instruments, enhancing their skills in evaluating ocular health and providing accurate diagnosis.
- To develop effective patient interaction and communication skills

Course Outcome:

After completion of this course the students will be able to:

CO	Statements	COs with POs and PSOs Mapping
CO 1	select relevant scientific literature.	PO 1, PO 5, PO 8, PO 9, PO 12, PSO 2, PSO 3
CO 2	execute appropriate data collection techniques and tool.	PO 1, PO 2, Po 5, Po 8, Po 9, Po 12, PSO 1, PSO 2, PSO 3
CO 3	analyze data with appropriate statistical techniques.	PO 1, PO 5, PO 8, Po 12, PSO 2, PSO 3
CO 4	value theoretical knowledge with practical.	Po 1, Po 2, Po 3, Po 4, Po 5, PO 8, PO 10,PSO 1, PSO 2, PSO 3
CO 5	design a research proposal.	PO 5, PO 8, Po 12, PSO 2, PSO 3

Course outline:

Internship: -

Case record

Lab management and ethics

Evaluation -guide(internal)

Industries guide (external)

University-project report/ viva