B. Optometry (2021-2022 AB) (GITAM in association with LVPEI)

Semester 1		
Course Code	Course title	Credits
OPTO1001	Introduction to Optometry	1
OPTO1011	Mathematical Concepts	3
OPTO1021	Essential General Biology	3
OPTO1031	Geometrical Optics - I	3
OPTO1041	General Biology Lab	1
OPTO1051	Clinical Examination Techniques - I Lab	5
OPTO1061	Geometrical Optics I Lab	2
		18
Semester 2		
OPTO1071	Ocular Biology I (Anterior segment)	4
OPTO1081	Geometrical Optics II	3
OPTO1091	Information Systems and Technology	3
OPTO1101	Functional English and Communication	3
OPTO1121	Geometrical Optics II Lab	2
OPTO1131	Clinical Examination Techniques II Lab	5
		20
Semester 3		
OPTO2001	Ocular Biology II (Posterior Segment)	4
OPTO2011	Optics of the Eye I	3
OPTO2021	Ocular Diseases I (Anterior Segment)	2
OPTO2031	General Pharmacology	2
OPTO2041	Introduction to Python Programming & Microcontroller unit	2
OPTO2051	Ocular Bilogy II (Posterior Segment) Lab	1
OPTO2061	Clinical Examination Techniques - III Lab	5
OPTO2071	Clinics I Lab	2
		21
Semester 4		
OPTO2081	Ocular Diseases II (Posterior segment)	2
OPTO2111	Ophthalmic Dispensing I	2
OPTO2121	Optics of the Eye II	3
OPTO2131	Ophthalmic Instrumentation I	2
OPTO2151	Ophthalmic Dispensing I Lab	1
OPTO2161	Clinics II Lab	4

		14
Semester 5		
OPTO3001	Ophthalmic Instrumentation II	2
OPTO3031	Ophthalmic Dispensing II	2
OPTO3041	Binocular Vision I	2
OPTO3051	Contact Lens I	2
OPTO3061	Ophthalmic Dispensing II Lab	1
OPTO3071	Binocular Vision I Lab	1
OPTO3081	Contact Lens I Lab	1
OPTO3091	Clinics III Lab	4
OPTO2091	Microbiology and pathology	2
OPTO2101	Ocular pharmacology	2
OPTO2141	Microbiology and pathology lab	1
		20
Semester 6		
OPTO3211	Visual Development and aging	2
OPTO3101	Systemic Diseases and nutrition	1
OPTO3111	Research methodolgy and biostatistics	2
OPTO3121	Public health and epidemiology	2
OPTO3131	Monocular sensory perception	2
OPTO3141	Low vision and rehabilatation	3
OPTO3151	Binocular vision II	2
OPTO3161	Practice management	1
OPTO3171	Contatct lens II	2
OPTO3181	Contact lens II lab	1
OPTO3191	Clinics IV	4
OPTO3201	Innovation and technology	1
		23
Semester 7		
OPTO4001	Internship I	16
OPTO4011	Research project -I	5
OPTO4021	Case discussions -I	3
		24
Semester 8		
OPTO4031	Internship II	16
OPTO4041	Research project -II	5
OPTO4051	Case discussions -II	3
		24

Total Credits 164

OPTO1001: Introduction to Optometry

L	T	P	C
3	0	0	3

Preamble: This course is to introduce the basic introduction to optometry. In this course, use of optometry on eye care will be taught. The knowledge from this curse will be utilized to know the best practices available in medical and optometric practices in India.

Course Objectives:

- To understand skills to provide comprehensive eye examination
- To acquire knowledge on carrier options of optometry
- To realize ethics in medical and optometric practice

Syllabus

UNIT I **8 Hours**

The eye health scenario globally and in India, different career options in optometry Interaction with leaders in Indian and global optometry.

Learning Outcomes:

By the end of this Unit, the student will be able to

- explore different carrier opportunities in optometry
- understand global leaders in area of optometry

UNIT II **8 Hours**

What is optometry and how do optometrists contribute to eye care, Different clinical practice streams of optometry

By the end of this Unit, the student will be able to

- explain different clinical practices
- know the eye care precautions

UNIT III **8 Hours**

Introduction to evidence-based practice in medicine, integrating evidence-based practice into studying optometry

By the end of this Unit, the student will be able to

- understand best practices in evidence-based eye care

UNIT IV **8 Hours**

Digital resources for evidence-based practice: The Cochrane database, BMJ Best Practice, Ethics in medical/optometric practice.

By the end of this Unit, the student will be able to

- know ethical values in optometric practice

- browse the digital resources available to understand ethics to be followed

UNIT V **8 Hours**

Optometry in practice at the L V Prasad Eye Institute, Optometry legislation - council and professional organizations

By the end of this Unit, the student will be able to

- role of L V Prasad Eye institute on the public eye health of national and international scenario.

Course Outcomes:

By the end of this course, the student will be able to

- explore different carrier opportunities in optometry
- understand global leaders in area of optometry
- explain different clinical practices
- know the eye care precautions
- understand best practices in evidence-based eye care

References:

Text Book:

Blepharitis: A Comprehensive Clinical Guide (Farooq & Reidy, 2021) EBSCO host

OPTO1011: Mathematical Concepts

L	T	P	C
3	0	0	3

Preamble: This course is to introduce the basic calculus and geometry of lines and conics in the Euclidean plane. Students can develop geometry with a degree of confidence and will gain fluency in the basics of calculus and Euclidean geometry. In this course, foundational essential Mathematics for Optometry will be taught. The knowledge from this math will be utilized to identify sight lines and vision angles during an eye exam.

Course Objectives:

- Explain the concept of limit and derivative.
- Elaborate how to find the tangent and normal of curve using calculus.
- Introduce the concept of Integration.
- Describe parametrize curves.
- Explicate to evaluate the distance and angle.
- Elucidate to sketch and identify conic sections.

Syllabus

UNIT-I **10 Hours**

Differential Calculus: Limits, continuity, and differentiability of real valued functions of a real variable, Derivative as a rate of change, velocity, acceleration, related rates

Learning Outcomes:
By the end of this Unit, the student will be able to

- explain the relationship between the derivative of a function as a function and the notion of the derivative as the slope of the tangent line to a function at a point.
- compare the ideas of continuity and differentiability.
- to use differentiability concept to find derivatives of composite functions.

Unit-II **8 Hours**

Integral Calculus: Integration, applications of derivatives and integrals, derivative as a measure of slope, tangent, normal and angle between curves.

Learning Outcomes:
By the end of this Unit, the student will be able to

- Develop the concepts of definite and indefinite integrals
- Learn methods of integration
- Learn some applications of integral calculus

Unit-III **10 Hours**

Points and line, vector structure, parameterized lines, pencils of lines. Euclidean plane, scalar product, length and distance, angle

Learning Outcomes:
By the end of this Unit, the student will be able to

- Develop the concepts basic coordinate system and point
- Find the coordinate of the mid of line and length of line
- Understand the relationship between parallel and perpendicular lines
- Learn to derive the equation of straight line and also the angle between the lines

Unit-IV **10 Hours**

Circle: Circles and generalized conics, General conics and centers of general conics, Degenerate conics and axes, asymptotes, Axes, asymptotes, focus and directrix. Tangents and normal

Learning Outcomes:
By the end of this Unit, the student will be able to

- Develop the concepts of circle and general conics
- Study the equation of circle and find the center and radius of circle
- Learn to find the tangent and normal of the circle

Unit-V **8 Hours**

Conic section: Parabola, Ellipse, Hyperbola, Pole and polar, orthoptic loci, Classifying and distinguishing conics

Learning Outcomes:
By the end of this Unit, the student will be able to

- Learn Standard position for each of the conic section
- Lean the concept the Focus, directrix, and axis of symmetry of a parabola
- Learn the foci, major and minor axes, center, and vertices of an ellipse
- Learn foci, branches, vertices, transverse and conjugate axes, and asymptotes of a hyperbola
- Able to recognize the conic sections from their functions in standard from and from their graphs.

Course Outcomes:

Upon completion of the courses, the student can

- apply the basic concept of differential and integral calculus and solve the problem to find the derivate or integrate a given function as application of real problem associate in optometry analysis.
- solve the problem dealing with coordinate geometry: straight line and conic sections
- identify sight lines and vision angles during an eye exam

Prescribed books

1. Rao, Murthy, Sarma, Sastry, Ranganatham: Differential Calculus (Theory & Practical), S. Chand
2. C.G.Gibson: Elementary Euclidean Geometry: An Introduction, Cambridge University Press.
3. H.İ.Karakaş, Analytic Geometry, METU Publishers.

Reference books

1. R.A.Adams and C.Essex, Calculus: A Complete Course, 7/e, Pearson.

OPTO1021: Essential General Biology

L	T	P	C
3	0	0	3

Preamble:
Proper knowledge about the human body is essential in order to understand the different aspects of organization of the body and the correlation between the different organs and systems for a healthy and balanced life.

Course Objectives:

- To impart fundamental knowledge on the cellular level of organization of the human body.
- To explain the gross structure and functions of the various systems of the human body.

UNIT –I **10 Hours**

Introduction to human body
Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology.

Cellular level of organization
Structure and functions of cell, transport across cell membrane, cell division, cell organelles.

Tissue level of organization
Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.

Learning Outcomes:
By the end of this unit, the student will be able to

- Understand the structural aspects of the human body.
- Understand the cellular and tissue level of organization.
- Know about the basic life processes and maintenance of homeostasis.

UNIT– II **10 Hours**

Skeletal system: Divisions of skeletal system. Types of bones. Salient features and functions of bones of
axial and appendicular skeletal systems.
Organization of skeletal muscle, physiology of muscle contraction, neuro muscular Junction. Joints Structure and functional classification, types of joints movements and articulation.

Learning Outcomes:
By the end of this unit, the student will be able to

- By the end of this unit, the student will be able to
- Understand the basic framework of the human body.
- Know about the different bones of the body.
- Understand the muscular coordination of body movements.

UNIT– III **8 Hours**

Body fluids
Body fluids, composition, and functions of blood, haemopoiesis, formation of hemoglobin, mechanisms of coagulation, blood grouping, Rh factor, blood transfusion and its significance. Reticulo – endothelial system. Blood disorders.
Digestion and Absorption
Human alimentary can a land digestive gland. Role of digestive enzymes. Digestion, absorption and assimilation of digested food.

Learning Outcomes:
By the end of this unit, the student will be able to

- Know about blood and understand its structural and functional aspects.
- Understand the concepts of blood groups and blood transfusion.
- Understand the mechanism of digestion and absorption of food thereby leading to various life processes in the human body.

UNIT– IV **8 Hours**

Integumentary system Structure and functions of human skin Special senses Structure and functions of eye, ear, nose and tongue and their disorders.
Breathing and respiration Human respiratory system
Mechanism of breathing and its regulation
Exchange of gases, transport of gases and regulation of respiration Respiratory volumes

Learning Outcomes:

- By the end of this unit, the student will be able to
- Understand the structural and functional aspects of the sense organs.
- Understand the breathing mechanism and terminologies used thereof.

UNIT– V **10 Hours**
Endocrine System: Endocrine glands and their secretions, Functions of hormones secreted by endocrine glands
Neural control and coordination
Definition and classification of nervous system. Structure of a neuron
Generation and conduction of nerve impulse. Structure of brain and spinal cord.
Functions of cerebrum, cerebellum, hypothalamus and medulla oblongata

Learning Outcomes:
By the end of this unit, the student will be able to

- Understand the hormonal level of control of the human body and various life processes.
- Know about the secretary glands of the human body.
- Understand the human nervous system.
- Understand the structural and functional aspects of the human brain and spinal cord.

Course Outcomes:
By the end of this course, the student will be able to

- Understand the basic framework of the human body.
- Know about the different bones of the body.
- Understand the muscular coordination of body movements.

- Know about blood and understand its structural and functional aspects.
- Understand the concepts of blood groups and blood transfusion.
- Understand the mechanism of digestion and absorption of food thereby leading to various life processes in the human body.
- Understand the hormonal level of control of the human body and various life processes.
- Know about the secretary glands of the human body.
- Understand the human nervous system.
- Understand the structural and functional aspects of the human brain and spinal cord.

Prescribed books

1. K. Sembulingam and P. Sembulingam. Essentials of Medical Physiology by Jaypee brothers medical publishers, New Delhi.
2. Kathleen J.W. Wilson, Churchill Livingstone, Anatomy and Physiology in Health and Illness by New York
3. Tortora Grabowski, Palmetto, Principles of Anatomy and Physiology by GA, U.S.A.
4. Inderbir Singh, Textbook of Human Histology, Jaypee brother's medical publishers, New Delhi.
5. C.L. Ghai, Textbook of Practical Physiology, Jaypee brother's medical publishers, New Delhi.
6. K. Srinageswari and Rajeev Sharma, Practical workbook of Human Physiology, Jaypee brother's medical publishers, New Delhi.

Reference Books (Latest Editions)

1. Williams &Wilkins Co, Physiological basis of Medical Practice, Best and Tailor Riverview,USA.
2. Arthur C, Guyton and John. E. Hall. Text book of Medical Physiology- Miamisburg, OH, U.S.A.
3. Dr. C.C. Chatterrje, Human Physiology (vol 1 and 2), Academic Publishers Kolkata.

OPTO1031: Geometrical Optics I

L	T	P	C
3	0	0	3

Preamble:
This course deals with the basic nature of light and its interactions with medium. The interactions of light can be understood through the wave nature of the light. The interaction of light with itself and medium is crucial for having right insight on functioning of eye and physics behind formation of images and processing of optical information.

Course Objectives:
- To introduce the basic concept of light and basic nature of light
- To analyses the behaviour of light in medium.

UNIT I **I8 Hours**

Nature of light–light as electromagnetic oscillation–wave equation; ideas of Sinusoidal oscillations–simple harmonic oscillation; transverse nature of oscillation; concepts of frequency, wavelength, amplitude and phase. Sources of light; Electromagnetic Spectrum. Polarized light; linearly polarized light and circularly polarized light. Intensity of polarized light; Malus' Law; polarizer and analyzers; Methods of producing polarized light; Brewster's angle. Birefringence; ordinary and extraordinary rays.

Learning Outcomes:
At the end of the Topic the student will be able to
- describe the concept of light
- explain the electromagnetic spectrum based on wavelength
- determine the polarization of light when reflected from a surface
- compare the oscillations of electric field in the light

UNIT II **8 Hours**

Coherence; interference; constructive interference, destructive interference; Fringes; fringe width, relationship between amplitude and intensity Double slits, multiple slits, gratings. Diffraction; diffraction by a circular aperture; Airy's disc. Resolution of an instrument (telescope, for example); Raleigh's criterion Scattering; Raleigh's scattering; Tyndall effect.

Learning Outcomes:
At the end of the topic the student will be able to
- interpret the coherence and interference of light
- calculate the amplitude and intensity of the light waves which undergo interference
- recognize the diffraction phenomenon
- calculate the resolution of an optical instrument
- describe the scattering of light

UNIT III **10 hours**

Nature of light – light as electromagnetic oscillation; ideas of sinusoidal oscillations; amplitude and phase; speed of light in vacuum and other media; refractive index. Wave fronts – spherical, elliptical and plane; Curvature and vengeance; rays; convergence and divergence in terms of rays and vengeance; vengeance at a distance Refractive index; its

dependence on wavelength, Fermat's and Huygens Principle – Derivation of laws of reflection and refraction (Snell's law) from these principles.

Learning Outcomes:

At the end of the Topic the student will be able to

- recognize the wave nature of light
- calculate the speed of the light in various medium
- outline the concept of wavefronts from Huygens principle
- derive the laws of reflection and refraction

UNIT IV **10 hours**

Plane mirrors – height of the mirror; rotation of the mirror Reflection by a spherical mirror – paraxial approximation; sign convention; derivation of vengeance equation, Imaging by concave mirror, Imaging by convex mirror**,** Reflectivity; transitivity, Snell's Law. Refraction at a plane surface, Glass slab; displacement without deviation; displacement without dispersion. Thick prisms; angle of prism; deviation produced by a prism; refractive index of the prism Prisms; angular dispersion; dispersive power; Abbe's number. Definition of crown and flint glasses; materials of high refractive index. Thin prism – definition; definition of Prism dioptre. Deviation produced by a thin prism; it dependence on refractive index.

Learning Outcomes:

At the end of the topic the student will be able to

- identify the effect on the light due to plane mirror
- predict the image formed by concave and convex mirrors
- describe the reflectivity and transitivity
- analyse refraction of light due to prism
- define flint glasses, prism diopter

UNIT V **7 hours**

Refraction by a spherical surface; sign convention; introduction to spherical aberration using image formed by a spherical surface of a distance object; sag formula Paraxial approximation; Derivation of vengeance equation. Imaging by a positive powered surface. Imaging by a negative powered surface. Vengeance at a distance formula. Effectivity of a refracting surface.

Learning Outcomes:

At the end of the topic the student will be able to

- describe the refraction of light by a spherical surface
- identify spherical aberration
- derive vengeance equation
- compute image formed by positive and negative powered surface

Course Outcomes:

At the end of the course the student will be able to

- describe the concept of light
- explain the electromagnetic spectrum based on wavelength
- calculate the resolution of an optical instrument
- describe the scattering of light
- outline the concept of wavefronts from Huygens principle

- identify spherical aberration
- derive vengeance equation
- compute image formed by positive and negative powered surface

Textbooks:

1. Subrahmanyan.N, BrijLal, A textbook of Optics, S.Chand.Co Ltd, New Delhi, India,2003.
2. Tunnacliffe A. H, Hirst J. G, Optics, The association of British Dispensing Opticians, London, U.K., 1990.
3. Pedrotti L. S, Pedrotti Sr. F. L, Optics and Vision, Prentice Hall, New Jersey, USA, 1998.

Reference Books:

1. Keating NM. P, Geometric, Physical and Visual Optics, Butterworth- Heinemann, Massachusetts, USA, 2002.
2. Loshin D. S. The Geometric Optics Workbook, Butterworth-Heinemann, Boston, USA, 1991.
3. Schwartz S. H. Geometrical and Visual Optics: A Clinical Introduction, McGraw-Hill, New York, USA, 2002.

OPTO1041: General Biology Lab

L	T	P	C
0	0	2	1

List of experiments:

1. Study of compound microscope.
2. Study of cell and cell organelles.
3. Microscopic study of epithelial, connective tissue, muscular and nervous tissues.
4. Identification of axial bones
5. Identification of appendicular bones
6. Study of human eye
7. Enumeration of white blood cell (WBC) count
8. Enumeration of total red blood corpuscles (RBC) count
9. Determination of bleeding time
10. Determination of clotting time
11. Estimation of hemoglobin content
12. Determination of blood group.
13. Determination of heart rate and pulse rate.
14. Recording of blood pressure.

Course Outcomes:
Upon completion of this course the student should be able to

- explain the gross morphology, structure and functions of various organs of the
- human body.
- understand the cellular level of organization of the human body.
- identify the various tissues and organs of different systems of human body.
- understand the coordinated working pattern of different organs of each system.
- perform the various experiments related to special senses and nervous system.

OPTO1051: Clinical examination techniques I Lab

L	T	P	C
3	0	0	3

Course Description:
Course Aim to impart fundamental application and appropriate procedure to perform optometry clinical technique/s conducted during a comprehensive ocular examination. This course is also intended to facilitate extensive skill-oriented hands-on practice and a base of knowledge on documentation and interpretation of the optometry clinical technique/s.

This course is a fundamental course on which to base the subsequent optometric clinical training which happens in the second year and during patient-care observation.

Course Objectives:
- To perform the optometry clinical techniques
- to facilitate extensive skill-oriented hands-on practice
- to facilitate a base of knowledge on documentation and interpretation of the optometry clinical technique/s

Syllabus:
Clinical etiquette
- Communication with the patient and professional behavior
- Preparation of the examination room and hygiene
- Professional conduct, confidentiality of patient records and adherence to safety policies
- Flow chart of sequence of comprehensive eye examination & logical steps in performing the procedures

Eliciting clinical history
- Components of eliciting clinical history for an ophthalmic patient and standard documentation
- Eliciting and documentation of detailed clinical history in the following patient profiles (known/suspected): a) Refractive errors b) Cataract c) Diabetes & Hypertension d) eyelid disorders e) Conjunctivitis
- Understanding wellbeing of the patient and recognizing challenges in patient's gait, verbal response & systemic illness

Visual acuity measurement

a) Visual acuity measurement for far distance
- Standard procedures of visual acuity measurement for far distance, designation of visual acuity, interpretation of the findings and documentation
- Visual acuity measurement for far distance in an adult patient with only ocular disability by using snellen visual acuity chart
- Visual acuity measurement for far distance in an adult patient with only ocular disability by using LogMAR visual acuity chart
- Alternate methods of visual acuity assessment for far distance
- Testing distance conversions & assigning visual acuity scores

b) Visual acuity measurement for near distance

- Standard procedures of visual acuity measurement for near distance, designation of visual acuity, interpretation of the findings and documentation
- Visual acuity measurement for near distance in an adult patient with only ocular disability by using LogMAR word reading near visual acuity chart
- Alternate methods of visual acuity assessment for near distance
- Testing distance conversions & assigning visual acuity scores

Manual Lensometry

- Instrumentation and labeling the parts of the manual lensometer instrument, its operating principles and optics of the manual lensomete rinstrument
- Measurement of the refractive power of the single vision spectacles using manual lensometer
- Measurement of the refractive power of the bifocal spectacles using manual lensometer

Objective retinoscopy

- Instrumentation and labeling the parts of the retinoscope instrument, its operating principles and optics of the retinoscope instrument
- Movement of the retinal reflex, characteristics of the reflex and working distance correction
- Static dry retinoscopy on an eye with clear media for any given spherical ametropia and its documentation
- Recognizing presence of astigmatism, break & skew phenomenon, thickness phenomenon and straddling the axis
- Static dry retinoscopy on an eye with clear media for any given regular astigmatic patients and its documentation
- Sources of error during retinoscopy

Subjective retinoscopy

- Standard procedures of subjective refining techniques in indicated cases to confirm the endpoint of refraction/refractive error
- Determining theendpoint of refraction/refractive error using Maximum plus Maximum Visual Acuity (MPMVA) technique
- Determining the endpoint of refraction/refractive error using Duochrome technique
- Standard procedures used for correction for near vision
- Measurement of inter pupillary distance of the eye balls using PD ruler and pen torch
- To write a suitable spectacle prescription

Anterior segment examination

a) Slit lamp biomicroscopy

- Instrumentation and labeling the parts of the slit lamp biomicroscopeinstrument, its operating principles and optics of the slit lamp biomicroscope instrument
- Examination of the anterior segment ocular structures using slit lamp biomicroscope by diffuse and direct focal illumination techniques

- Examination of the anterior segment ocular structures using slit lamp biomicroscope by in-direct illumination techniques
- Examination of the anterior segment ocular structures using slit lamp biomicroscope by Retro- illumination technique
- Anterior chamber angle evaluation by Van Herrick's technique and grades used for angle estimation

b) Assessment of pupils

- Identification of reaction of the pupils (direct and consensual), comment on its shape, size and speed of reaction
- Relative afferent pupillary defect (RAPD) assessment

c) Measurement of Intraocular Pressure (IOP)

- Instrumentation and labeling the parts of the Goldmann applanation tonometerinstrument, its operating principles and optics of the Goldmann applanation tonometer instrument
- Measurement of intraocular pressure of the eyeball using slit lamp biomicroscope and Goldmann Applanation tonometer
- Sources of error during intraocular pressure measurement

Posterior segment examination

- Instrumentation and labeling the parts of the direct ophthalmoscope instrument, its operating principles and knowledge on optics of the direct ophthalmoscope instrument.

- Examination of the posterior segment ocular structures using direct ophthalmoscope by different examination techniques

Course Outcomes:

- apply the optometry clinical technique/s and/or instrument/s
- demonstrate the procedure of the optometry clinical technique/s and/or instrument/s
- perform the procedure of optometry clinical technique/s and/or instrument/s under supervision
- analyze the findings and produce the documentation of the optometry clinical technique/s and/or instrument/s
- compare normal and abnormal findings and generate the interpretation of the optometry clinical technique/s and/or instrument/s

References:

1. Kuraikore, Clinical Insight and Examination Techniques in Ophthalmology (Hb 2020), Springer

OPTO1061: Essential optics I Lab

L	T	P	C
0	0	4	2

List of Experiments

1. Refractive index of prism for sodium D-Line using spectrometer
2. Dispersive power of prism for Hg source using spectrometer
3. Air wedge - Interference method to find diameter of an optically thin wire
4. Newton's ring - to find the wavelength of sodium light
5. Biprism - To find the wavelength of sodium light
6. Diffraction grating - (Minimum deviation method). of Hg prominent lines
7. Polarimeter - specific rotation of dextrose and concentration of IV injection
8. Lumenbrodem Photometer - Comparison of luminous power
9. μ of liquid - using liquid prism - spectrometer
10. Michelson interferometer -wavelength of laser light.

GITAM University & L V Prasad Eye Institute,
Brien Holden Institute of Optometry and Vision Sciences,
GPR Campus, Kismatpur.

First Year – Semester II

Course No.	:	OPT 102
Course Title	:	Ocular biology (Anterior segment) I
Semester	:	II
Lectures	:	4
Credits	:	4
Course lead	:	Dr Charanya Ramachandran

Broad topics

1. Embryological development of the eye
2. Structure and function of the eyelids and the lacrimal system
3. Structure of the cornea and its different layers
4. Function of the layers of the cornea
5. Regenerative capacity of the different layers of the cornea
6. Optical properties of the cornea and mechanisms that maintain its transparency
7. Structure and function of conjunctica
8. Limbus and its function
9. Anterior chamber – secretion of aqueous humor
10. Structures and mechanisms regulating aqueous humor drainage
11. Cause and effect of increased intraocular pressure – glaucoma
12. Pharmacodynamics of anti-glaucoma medications
13. Iris and pupils – neurological control of the pupillary function

Suggested reading resources

1. Digital resource library on Ocular Anatomy and Physiology
2. The Human Eye– Clyde Oyster
3. Adler's physiology

Course No.	:	OPT 110
Course Title	:	Ocular biology (Anterior segment) I Lab
Semester	:	II
Practical's	:	2
Credits	:	1
Course lead	:	Dr Charanya Ramachandran

Broad topics

1. Dissection of bovine/rabbit/human eyeballs
2. Measurement of corneal edema
3. Lab visit to KAR campus – visualization of cells
4. Measurement of tear secretion
5. Measurement of TBUT

OPTO1081 : Geometrical Optics II

L	T	P	C
3	0	0	3

Preamble:
This course deals with the lens and the physics of image formation. The order of magnification of image and associated aberration can be predicted. The knowledge of formation of image is crucial and essential in diagnosing and suggesting apt solution for many of the problems related to optometry

Course objectives:

- To analyse the formation of image due to combination of lens
- To compare the image formed by lens of varying geometry.

Syllabus:

UNIT I **10 Hours**

Definition of a lens as a combination of two surfaces; different types of lens shapes. Image formation by a lens by application of vergence at a distance formula; definitions of front and back vertex powers; equivalent power; first and second principal planes/points; primary and secondary focal planes/points; primary and secondary focal lengths Newton's formula; linear magnification; angular magnification Nodal Planes Thin lens as a special case of thick lens; review of sign convention Imaging by a thin convex lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions Imaging by a thin concave lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions Prentices Rule System of two thin lenses; review of front and back vertex powers and equivalent power, review of six cardinal points. System of more than two thin lenses; calculation of equivalent power using magnification formula.

Learning Outcomes:
At the end of the topic the student will be able to

- describe Lens and types of lens
- predict the image formed by different types of lens
- analyse sign of Convention imaging by thin convex lens.
- review the front and back vertex power

UNIT II **10 Hours**

Cylindrical Lenses; image formation; relation between cylinder axis and line image orientation. Imaging due to two cylinders in contact with axes parallel. Two cylinders in contact with axes perpendicular; line images and their orientations to the cylinders' powers; Interval of Sturm; circle of least confusion (CLC); spherical equivalent; position of CLC.

Learning Outcomes:
At the end of the topic the student will be able to

- predict the image formed by cylindrical lens
- compute image formation due to two cylindrical lenses with axes parallel and perpendicular
- analyse interval of sturm

UNIT III **8 Hours**

Spherical lens and a cylindrical lens in contact; spherical equivalent; interval of Sturm and CLC. Sphereo-cylindrical lens notations– plus/minus cylinder form, cross cylinder/meridian form; transformations between them. Field stops and apertures; entrance and exit pupils. Apertures and defocus blur, Receiver/detector diameter; Depth of focus, Depth of field.

Chromatic aberrations; methods of removing chromatic aberrations. Abbe number. Monochromatic aberrations –deviation from paraxial approximation, Difference between ray aberrations and wave-front aberrations. Third order aberrations–spherical aberrations, coma, astigmatism; distortion and curvature of fields, Ways of minimizing spherical aberrations–Pupil-size, bending of lens, shape factor, Lens tilt – astigmatism. Higher order aberrations; introduction to Zernike Polynomials.

Learning Outcomes:
At the end of the topic the student will be able to

- predict the image formed by spherical and cylindrical lenses in contact
- define Aperture, defocus blur and Chromatic aberration
- indicate methods to remove chromatic aberration
- classify aberrations during the formation of aberrations
- propose methods to minimize the aberration.

UNIT IV **8 Hours**

Telescopes– Keplerian, Galilean and Newtonian; position of cardinal points, entrance and exit pupils; magnifications; advantages and disadvantages. Microscopes–magnification, tube-length. Gullstrand's Schematic Eye (GSE). Calculation of the power of the cornea, the lens and the eye, axial length, Calculation of the position of the cardinal points, magnification. GSE-Purkinje images and their reflectance. GSE-entrance and exit pupils for a 3mm pupil; ocular aberrations– spherical aberrations and coma, chromatic aberrations.

Learning Outcomes:
At the end of the topic the student will be able to

- define and classify Telescope
- compare different types of telescope
- recall the construction of microscope
- calculate the power of the cornea, the lens and the eye
- propose methods to minimize the aberration.

UNIT V **8 Hours**

GSE–introduction to refractive errors-myopia and hyperopia; corneal curvature; axial length; far point; blur-size calculations; corrections; astigmatism; blur size; circle of least confusion; correction. GSE-Object closer than at infinity; Introduction to accommodation; far-point; near-point; presbyopia; spectacle and contact lens corrections- comparison of magnification.

Learning Outcomes:
At the end of the topic the student will be able to

- define and Gullstrand's Schematic Eye (GSE).
- outline errors-myopia and hyperopia

- calculate the blur-size
- propose methods to correction.

Course Outcomes:
At the end of the course the student will be able to

- To compare the image formed by lens of varying geometry
- predict the image formed by different types of lens
- analyse sign of Convention imaging by thin convex lens
- calculate the power of the cornea, the lens and the eye
- propose methods to minimize the aberration
- outline errors-myopia and hyperopia

Textbooks:

1. Tunnacliffe A. H, Hirst J. G, *Optics*, The association of British Dispensing Opticians, London, U.K., 1990.
2. Pedrotti L. S, Pedrotti Sr. F. L, *Optics and Vision*, Prentice Hall, New Jersey, USA, 1998.
3. Tunnacliffe A. H, Hirst J. G, *Optics*, The association of British Dispensing Opticians,London,U.K.,1990.
4. Pedrotti L.S, Pedrotti Sr. F. L, *Optics and Vision*, Prentice Hall, New Jersey, USA,1998.

Reference Books:

1. Loshin D. S. The Geometric Optics Workbook, Butterworth-Heinemann, Boston, USA, 1991.
2. Schwartz S. H. Geometrical and Visual Optics: A Clinical Introduction, McGraw-Hill, New York, USA, 2002.
3. Loshin D.S. The Geometric Optics Work book, Butterworth-Heinemann, Boston, USA, 1991.
4. Schwartz S.H. Geometrical and Visual Optics: A Clinical Introduction, McGraw-Hill, NewYork, USA, 2002

OPTO1091: Information Systems and Technology

L	T	P	C
3	0	0	3

Course Description:

This course introduces the student to the building blocks of information systems and their utility in healthcare management systems. The first two units cover the building blocks of the computer system. The students are made aware of the text processing tools and data management systems in the third unit. The fourth module makes the student aware of internet technology and associated risks and internet technology issues. Finally, the last module covers the healthcare informatics and management tools.

Course Objectives:

- To familiarize with the working principle of computers and their component
- To introduce the computer software systems and their functionality.
- To learn and utilize MS-office tools and their functionality.
- To learn and utilize the world wide web.
- To learn about the medical informatics used in the management of optometry records.

UNIT I **8 Hours**

Introduction to Computers: Computer Generations & Classifications: Evolution of computers, Classification of Computers. Central Processing Unit, Random access memory, storage systems, Input devices: Keyboard, pointing devices, scanning devices, Data acquisition sensors, Output devices: Monitors, printers.
Learning outcome:
After completion of this unit, the student will be able to

- understand the basics of the computer system (L1)
- identify the components of computers (L2)

UNIT II **8 Hours**

Introduction to Computer Software, type of different software, standard application software, overview of proprietary software, an overview of Operating System Concepts, the function of operating systems, type of operating systems, File management, memory management, process management, device management, popular operating systems. Windows 7.
After completion of this unit, the student will be able to

- Understand the overview of computer software (L1)
- Uses of software for performing a specific tasks (L3)
- Troubleshoot the software-related issues. (L3)

UNIT III **8 Hours**

Introduction, MS-word systems, MS-excel systems, MS PowerPoint systems, MS access systems.

After completion of this unit, the student will be able to

- understand the overview of different tools available in MS office(L1)
- uses of MS-EXCEL for performing a specific tasks (L3)
- understand the organization of data in database management systems(L2)
- use MS-ACCESS to store and retrieve data from the table (L3)

UNIT IV **8 Hours**

Internet and Its Working: History of the Internet, understanding WWW, Web browsers, Protocols used for Internet, Internet address, other internet services: Emails, Instant Messaging, FTP. Internet and network attacks: Virus, worms, trojan and rootkits, safeguard against computer virus and other malware, DOS attack, spoofing, backdoors, Firewalls

After completion of this unit, the student will be able to

- understand the worldwide web, its protocols, and its threats(L1)
- uses of the world wide web (L3)
- protect and troubleshoot the system in case of threats of attack. (L3)

UNIT V **8 Hours**

Biomedical Informatics: Emerging Discipline, Biomedical data: their acquisition, storage, and use. Electronic Health records, Imaging management, and display, Telehealth,

After completion of this unit, the student will be able to

- understand how computers are used in medical informatics(L1)
- utilize the PACS imaging system to store and retrieve ophthalmic images (L3)
- understand the characteristics of different software used in optometry. (L1)
- use the optometry software for their specified task. (L3)

Course Outcomes:

After completion of this course, the student will be able to

- To learn and utilize MS-office tools and their functionality
- identify the components of computers
- Troubleshoot the software-related issues
- uses of MS-EXCEL for performing a specific task
- understand how computers are used in medical informatics

Text Books:

1. Balagurusamy, E., Fundamentals of Computer by, Tata McGraw Hill Education Pvt. Ltd, New Delhi
2. Shelly, Gary B. Discovering Computer Fundamentals. Shelley Cashman Series, 2010.
3. Shortliffe, E. H., Shortliffe, E. H., Cimino, J. J., & Cimino, J. J. (2014). Biomedical informatics: computer applications in health care and biomedicine. Springer..

Reference Books:

1. Vikas Gupta, Comdex Information Technology Course Tool Kit, Wiley Dreamtech, 2009.

2. ITL Education Solutions limited, Introduction to Information Technology, Pearson Education, 2006.
3. Joos, I., Wolf, D., & Nelson, R. (2019). Introduction to computers for healthcare professionals. Jones & Bartlett Learning.

Web References:

1. Health informatics specialization, https://www.coursera.org/specializations/health-informatics
2. Fundamentals of Computers, https://onlinecourses.swayam2.ac.in/cec21_cs15/preview
3. Introduction to MS-office, https://www.youtube.com/watch?v=yCVy5Kw0l8s
4. Interprofessional health informatics, https://www.coursera.org/learn/health-informatics-professional

OPTO1101 Functional English and Communication

L	T	P	C
3	0	0	3

Preamble:

The course is designed to help learners enhance their English language skills and communicate efficiently and effectively. It focuses on all four language skills with an emphasis on communication in a healthcare environment in general and optometry in particular. It familiarizes learners with the kind of language they would need every day at work by using real healthcare scenarios in the activities and materials.

Course Objectives:

- Help learners understand and apply the rules of the English language in speech and writing (L2)
- Equip learners with the knowledge of the sub-skills and strategies of effective reading and active listening with specific reference to workplace scenarios in the healthcare sector (L3)
- Familiarize learners with the conventions of formal and informal communication (oral and written) and enable them to communicate (in speech and writing) with confidence, competence and clarity in professional contexts (L3)
- Prepare learners to appear for globally recognized English language tests for professionals in the healthcare sector (L3)

Syllabus:

UNIT I **8 Hours**

Introduction: Practical approach to recognizing significant differences between English and one's native language: use of articles, prepositions, verb tense and voice

Listening: Listen to recorded extracts and identify specific information to complete notes

Speaking: Impact of pronunciation, intonation and accent on how clearly the listener can hear and understand what the speaker is saying; relationship-building: the importance of the choice of opening to the conversation; demonstration of empathy and respect

Reading: Locate specific information from short texts in a quick and efficient manner

Writing: Take/make notes and summarise clearly and concisely what is heard in short audio extracts and reading texts

Learning Outcomes:

By the end of this Unit, the student will be able to -

- Obtain relevant information from short extracts of spoken and written content (L2)
- Initiate a conversation that leads to professional relationship-building and write short structured summaries of content from listening and reading texts (L2)

UNIT II **8 Hours**

Listening: Strategies to develop a range of listening skills, such as identifying specific information, detail, and gist

Speaking: Significance of speed and smoothness of the speaker's speech on the listener's understanding; incorporating the patient's perspective; involving the patient in the conversation

Reading: Identify the detail, gist or main point of short texts related to healthcare in general and eye care in particular

Writing: Draft a letter/email communicating clear information (e.g.: a referral letter) with a focus on purpose and content

Learning Outcomes:

By the end of this Unit, the student will be able to -

- understand spoken and written content relevant to the field and answer questions based on overall understanding of the texts read/listened to (L3)
- participate confidently in role-plays based on workplace contexts and draft short structured letters/emails (L3)

UNIT III **8 Hours**

Listening: Identify the opinion or purpose of short extracts from the healthcare workplace.

Speaking: Emphasis on the speaker's language, tone and professionalism to ensure the listener's understanding and comfort; organise the information provided and introduce new topics for discussion in the course of a consultation or demonstration

Reading: Identify the detail, gist or main point of texts sourced from the healthcare workplace including extracts from policy documents, hospital guidelines, manuals or communications such as emails or memos

Writing: Communicating through letters/email with clarity and conciseness; accuracy of the grammar, vocabulary, spelling and punctuation; editing one's own and others' drafts for language and clarity

Learning Outcomes:

By the end of this Unit, the student will be able to -

- comprehend spoken and written content relevant to the healthcare workplace and understand the conventions of different medical text types as well as the presentation of numerical and textual information. (L2)
- demonstrate professionalism in oral communication through role-plays related to specific workplace scenarios and write clear, concise emails in error-free language. (L3)

UNIT IV **8 Hours**

Listening: Strategies for active listening to understand opinion and the speaker's purpose

Speaking: Focus on grammatical accuracy and vocabulary choices in speech; type of questions that can be asked to indicate interest in the responses of the listener/patient

Reading: Identify detailed and implied meaning in longer texts on topics of interest to healthcare professionals

Writing: Organization of content in writing; use of suitable signposting language; achieving clear structure and coherence in writing

Learning Outcomes:

By the end of this Unit, the student will be able to -

- adopt suitable strategies for active listening and inferential reading to understand and answer questions regarding the speaker's/writer's intent and opinion/ attitude (L3)
- ask and answer questions orally in an insightful manner and demonstrate understanding of structure and coherence in independent writing tasks. (L3)

UNIT V **8 Hours**

Listening: Listen actively and follow a recorded presentation or interview on a range of accessible healthcare topics

Speaking: Provide relevant information and check if the information is being understood clearly by the listener/patient

Reading: Identify the writer's purpose and opinion in longer texts on topics of interest to healthcare professionals

Writing: Focus on the use of appropriate register and tone in written communication

Learning Outcomes:

By the end of this Unit, the student will be able to

- gauge listener responses during professional conversations and gain insights into the writer's intent and attitude while reading
- convey the content clearly in oral communication and guide the listener/patient to provide the required information, and apply knowledge of appropriate register and tone in written communication (L3)

Course Outcomes:

Upon completion of the course, the student will be able to

- understand the linguistic and professional aspects of spoken and written communication in clinical contexts (L2)
- build upon and improve communicative abilities in English across the skills

of listening, reading, writing and speaking in English (L3)
- follow the given rubrics and give peer feedback to fellow learners on their performance in role plays as well as their responses to writing tasks. (L3)
- take a global English Skills Test relevant to their profession if required/desired (L3)

Reference Books:

1. Cunningham, S., Moor, P., and Eales, F. (2007) New Cutting Edge Pre-Intermediate. Pearson Longman.
2. McCarthy, M., O'Dell, F., Mark, G. (2005) English Vocabulary in Use. Spain: Cambridge University Press.
3. Murphy, Raymond. (2015) Essential Grammar in Use. Cambridge University Press.
4. Sanjay Kumar and Pushp Lata. (2018) Communication Skills: A Workbook. OUP.

Internet Resources:

Listening and Speaking:

- ABC – All in the Mind
- ABC – Health Minutes
- ABC – Health Report
- ABC – Life Matters
- BBC – Health
- BBC – Health Check
- BBC – Inside Health
- BBC – Science in Action
- Speaking Video Samples

Reading:

- ABC health newsletter
- New England Journal of Medicine
- Science Magazine for the American Association for the Advancement of Science
- British Medical Journal
- Journal of the American Medical Association
- Medical Journal of Australia
- Free Medical Journals
- OMICS International

Language Skills, Grammar, Vocabulary and Dictionaries:

- https://www.grammarly.com/blog/
- https://learnenglishteens.britishcouncil.org/
- https://eslflow.com/
- https://www.englishclub.com/
- https://freerice.com/categories/english-vocabulary
- https://www.oxfordlearnersdictionaries.com/
- https://dictionary.cambridge.org/

Activities/Tasks:

Listening: Listen to recorded extracts of talks, lectures, team briefings, demonstrations, handovers, and health professional-patient dialogues/consultations and answer questions of varied types such as notes completion, gap filling, MCQs, and very short answers using the information heard

Speaking: Primary focus on role-plays based on workplace contexts, presentations to give a demonstration of procedures/products; peer feedback and instructor feedback would be part of every activity

Reading: Scaffolding activities to help learners understand the conventions of different medical text types, presentation of numerical and textual information, and identify the details. Tasks would also include questions focused on the relationship between ideas at sentence and paragraph level, lexical references and complex phrases within the text. Students would be expected to answer questions of varied types such as notes completion, gap filling, MCQs, and very short answers.

Writing: Collaborative tasks, guided writing tasks, and independent writing tasks would be included in a phased manner; students would be given practice in drafting written communication, editing and proofreading their drafts to avoid language errors as well as to check for tone and agreement with the conventions of professional communication.

Assessment and Evaluation

Combination of formative and summative assessments

Listening: A range of listening skills (such as identifying specific information, detail, gist, opinion or the speaker's purpose) will be assessed through note-completion tasks, gap fills, multiple-choice questions, and questions that demand response in the form of short answers.

Reading: Reading tests assess the ability of the learners to skim and scan quickly across different texts on a given topic in order to locate specific information; understand the detail and the gist/main idea of complex texts commonly found in the healthcare workplace; comprehend both explicit and implied meaning as well as the attitude or opinion presented in longer texts.

Speaking and Writing: Speaking and writing assessments take into account the level of task accomplishment and will be assessed on the basis of detailed rubrics using the following criteria: purpose, content, conciseness and clarity, organisation of thoughts/points, tone and language, as well as the pace of speech (for speaking assessment).

OPTO1121 Geometrical Optics II Lab

L	T	P	C
0	0	2	1

1. f & μ of convex lens (f by u-v and shift method)
2. f& μ of concave lens (f of concave lens by u-v method, combined lens u-v method, R -
   Boy's method)
3. μ of the prism (i-d curve)
4. μ of slab - shift method (traveling microscope)
5. μ of liquid - shift method (traveling microscope)
6. f of convex of mirror
7. f of concave mirror (u-v graph)
8. Verification of laws of reflection - plane mirror.
9. Verification of laws of refraction - glass slab - pin method (μ by lateral shift)
10. Resolving power of telescope.
11. Photodiode – characteristics.
12. Plank’s constant.

OPTO1131 Clinical examination techniques II Lab

L	T	P	C
0	0	2	1

Course Description:

Course Aim: Students receive reinforcement of the optometry clinical technique/s taught in clinical examination techniques I lab and will be trained in additional optometry clinical technique/s of comprehensive eye examination. This course is also intended to facilitate extensive skill-oriented hands-on practice and a base of knowledge on documentation and interpretation of the optometry clinical technique/s.

Course Objectives:

- This course is a fundamental course on which to base the subsequent optometric clinical training which happens in second year and during patient-care observation.

Syllabus:

Eliciting clinical history

- Eliciting and documentation of detailed clinical history in the following patient profiles (known/suspected): a) Corneal disorders b) Glaucoma c) Retinal disorders d) Injury cases
- Making tentative differential diagnosis

Visual acuity measurement

c) Visual acuity measurement for far distance

- Visual acuity measurement for far distance in an adult patient with only ocular disability by using appropriate chart and documentation of the findings
- Visual acuity measurement for far distance in children with only ocular disability by using Lea symbols chart and documentation of the findings
- Testing distance conversions & assigning visual acuity scores

d) Visual acuity measurement for near distance

- Visual acuity measurement for near distance in an adult patient with only ocular disability by using appropriate chart and documentation of the findings
- Visual acuity measurement for near distance in children with only ocular disability by using Lea symbols chart and documentation of the findings
- Testing distance conversions & assigning visual acuity scores

Refraction

a) Manual Lensometry

- Measurement of the refractive power of the single vision spectacles using manual lensometer
- Measurement of the refractive power of the bifocal spectacles using manual lensometer

b) Objective retinoscopy

- Static dry retinoscopy on an eye with clear media for any given spherical ametropia and its documentation
- Static dry retinoscopy on an eye with clear media for any given regular astigmatic patients and its documentation
- Static wet retinoscopy on an eye with clear media for any given spherical ametropia and/or regular astigmatic patients in adult patients or children using cycloplegic eye drops wherever indicated

c) Subjective retinoscopy

- Determining the endpoint of spherical refraction/refractive error using Maximum plus Maximum Visual Acuity (MPMVA) technique
- Determining the endpoint of spherical refraction/refractive error using Duochrome technique
- Determining the endpoint of astigmatic refraction/refractive error using Jackson's cross cylinder (JCC)
- Determining the endpoint of refraction/refractive error using binocular refraction and balancing techniques
- Determining the endpoint of refraction/refractive error using post mydriatic test (PMT)
- To write a suitable spectacle prescription.

Anterior segment examination

d) Slit lamp bio microscopy

- Examination of the anterior segment ocular structures using slit lamp biomicroscope by diffuse, direct focal, in-direct and retro illumination techniques
- Examination of the anterior segment ocular structures using slit lamp biomicroscope by tangential, illumination techniques
- Examination of the anterior segment ocular structures using slit lamp biomicroscope by specular reflection illumination techniques
- Examination of the anterior segment ocular structures using slit lamp biomicroscope by sclerotic scatter illumination techniques
- Anterior chamber angle evaluation by Van Herrick's technique and grades used for angle estimation

e) Measurement of Intraocular Pressure (IOP)

- Measurement of intraocular pressure of the eyeball using slit lamp biomicroscope and Goldmann Applanation tonometer

f) Keratometry

- Instrumentation and labeling the parts of the manual Keratometer instrument, its operating principles and optics of the manual Keratometer instrument
- Measurement of the anterior surface corneal curvature in spherical and regular astigmatic eyes using manual Keratometer and appropriate documentation of the findings

Motor examination

a) Examination of extra-ocular muscle balance

- Demonstration of extra-ocular muscle balance testing procedure using Broad H test

- Interpretation of the findings and generation of the documentation

b) Evaluation of ocular deviation

- Evaluation of ocular deviation using cover/uncover/alternate tests and comment on phoria and tropia with the direction of deviation
- Evaluation of ocular deviation using corneal reflex test and comment on phoria and tropia with the direction of deviation

Course outcomes:
After successful completion of this course student should be able to:

- know the application and procedure of the optometry clinical technique/s and/or instrument/s
- explain and demonstrate the procedure of the optometry clinical technique/s and/or instrument/s
- perform the procedure of optometry clinical technique/s and/or instrument/s under supervision
- analyze the findings and produce the documentation of the optometry clinical technique/s and/or instrument/s
- compare normal and abnormal findings and generate the interpretation of the optometry clinical technique/s and/or instrument/s

Reference books:

1) Clinical procedures in optometry by J.Boy E. Eskridge, John F. Amos, Jimmy D. Bartlett. Lippincott Williams & Wilkins 1991
2) Borish's Clinical Refraction William J. Benjamin W.B. Saunders Company 1998
3) Primary Care Optometry Theodore Grosvenor Butter Worth 225 H.A 01801-2041 1996
4) Clinical Ophthalmology : A Systematic Approach, 5th Edition Jack J Kanski Butterworth - Heinemann 2003

SEMESTER III

OPTO2001 Ocular Biology (Posterior Segment) II

L	T	P	C
4	0	0	4

Preamble:

This course is a continuation of ocular biology I. In this course, we will discuss in detail the structure and function of the ocular tissues that form the posterior segment including lens, retina, visual pathway and visual function.

Course objectives:

- The main objective of this course is to give the student a clear understanding of the ocular layers that constitute the posterior segment
- To discuss in detail the structural and functional aspects of each of the layers and how they contribute to clear vision

Syllabus:

UNIT I **4 Hours**

Structure and function of the crystalline lens: Accommodation and presbyopia.

Learning Outcomes:

- By the end of the unit the student will have a clear understanding of the lens layers, principles that govern its transparency, and the changes in its function with age

UNIT II **12 Hours**

Cell layers of the retina and function of each layer: Mechanism of light capture and processing.

Learning Outcomes:

- By the end of the unit the student will have a clear understanding of the different cell layers of the retina, the tissue architecture, the biochemical processes and function of each cell layer.

UNIT III **8 Hours**

Receptive fields: Visual perception.

Learning Outcomes:

- By the end of the unit the student will have a deeper understanding of how the neuronal cells of the retina collect and process visual information

UNIT IV **4 Hours**

Visual pathway and its defects

Learning Outcomes:

- By the end of the topic the student will know the pathway that the optic nerves take to reach the visual cortex in the brain. Understand the types of defects that can occur in this connection and their impact on the vision.

UNIT V **8 Hours**

Extraocular muscles– insertion and function

Learning Outcomes:

- By the end of the topic the student will have a clear understanding of the types of extraocular muscles, their function and neural innervation.

Course Outcomes:

By the end of the course the student will

- have a clear understanding of the lens layers, principles that govern its transparency, and the changes in its function with age
- have a clear understanding of the different cell layers of the retina, the tissue architecture, the biochemical processes and function of each cell layer.
- have a deeper understanding of how the neuronal cells of the retina collect and process visual information
- know the pathway that the optic nerves take to reach the visual cortex in the brain. Understand the types of defects that can occur in this connection and their impact on the vision.
- have a clear understanding of the types of extraocular muscles, their function and neural innervation.

Resources & Textbooks:

1. Digital resource library available on 361 degree minds on Ocular Anatomy and Physiology
2. The Human Eye (Structure and Function) by Clyde W. Oyster. Oxford University Press, 1999.
3. Adler's physiology of the eye edited by Leonard Levin. 11th edition, Elsevier, 2011.

OPTO2011 Optics of the Eye I

L	T	P	C
3	0	0	3

Preamble:

This coursework will give a detailed understanding of the optical structures of the eye and its contribution to the total refractive power of the eye.

Course objectives:

- To understand optical components of the eye
- To understand refractive errors and management

Syllabus:

UNIT I **8 Hours**

Basic optical structures of the eye - Overview of human eye; Refractive components of the eye; Equivalent power and focal lengths; Cardinal points; Axes of the eye.

UNIT II **8 Hours**

Spherical Ammetropia - Emmetropization; Myopia; Hyperopia.

UNIT III **8 Hours**

Astigmatism - Circle of least confusion; Astigmatism categories; Spherical Equivalent; Vector components - J0 and J45; Transposition.

UNIT IV **8 Hours**

Accommodation - Components of accommodation; Amplitude of accommodation; Presbyopia.

UNIT V **8 Hours**

Vertex distance and effective power of eye – Theory – Spherical and Sphero-cylinderical; Spectacles and contact lens correction.

Textbooks:

1. Optics of the eye. David A. Atchison and George Smith. 2000.
2. Bennett and Rabbett's Clinical Visual Optics, 4th edition, 2007.

Reference Books:

1. Clinical Optics. Troy E Fannin, Theodore Grosvenor, 2nd edition, 1996.

GITAM University & L V Prasad Eye Institute,

Brien Holden Institute of Optometry and Vision Sciences,

GPR Campus, Kismatpur.

Course No.	:	OPT 205
Course Title	:	Ocular Diseases I (Anterior Segment)
Semester	:	III
Lectures	:	2
Credits	:	2
Course lead	:	LVPEI [Dr PremNandhini Satgunam, Mobile: +91 8099224888]

Preamble: This course will give a detailed understanding ofthe various diseases that affects the front portion of the eye called anterior segment. Prevalence of these conditions, risk factors, clinical signs and symptoms, pathophysiology, treatment and management in each disease will be discussed.

Learning objective:
To identify the common eye diseases of anterior segment
To understand the management of these diseases

MODULE-I: 6hours
Anatomy of eyelid, congenital& developmental anomalies of eyelids, diseases of eyelids, evaluation of ptosis, infections, inflammation, tumors and trauma

Learning Outcomes:
At the end of the Topic the student will be able to

- Describe the eyelid structures
- Describe the diseases of the eyelid
- Describe procedures for evaluating eyelid disorders
- Describe management of eyelid disorders

MODULE-II: 6hours
Anatomy of lacrimal system, lacrimal pump mechanism, evaluation of lacrimal system, congenital & developmental anomalies of lacrimal system, lacrimal sac tumors, lacrimal obstruction and trauma

Learning Outcomes:
At the end of the topic the student will be able to

- Describe the lacrimal system
- Describe the evaluation of lacrimal system
- Recognize lacrimal disorders
- Describe management of lacrimal disorders

MODULE-III: 6 hours
Pathologies of sclera (scleritis and episcleritis), ectasia and staphyloma. Orbital anatomy, prevalence of orbital disorders, methods of orbital examination, congenital and developmental anomalies of the orbit, sinus disorders affecting the orbit, orbital tumor, inflammation and trauma

At the end of the topic the student will be able to

- Describe the pathologies of sclera
- Describe orbital disorders

- Describe orbital examination
- Describe the management of orbital disorders

MODULE-IV: 6 hours
Conjunctival degeneration, inflammation, infections, Vitamin A deficiency, keratoconjunctivitissicca, Stevens-Johnson syndrome, congenital anomalies of iris, ciliary body, tumors

Learning Outcomes:
At the end of the topic the student will be able to

- Identify pathologies of conjunctiva
- Identify pathologies of iris and ciliary body
- Describe management of conjunctival disorders
- Describe management of iris and ciliary body disorders

MODULE-V: 6hours
Corneal pathologies, corneal degeneration, corneal dystrophies, infections, pupils, pupillary reactions, congenital anomalies

Learning Outcomes:
At the end of the topic the student will be able to

- Identify pathologies of cornea
- Describe pupillary evaluation
- Describe management of corneal disorders

Textbooks:

1. Kanski's Clinical Ophthalmology, ninth edition, 2019.
2. Basic and Clinical Science Course. American Academy of Ophthalmology, 2020

Reference Books:

1. Parson's diseases of the eye. 22nd edition, 2015

GITAM & L. V. PRASAD EYE INSTITUTE

B-Optometry- II Semester

Course: OPTO2031- General Pharmacology- 2 Credits

UNIT I - 08 Hrs

General Pharmacology

Sources of Drugs
Route of drug administration
Pharmacokinetics (Absorption, Metabolism, Distribution, Excretion)
Pharmacodynamics (Mechanisms of action)

Unit II – 08 Hrs

PNS and CVS

Skeletal muscle relaxants-D Tubocurarine, Succinyl choline, Diazepam, Dantroline
Local anaesthetics-lignocaine, la+vasoconstrictor
CVS-ionotropic agents -Digoxin,
Antianginal drugs-GTN,
Antihypertensives- Betablockers (Propranolol, Atenolol, carvidelol), CCBs (Nifedeine), Diuretics (Thiazide, Furesemide, ace inhibitors, ARBs, Clonidine
Drugs used in treatment of different types of shock, Plasma expanders

Unit III – 08 Hrs

CNS

CNS-general Anaesthetics-nitrous oxide, Halothane, iv anaesthetics
Sedative hypnotics-diazepam,barbiturates,zolpidem
Antiepileptics - Phenytoin, carbamezapine, phenobarbitone, valproate
Opioid analgesics-morphine,pethidine, codiene
NSAIDS-Aspirin, Diclofenacibuprofen, Selective COX2 inhibitors

Unit IV- 08 hours

Blood and Renal Systems

Blood-Hematinics, Anticoagulants -Warfarin, Heparin
Thrombolytics & Antiplatelet drugs-streptokinase,/ aspirin, clopidogrel
Renal system-Diuretics Furosemide, Thiazide, Spiranolactone
Antidiuretics-Vasopressin

Unit V- 08 hrs

Antimicrobials and Hormones

Macrolides, other antibiotics(vancomycin,linezolid) & treatment of UTI
Antifungal(clotrimazole,flucanozole)
Antiviral (Acyclovir, Few drugs used in HAART,)
Hormones-Corticosteroids its uses and adverse effects,
Treatment of Diabetes mellitus (insulin, Metformin, Glibenclamide)

OPTO2041 Introduction to Python Programming

L	T	P	C
2	0	2	2

Preamble:

Python is an interpreter oriented, high-level, general-purpose programming language. Created by Guido van Rossum and first released in 1991. Python has a design philosophy that emphasizes code readability, notably using significant white space. It provides constructs that enable clear programming on both small and large scales.

Course objectives:

- This course is designed to give the students an exposure to the programming environment through python which would help them in solving practical problems using a computer.

Syllabus:

UNIT I **6 Hours**

Introduction: Strengths and Weaknesses, IDLE, Numeric Data Types, Dynamic Types, Naming Conventions.

Strings: Values, operations, slices, operators, Built-in functions.

Learning Outcomes:

By the end of the unit the student will be able to

- develop and run simple Python program.(L3)
- write simple programs in python that read input from the keyboard.(L2)
- use the print statement to display output in a Python program.(L2)
- construct programs to perform operations on strings.(L3)

UNIT II **8 Hours**

Data Collection and Language component: introduction, Operators – Relational operators, Logical Operators, Bitwise Operators, control flow and syntax, Indenting, The if statement, While loop, break and continue, for loop, Tuples, Sets, Dictionaries- sorting dictionaries, Copying collections.

Learning Outcomes:

By the end of the unit the student will be able to

- Need of relational operators, Bitwise operators and logical operators. (L2)
- Use decision structures and construct program to control the flow of the program. (L2)
- Understand what is repetition structures and how to create repetition structures using the while and for –loop along with flowcharts and their syntax. (L2)

- Explain basic concepts related to lists.(L2)
- Access values in tuples, update, delete tuple elements.(L2)
- Identify the difference between a list and a tuple.(L3)
- Outline the concepts and methods in dictionaries, sets.(L2)

UNIT III **6 Hours**

Objects and Classes: Classes in python, principles of Object Orientation, Creating classes, objects, methods, special methods, class variables, Inheritance, access specifiers, polymorphism, Type identification.

Learning Outcomes:

By the end of the unit the student will be able to

- Learn the object oriented principles. (L2)
- Develop simple programs using class.(L3)
- Develop programs using special and user defined methods. (L3)
- Demonstrate the concepts of inheritance and polymorphism. (L3)

UNIT IV **6 Hours**

Functions and Modules: Introduction, User defined functions, parameters, keyword and optional parameters, function documentation, passing collections to a function, scope and lifetime.

Learning Outcomes:

By the end of the topic the student will be able to

- Use functions and develop programs using functions.(L3)
- Understand how to pass arguments to functions.(L3)
- Develop python programs using functions.(L3)
- Identify the difference between local and global variables.(L3)

UNIT V **6 Hours**

I/O and Error handling: Introduction, Data Streams, creating your own data streams, Access modes, writing data to a file, reading data from a file, additional file methods, Handling I/O Exception.

Learning Outcomes:

By the end of the topic the student will be able to

- Understand the basics of creating and access using data streams.
- Understand the basic file handling concepts (L2)
- Understand the exception handling mechanisms. (L2)

Course Outcomes:

OPTO2051 Ocular Biology (Posterior Segment) II Lab

L	T	P	C
0	0	2	1

Preamble:

- This course is an extension of the laboratory practice of Ocular Biology (Anterior Segment) I Lab to the posterior segment of the eye.

Course objectives:

- To demonstrate certain physiological visual phenomena and the process of expanding the ocular cells for research and clinical transplantation

List of Experiments & Activities:

1. Visualization of blind spot and visual field extent. (Outcome: Able to identify the extent of visual field using different techniques and the presence of physiological scotoma)
2. Dark and light adaptation. (Outcome: To be able to understand the functional difference between rod and cone photoreceptors)
3. Lab visit to KAR campus – visualization of ocular cells. (Outcome: Have an opportunity to look at some of the cells from the eye that are being expanded in the laboratory for research)
4. Demonstration of the extraocular muscle action. (Outcome: Understand the way the different muscles function independently and together)

Course No.	:	OPT 213
Course Title	:	Clinical Examination Techniques III
Semester	:	3
Practical's	:	10
Credits	:	5
Course lead	:	Shailaja P Reddy

Preamble:
During this course students receive reinforcement of the fundamental optometry clinical examination technique/s taught in clinical examination techniques I & II labs and will be trained in additional optometry clinical examination technique/s conducted during comprehensive ocular examination. This course is also intended to facilitate extensive skill-oriented hands-on practice and a base of knowledge on documentation and interpretation of the optometry clinical examination technique/s.

Learning objective:
1)Know the application and importance of the optometry clinical technique/s and/or instrument/s conducted during comprehensive ocular examination
2)Demonstrate and perform the procedure of optometry clinical examination technique/s under supervision
3)Analyze the findings and produce the documentation of the optometry clinical examination technique/s
4)Generate the interpretation of the optometry clinical examination technique/s

EXPERIMENT- I:
Eliciting clinical history
Eliciting and documentation of detailed clinical history in the following patient profiles: a) Corneal disorders b) Glaucoma c) Retinal disorders d) Pediatric & e) Injury cases; Making tentative differential diagnosis

Learning Outcomes:
At the end of the topic the student will be able to
- Elicit a comprehensive ocular history required for an adult patient and a detail history in the following patient profiles a) Corneal disorders b) Glaucoma c) Retinal disorders d) Pediatric & e) Injury cases
- Document and interpret the comprehensive ocular history of the patient appropriately

EXPERIMENT- II:
Visual acuity measurement
Measurement of far and near distance visual acuity in children with only ocular disability using Lea symbols chart; Visual acuity testing distance conversions; Visual acuity scoring rules; Measurement of far and near distance visual acuity in an adult patient using appropriate chart and with standard procedure; Documentation of the visual acuity findings appropriately.

Learning Outcomes:
At the end of the topic the student will be able to
- Demonstrate various methods of visual acuity measurement with appropriate chart selection
- Measure monocular and binocular visual acuity for far and near distance appropriately in children and adults with only ocular disability
- Perform visual acuity testing distance conversions and assign a visual acuity score appropriately

EXPERIMENT- III:
Manual lensometry
Measurement of the refractive power of the single vision and bifocal spectacles using manual lensometer; Transposition of the prescription into various forms; Identification of lens forms, materials, frame materials and types. Interpretation of the findings and documentation of the refractive power of the given spectacles.

Learning Outcomes:
At the end of the topic the student will be able to

- Measure the refractive power of spectacles (Single vision and Bifocal spectacles) using manual lensometer
- Document and interpret the findings accurately
- Match the current spectacle power and the previous prescription (if available with patient)
- Identify lens forms, materials, frame materials and types

EXPERIMENT- IV:
Objective refraction
Concepts of Break & skew phenomenon, thickness phenomenon; Static dry retinoscopy on an eye with clear media for any given regular astigmatic patients and its documentation; Neutralizing in minus cylinder form; Ways to overcome dull reflex during retinoscopy; Sources of error during retinoscopy.

Learning Outcomes:
At the end of the topic the student will be able to

- Perform static dry retinoscopy in an adult patient to determine the refractive status of the patient on an eye with clear media for any given spherical ametropia
- Perform static dry retinoscopy in an adult patient to determine the refractive status of the patient on an eye with clear media for any given regular astigmatic patients
- Document and interpret the findings accurately

EXPERIMENT- V:
Subjective refraction
Determining the endpoint of refraction/refractive error using Maximum plus Maximum Visual Acuity (MPMVA) technique; Determining the endpoint of cylindrical refraction/refractive error using Jackson's cross cylinder; Determining the endpoint of refraction/refractive error using Duochrome technique; Standard procedures used for correction for near vision; Writing suitable spectacle prescription

Learning Outcomes:
At the end of the topic the student will be able to

- Perform maximum plus maximum visual acuity test in indicated cases to confirm the endpoint of refraction/refractive error
- Perform Duochrome test in indicated cases to confirm the endpoint of refraction/refractive error
- Perform Jackson's cross cylinder(JCC) test in indicated cases to confirm the endpoint of cylindrical refraction/refractive error
- Write appropriate spectacle prescription based on objective and subjective refraction findings

EXPERIMENT- VI:
Anterior segment examination
Examination of the anterior segment ocular structures using slit lamp biomicroscope by different illumination techniques; Measurement of intraocular pressure using slit lamp biomicroscope and Goldmann Applanation tonometer; Sources of error during intraocular pressure measurement.

Learning Outcomes:
At the end of the topic the student will be able to

- Performs anterior segment examination with appropriate slit lamp illumination techniques
- Measure intraocular pressure of the eyes using slit lamp biomicroscope and Goldmann Applanation tonometer
- Document and analyze the Goldmann Applanation tonometer findings

EXPERIMENT- VII:

Posterior segment examination

Instrumentation and labeling the parts of the direct ophthalmoscope instrument; Examination of the posterior segment ocular structures using direct ophthalmoscope by different examination techniques.

Learning Outcomes:

At the end of the topic the student will be able to

- Perform direct ophthalmoscopy for examination of the posterior segment ocular structures
- Examine appropriately the color, cup, contour and cup-disc ratio
- Assess the retina including macula and has ability to differentiate normal retina from abnormal

Reference books:

1)Clinical procedures in optometry by J.Boy E. Eskridge, John F. Amos, Jimmy D. Bartlett. Lippincott Williams & Wilkins 1991

2)Borish's Clinical Refraction William J. Benjamin W.B. Saunders Company 1998

3)Primary Care Optometry Theodore Grosvenor Butter Worth 225 H.A 01801-2041 1996

4)Clinical Ophthalmology: A Systematic Approach, 5th Edition Jack J Kanski Butterworth-Heinemann 2003

OPTO2071 Clinics I Lab

L	T	P	C
0	0	4	2

Course Aim: Students rotate for clinical postings in LVPEI network clinics. They will be doing patient care observation in the following out-patient department clinics under the supervision of faculty

List of Laboratory Activities:

1. Comprehensive clinics
2. Cornea & Anterior segment clinic
3. Emergency clinic
4. Cataract clinic
5. Fellow clinic

GITAM University & L V Prasad Eye Institute,

Brien Holden Institute of Optometry and Vision Sciences,

GPR Campus, Kismatpur.

Course No.	:	OPTO2081
Course Title	:	Ocular Diseases II (Posterior Segment)
Semester	:	IV
Lectures	:	10
Credits	:	2
Course lead	:	LVPEI

Preamble: This course will give a detailed understanding ofthe various diseases that affects the back portion of the eye calledposterior segment. Prevalence of these conditions, risk factors, clinical signs and symptoms, pathophysiology, treatment and management in each disease will be discussed.

Learning objective:
To identify the common eye diseases of posterior segment
To understand the management of these diseases

MODULE-I: 7 hours
Anatomy & Pathophysiology of lens, normal aging changes of lenses, developmental defects, cataract & management, congenital anomalies of choroid, diseases of choroid, tumors

Learning Outcomes:
At the end of the Topic the student will be able to

- Describe lens anatomy and its aging changes
- Describe different types of cataract and grading
- Describe choroidal disorders including tumors
- Describe management of lenticular and choroidal disorders

MODULE-II: 6hours
Developmental anomalies of vitreous, hereditary hyaloidoretinopathies, juvenile retinoschisis, asteroid hyalosis, vitreous hemorrhage, inflammation, parasitic infestations of vitreous, trauma

Learning Outcomes:
At the end of the topic the student will be able to

- Describe developmentalanomalies of vitreous
- Describe disorders of the vitreous
- Describe management of vitreous conditions

MODULE-III: 9 hours
Anatomy, physiology of retina and choroidal vasculature, retinal vascular diseases, retinoblastoma, retinal inflammation, infection, retinal detachment, metabolic disorders, intraocular foreign bodies, heriditary andacquired macular disorders, electrophysiology, photocoagulation

Learning Outcomes:
At the end of the topic the student will be able to

- Describeretinal pathophysiology of various diseases
- Describeexamination techniques of retina, electrodiagnostics

- Identify various pathologies of retina
- Describe the management of retinal disorders

MODULE-IV: 8hours
Neurophthalmic examination, history taking, visual function testing, pupillary evaluation, testing various visual system, eye movement testing,supranuclear control of eye movements, saccadic disorders, pursuits, progressive supranuclear palsy, ocular motor nerves, cerebellar disorders, nystagmus

Learning Outcomes:
At the end of the topic the student will be able to

- Describe the common neuro-ophthalmology conditions
- Describe techniques of pupillary evaluation
- Describe various neuro-ophthalmic tests
- Describe eye movement disorders
- Describe management of neuro-ophthalmological conditions

MODULE-V: 7 hours
Ocular trauma (anterior and posterior segment), drug induced ocular diseases, definition of blindness, causes, social implication and rehabilitation

Learning Outcomes:
At the end of the topic the student will be able to

- Describe the different kinds of ocular trauma
- Management of ocular trauma and referral
- Define blindness and visual impairment
- Describe rehabilitation management

Textbooks:

1. Kanski's Clinical Ophthalmology, ninth edition, 2019.
2. Basic and Clinical Science Course. American Academy of Ophthalmology, 2020

Reference Books:

1. Parson's diseases of the eye. 22nd edition, 2015

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Ophthalmic Dispensing – I

SEMESTER IV

Course No. OPT 206

GITAM University & L V Prasad Eye Institute,
Brien Holden Institute of Optometry and Vision Sciences,
GPR Campus, Kismatpur.

Course No.	:	OPT 206
Course Title	:	Ophthalmic dispensing I
Semester	:	IV
Lectures	:	2/week
Credits	:	2
Course lead	:	Srikanth Maseedupalli

Preamble: This course deals with the fundamentals of ophthalmic lenses, prisms, and spectacle frames. Understanding the optics of ophthalmic lenses and the materials of frame and lens is essential to guide the client to choose a suitable lens based on visual, occupational, and lifestyle needs and desires. Similarly, understanding the fundamentals of the spectacle frame would help analyze the intricacies when a pair of lenses and frame are combined to make a pair of spectacles. One needs to study how spectacles would alter the functioning of the visual system when these both integrate.

Learning outcome:

Upon completion of the course, the student would be able to guide suitable ophthalmic lenses and frames based on the ametropia, visual needs and desires after analyzing the occupational tasks, lifestyle and affordability.

MODULE-I: **9 hours**
Spectacle Lenses – Part I
Introduction to ophthalmic lens terminology and forms of lenses; Characteristics of ophthalmic lenses; ophthalmic lens materials, various forms of power; aberrations in ophthalmic lenses; spherical and toric lenses; Simple and toric transposition.

Learning objectives:

At the end of the topic, the student will be able to

1. Define/Describe various terms and forms of lenses
2. Explain and compare the characteristics of ophthalmic lens materials
3. Describe different types of powers
4. Relate aberrations of the ophthalmic lenses and eye
5. Calculate or transpose the spectacle prescription or anything related to ophthalmic lenses or frames

MODULE-II: **9 hours**
Spectacle Lenses – Part II
The manufacturing process of glass; Lens surfacing/fabrication; Principle of surface generation; Lens designs, concepts, enhancements.

Learning objectives:

At the end of the topic, the student will be able to

1. Discuss the stepwise process of manufacturing and fabrication of ophthalmic lenses
2. Describe the types of lens designs, enhancements, and concepts
3. Illustrate various categories of anti-reflective coatings
4. Explain various tests performed to understand the quality of the lens enhancements

MODULE-III: **6 hours**
Lens quality:
Defects in lenses at the manufacturing of lens level; Defects/faults in lenses at surfacing or fabrication level.

Learning objectives:

At the end of the topic, the student will be able to

1. Test for the quality of the ophthalmic lenses
2. Inspect and identify the defects in ophthalmic lenses
3. Examine the ophthalmic lenses and differentiate toughened and fragile lenses

MODULE-IV: **7 hours**
Ophthalmic Prisms:
Prisms; units of prism power; Thickness difference; clinical and lab base-apex notation; Dividing, compounding, and resolving prisms; Prismatic effect - sphero-cyl lenses.

Learning objectives:

At the end of the topic, the student will be able to

1. Understand the ophthalmic prism
2. Describe and relate the clinical and lab notation of the prisms
3. Calculate the prismatic effects with sphero-cylinders
4. Divide the given prisms between the two eyes
5. Compound or resolve the prisms for clinical understanding and for communicating with the fab lab

MODULE-V: **6 hours**

Spectacle Frames:

Spectacle frame construction; spectacle frame parts; types of spectacles frames; classification of spectacle frames based on weight, temple position and coloration; Frame measurements and marking (Boxing system) and frame materials.

Learning objectives:

At the end of the topic, the student will be able to

1. Describe the construction of the spectacle frame
2. Identify the parts of the spectacle frame
3. Describe the frame materials and compare the features and benefits
4. Classify spectacles frame based on material, weight, temple position and coloration
5. Apply suitable terms, learned from the boxing system, while marking and measuring during the dispensing procedure

Textbooks:

1. Clifford W. Brooks, Irvin Borish, *System for Ophthalmic Dispensing*, Butterworth-Heinemann; 3rd edition (16 October 2006).
2. Troy E. Fannin, Theodore Grosvenor, Clinical *Optics*, Butterworth-Heinemann, 22-Oct-2013.
3. Mohammed Jalie, *Ophthalmic Lenses and Dispensing*, Elsevier/Butterworth Heinemann, 2008.

Reference Books:

1. Keating NM. P, *Geometric, Physical and Visual Optics*, Butterworth- Heinemann, Massachusetts, USA, 2002.

Optics of the Eye II

Ophthalmic Instrumentation I

GITAM University & L V Prasad Eye Institute,
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GPR Campus, Kismatpur.

Ophthalmic Dispensing – I Lab

SEMESTER IV

Course No. OPT 214

GITAM University & L V Prasad Eye Institute,
Brien Holden Institute of Optometry and Vision Sciences,
GPR Campus, Kismatpur.

Course No.	:	OPT 214
Course Title	:	Ophthalmic dispensing I Lab
Semester	:	IV
Practical	:	2/week
Credits	:	1
Course lead	:	Srikanth Maseedupalli

Preamble: This course deals with the practical aspects of ophthalmic dispensing. Optometrists need to have certain competencies which would help in understanding a strange lens and investigating the pair of spectacles that would lead to the source of the problem when the patient comes with non-tolerance to spectacles or to guide professionally to choose a suitable pair of lenses and frame based on his/her spectacles prescription, occupation and lifestyle needs.

Learning outcome:

Upon completion of the course, the student would be able to mark, measure and investigate lenses and frames and shall record the important mounting parameters for the professional edging of the spectacles. Should be able to get leads towards the troubleshooting of dissatisfied spectacles wearer.

MODULE-I: **3 hours**
Measuring & extracting the inputs from the frame to match the wearer's IPD and lens needs

Boxing system – A-Size, B-Size, DBL, DBC

Learning objectives:

At the end of the topic, the student will be able to

1. Mark and measure the fitting height for single-vision lenses
2. Explain how to match the frame inputs to the findings of the facial anthropometry
3. Measure the important parameters required

MODULE-II: **12 hours**
Mounting parameters - 1

Measuring mounting parameters – Monocular PD (MPD), Inter-Pupillary Distance (IPD) with spectacle frame on-face (Manual), Fitting height for single vision lenses, progressive addition lenses, Segment height – Bifocals, Effective diameter & Minimum Blank Size.

Learning objectives:

At the end of the topic, the student will be able to

1. Mark and measure the MPDs, IPDS and other mounting parameters (Fitting height, Segment height, Effective Diameter and Minimum Blank Size)
2. Comment on the relationship between one parameter to the other
3. Should be able to understand how the frame shape and size affect the thickness of the lens
4. Comment whether the frame fulfills the cut-off measurements for bifocal & progressive addition lens

MODULE-III: **6 hours**
Mounting parameters - 2

Measuring mounting parameters – Vertex Distance (VD), Face Form Angle (FFA), Pantoscopic Angle (PA), UV protection.

Learning objectives:

At the end of the topic, the student will be able to

1. Measure vertex distance by using the PD rule
2. Measure face form angle and pantoscopic angle
3. Measure UV protection of an Ophthalmic lens
4. Able to comment on whether the FFA, VD and PT would affect the wearer's VA and Field of View (FoV)

MODULE-IV: **6 hours**
Pupillometry and Distometry - 2

Using a pupillometer for measuring MPD and IPD for various distances and measuring vertex distance

Learning objectives:

At the end of the topic, the student will be able to

1. Measure MPD and IPD by using Pupillometer for far and near
2. Measure vertex distance by using Pupillometer
3. Measure MPD in case of alternate divergent squint

MODULE-V: **6 hours**
Identification of ophthalmic lenses - 1

Identifying by material type, granularity, total internal reflection, identifying the -Cyl and + Cyl axis, and type of the lens.

Learning objectives:

At the end of the topic, the student will be able to

1. Identify and classify the ophthalmic lenses based on material
2. Identify and classify the ophthalmic lenses based on type – Single-vision, Bifocal and Progressive Addition Lens

MODULE-VI: **9 hours**
Identification of ophthalmic lenses – 2

Identifying by lens defects, manufacturing defects, surface defects, coating defects, the strain on the lenses, coatings – SRC, ARC and mirror coats. FOG IDs, microetchings.

Learning objectives:

At the end of the topic, the student will be able to

1. Describe the colmascope and its uses
2. Describe PAL identifier and its uses
3. Perform colmascopy and differentiate whether the lens stress caused because of fabrication or because of edging
4. Use the progressive lens identifier to spot the micro etchings in a lens – Single-vision and Progressive lenses
5. Critically observe the lens manufacturing/fabrication defects, surface defects, coating defects

MODULE-VII: **12 hours**
Lensometry

Vertex powers, prism power – magnitude and orientation, ground-in and decentred prism identification. Addition in bifocal lenses and progressive addition lenses.

Learning objectives:

At the end of the topic, the student will be able to

1. Describe lensometer parts and the uses of the lensometer
2. Calibrate the lensometer – accommodation, power, axis, and prism errors
3. Use a lensometer to measure the front and back vertex power – Spherical and Sphero cyl lenses
4. Extract the addition in bifocal and
5. Progressive additional lens
6. To measure the prism power and orientation
7. Differentiate ground-in or decentred prism

MODULE-VIII: 6 hours
Geneval Lens Measure/Lens clock

Front surface power, back surface power, approximate power

Learning objectives:

At the end of the topic, the student will be able to

1. Describe the GLM and parts and its uses
2. Calibrate the GLM
3. Measure the Front and Back Surface Power for a spherical and sphero-cylinder lens
4. Measure the approximate power

MODULE-IX: 6 hours
Identifying frames

Frame materials - Metal-Monel, Stainless steel, Titanium, Unobtanium, gold plated and gold frames. Plastic- Cellulose acetate, Optyl, TR-90, Polyamide etc. Shapes – Aviator, wayfarer, upswept, round, pantoscopic round oval, rectangular, etc. Type – Full rim, Supra, three-piece. Color and position of the temple – Low joint, mid joint and high joint. Face shapes and frame selection based on the face shape.

Learning objectives:

At the end of the topic, the student will be able to

1. Classify frames according to frame materials, shapes, colors and position of the temples.
2. Suggest the appropriate frame size, shape, color and position of the temple, based on the face shapes of the individuals.

MODULE-X: 12 hours
Industrial Visit

Visiting fabrication labs to understand the process of ophthalmic lenses from receiving the order to delivering the pair of spectacles

Learning objectives:

At the end of the topic, the student will be able to

1. Explain the process steps involved in the fabrication of the lens
2. Explain the intricacies involved in the fabrication of the lens

Reference Books:

1. Clifford W. Brooks, Irvin Borish, *System for Ophthalmic Dispensing*, Butterworth-Heinemann; 3rd edition (16 October 2006).

2. Troy E. Fannin, Theodore Grosvenor, Clinical *Optics*, Butterworth-Heinemann, 22-Oct-2013.

3. Mohammed Jalie, *Ophthalmic Lenses and Dispensing*, Elsevier/Butterworth Heinemann, 2008.

Clinics II Lab

GITAM University & L V Prasad Eye Institute,

Brien Holden Institute of Optometry and Vision Sciences,

GPR Campus, Kismatpur.

Course No. : OPT02131

Course Title : Ophthalmic Instrumentation I

Semester : IV

Lectures : 10

Credits : 2

Course lead : Mr Vijay Kumar Yelagondula

Preamble: This course will focus on the ophthalmic instruments used in the clinics in examining the anterior segment and visual function of the eye. Understand the basic operating principles of these instruments and application of these instruments in examining patients including basic trouble shoot in the clinics.

Learning Objectives:

1. Able to identify the parts of the instrument/s and describe its function

2. Able to explain and demonstrate the operating principle/s of the instrument/s

3. Able to use the instrument/s appropriately in conducting the eye examination

4. Able to document and interpret the findings generated by the instrument in diagnosis and management

5. Able to do find the sources of error and calibration of the instrument including basic trouble shoot

Module: 1

Visual acuity instrumentation

1.1 Visual acuity – optical and neural limits of resolution

1.2 Visual acuity charts and designation of distance and near visual acuity

1.3 Test chart standards, Snellen and logMAR

1.4 Contrast sensitivity function and charts

1.5 Charts – illuminated, non illuminated, projection and video display

Learning outcome: 1) knows the theory behind the visual acuity 2) Understands the construction of VA chart and different notations 3) Know different types of contrast sensitivity measuring devices 4) Merits and demerits of different acuity charts

Module: 2

Objective refraction apparatus

2.1 Retinoscope and construction

2.2 Autorefractors

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2.3 Photorefraction

2.4 Sources of errors

2.5 Trial lenses, trial frame and phoropters

Learning outcome: 1) knows how Retinoscope measures refractive error 2) Types of different Retinoscope 3) Refractive error measurement using autorefractor and Photorefraction 4) Trail case lenses and its accessories use in clinical practice 5) Sources of errors in measuring refractive error

Module: 3

Lens power measurement:

3.1 Lensometer

3.2 Lens gauge or clock

Learning outcome: 1) Different types of power 2) Lensometer operating principle 3) use and application of parts of the Lensometer 3) Lensmeter focusing and calibration 4) Lens gauge theory and surface power measurement

Module: 4

Anterior segment – instrumentation

4.1 Slit lamp optical and mechanical design

4.2 Slit lamp accessories

4.3 Illumination techniques

4.4 Tonometry and types of tonometers

4.5 Sources of errors and calibration

Learning outcomes: 1) Knows the operating principle of slit lamp 2) Knows the construction of the slit lamp and application of different slit lamp illumination techniques 3) application of slit accessories 4) basic repair and maintenance including trouble shoot 4) Principle of intra ocular pressure measurement (IOP) 5) sources of error and calibration of tonometers

Module: 5

Corneal topographers and Aberrometer

6.1 Keratometers and Types of keratometers

6.2 Video topographers –placiodo and slit scan based

6.3 Interpretation

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6.4 Principles and commercial Aberrometer

6.5 Measuring higher order aberrations (HOAs)

6.6 Interpretation – reading the maps

Learning outcome: 1) Principles of topographers and Aberrometers 2) Generating different maps and interpretation

Prescribed text books:

1. Optical Devices in Ophthalmology and Optometry: Technology, Design Principles and Clinical Applications: Michael Kaschke, Karl-Heinz Donnerhacke and Michael Stefan Rill

2. Optometric instrumentation: David B. Henson

Reference text books:

3. Duane's Clinical Ophthalmology, volume 1: Thomas D Duane and Edward A Jaeger

4. Optometry: Science, Techniques and Clinical Management: Mark Rosenfield and Nicola Logan

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Third Year – Semester V

Course No. : OPT 3001

Course Title : Ophthalmic Instrumentation II

Semester : V

Lectures : 10

Credits : 2

Course lead : Mr Vijay Kumar Yelagondula

Preamble: This course will focus on the ophthalmic instruments used in the clinics in examining the posterior segment of the eye and visual function of the eye. Understand the basic operating principles of these instruments and application of these instruments in examining patients including basic trouble shoot in the clinics.

Learning outcomes:

1. Able to identify the parts of the instrument/s and describe its function

2. Able to explain and demonstrate the operating principle/s of the instrument/s

3. Able to use the instrument/s appropriately in conducting the eye examination

4. Able to document and interpret the findings generated by the instrument in diagnosis and management

5. Able to do find the sources of error and calibration of the instrument including basic trouble shoot

Module: 1

Ophthalmoscopes and fundus cameras

1.1 Types of Ophthalmoscopes

1.2 Design of ophthalmoscopes

1.3 Filers and apertures

1.4 The fundus camera – principles & techniques

Learning outcome: 1) knows the different types of ophthalmoscope and fundus camera devices and its operating principle 2) Parts of the instruments and application of the apertures and filters

Module: 2

Visual filed, color vision and other visual function testing devices

2.1 Visual filed analyzers

2.2 Automated and manual field analyzers

2.3 Screening and threshold strategies

2.4 Interpretation of the visual fields printout

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2.5 Psuedoisochomatic plates

2.6 Color arrangement tests

2.7 Potential acuity meter (PAM) and Brightness acuity test (BAT)

Learning outcomes: 1) Basics of perimetry 2) Different types of visual filed testing equipment and its merits and demerits 3) Global indices and application in visual fields evaluation 4) interpretation of single filed print out and overview 5) color vision testing principles and its application 6) visual

functions with PAM and BAT.

Module: 3

Ophthalmic Ultrasonography and Ocular biometry – ultrasound and optical

3.1 Basics of ultrasound

3.2 Ultrasound image – B-scan

3.3 Types of B-scan

3.4 Ultrasound biometry – contact biometry

3.5 Optical biometry- A- scan

3.6 Calibration and sources of measurement

Learning outcomes: 1) ultrasound and imaging 2) Principle of ultrasound imaging –piezo electric principle 2) plane and concave focused ultrasound beam 3) B –scan imaging techniques 4) interpretation 5) contact biometry 6) optical biometer principles 7) calibration and sources of error

Module: 4

Optical coherence tomography – posterior segment

4.1 Operating principles

4.2 Types of OCT and application

Module: 5

Electro diagnostics

5.1 Electroretinogram (ERG)

5.2 Visual evoked potential (VEP)

5.3 Electroculogram (EOG)

Prescribed text books:

GITAM University & L V Prasad Eye Institute,

Brien Holden Institute of Optometry and Vision Sciences,

GPR Campus, Kismatpur.

1. Optical Devices in Ophthalmology and Optometry: Technology, Design Principles and Clinical Applications: Michael Kaschke, Karl-Heinz Donnerhacke and Michael Stefan Rill

2. Optometric instrumentation: David B. Henson

Reference text books:

3. Duane's Clinical Ophthalmology, volume 1: Thomas D Duane and Edward A Jaeger

4. Optometry: Science, Techniques and Clinical Management: Mark Rosenfield and Nicola Logan

GITAM University & L V Prasad Eye Institute,
Brien Holden Institute of Optometry and Vision Sciences,
GPR Campus, Kismatpur.

Ophthalmic Dispensing – II

SEMESTER V

Course No. OPT 307

GITAM University & L V Prasad Eye Institute,
Brien Holden Institute of Optometry and Vision Sciences,
GPR Campus, Kismatpur.

Course No.	:	OPT 307
Course Title	:	Ophthalmic dispensing II
Semester	:	V
Lecture	:	2/week
Credits	:	2
Course lead	:	Srikanth Maseedupalli

Preamble: This course deals with the advanced science of ophthalmic lenses and their connection to real-world situations. Understanding the intricacies of optics of ophthalmic lens and frame designs, analyzing the occupational and lifestyle needs with regards to the visual tasks, demands and optical and non-optical hazards at the workplace and in the lifestyle of an individual.

Learning outcome:

Upon completion of the course, the student would be able to guide suitable ophthalmic lenses for typical and atypical spectacles prescriptions and for diverse occupations and lifestyles by understanding the intricacies in ophthalmic lenses and frames. Should be able to indulge in verification, quality control and multiple pair dispensing with all the expertise required to calculate and communicate professionally.

MODULE-I: **9 hours**
Absorptive lenses

Effects of radiation on the eye and importance of absorptive lenses. Tinted lenses, protective lenses, Pulfrich phenomenon. Characteristics of tinted lenses – Reflectance, Transmission and Absorption. Transmission curves, Tinted lenses for color vision deficient individuals. Polarising filters, Photochromic and special filters.

Learning objectives:

At the end of the topic, the student will be able to

1. Define/Describe the characteristics of tinted lenses and transmission curves
2. Compare and contrast the transmission curves of the tinted lenses
3. Explain the differences among tinted, photochromic, and polarized lenses
4. Understand and compare the optical differences and differences in manufacturing various kinds of absorptive lenses
5. Understand why and what type of absorptive lenses are dispensed based on the ocular optical and health condition

MODULE-II: **9 hours**
Advanced Lens Designs and Specialty dispensing (frames + lenses)

Lenticular lens designs, **A**pparent and **R**eal FoV, Specia lenses – Iseikonic lenses, Fresnel lenses, Contrast filters, Recumbent and Fresnel lenses. Dispensing in Myopia, Hyperopia and atypical prescriptions, Geriatric, Occupational, Pediatric, Sports and Special case dispensing.

Learning objectives:

At the end of the topic, the student will be able to

1. Describe the optics of the Advance Lens Designs
2. Explain the difference between **A**FoV and **R**FoV
3. Should be able to suggest the client and lens fabrication and edging lab for better optical and aesthetical pairs of spectacles
4. Should be able to suggest and dispense spectacles for pediatric, geriatric, sports and in special cases.

MODULE-III: **6 hours**
Intricacies in bringing ophthalmic lens and frame together to make a pair of spectacles

Lens and frame designs and their compatibility with contemporary spectacle frames. Standard alignments, lens insertion, the difference between stock and Rx lenses and Eyewear fashions.

Learning objectives:

At the end of the topic, the student will be able to

1. Understand the intricacies involved in bringing lenses and frames together in typical and atypical lenses and frames
2. Understand the science behind the standard alignment and its importance for restoring optics for the wearer
3. Demonstrate the fashion eyewear and its limitations for Rx spectacles

MODULE-IV: **6 hours**
Communication with clients, fabrication, and edging labs

Communication for client education, demonstration, counseling, and upgradation. Drawing the needs and wants of the client. Special practical instructions in centration, marking and mounting the lenses of all designs, types, shapes, and sizes in accordance with frame and facial measurements.

Learning objectives:

At the end of the topic, the student will be able to

1. Effectively communicate and demonstrate the product and its FAB with the client
2. Effectively communicate with the edging and fabrication labs
3. Effectively communicate with colleagues and through the order forms

MODULE-V: **3 hours**
Backend to frontend and After-sales

The ophthalmic lens fabrication process, ophthalmic lens blanks – Single Vision, Bifocal and PALs. Visiting lens fabrication labs for a better understanding the backend process, Verification, Quality check, Troubleshooting and Multiple pair dispensing, Forms and data required to process the pair of spectacles.

Learning objectives:

At the end of the topic, the student will be able to

1. Understand and describe the process of ophthalmic lens power generation and surface coatings
2. Would be able to identify the single vision, Bifocal, PAL blanks and semi-finished blanks.
3. Verify lenses and spectacles as per the order
4. Quality check the spectacles lenses and frames at every phase of making spectacles
5. Fill out various forms and data required for making the spectacles from the frontend
6. Troubleshoot any case that comes with any kind of problem-related to spectacles

MODULE-V: **6 hours**
Practical Calculations

Curve Variation Factor, Transverse Chromatic Aberration, Prismatic effect, change in phoria, Effective power, Transposition, Near add and Near power, Refractive index, Spectacle magnification, Rx calculations for swimming goggles.

Learning objectives:

At the end of the topic, the student will be able to

1. Apply the mathematical formula for calculating various factors and guide the patient accordingly.
2. Should be able to guide the opticians on how to overcome with optical disadvantages, that may prevail during the spectacles dispensing.

Textbooks:

1. Clifford W. Brooks, Irvin Borish, *System for Ophthalmic Dispensing*, Butterworth-Heinemann; 3rd edition (16 October 2006).
2. David A. Wilson, Steven Daras, Practical Optical Dispensing, Open Training and Education Network - OTEN - TAFENSW, 2014

Reference Books:

3. Mohammed Jalie, *Ophthalmic Lenses and Dispensing*, Elsevier/Butterworth Heinemann, 2008.

Course No.	:	OPTxxx
Course Title	:	Binocular Vision I
Semester	:	V
Lectures	:	xx
Credits	:	xx
Course lead	:	LVPEI (Dr Shrikant R. Bharadwaj)

Preamble: This course will focus on the ability of the two eyes to work as a team, thereby allowing humans to experience the external environment binocularly. The course will focus on the advantages of this teaming ability for 3D space perception and how various stages of this teaming ability is achieved. The course will also focus on how we use our eye movements to explore the world to achieve and maintain binocular vision.

Learning Objectives:

1. Describe the advantages of binocular vision over using each eye independently
2. Describe the three stages of binocular vision and how each of these stages are achieved
3. Describe the different types of eye movements, their purposes and how they are controlled by the nervous system.
4. Describe the techniques used to measurement various aspects of sensory binocular vision and eye movements.

Module: 1

Establishing the spatial sense for the visual system

1.1 Introduction of coordinate systems
1.2 First and second laws of visual directions
1.3 Hering's law of identical visual directions
1.4 Correspondence mapping and the Veith-Muller circle (theoretical horopter)
1.5 Empirical horopter and its properties

Learning outcome: 1) Describe how direction and distance of an object is computed monocularly and binocular in 3D space; 2) Describe the different coordinate systems used by the visual system to compute distance and direction; 3) Describe how features from the two eyes are mapped into a single cyclopean percept using the concept of retinal correspondence; 4) Describe the concept of the horopter and its extension across the horizontal and visual vertical.

Module: 2

Sensory and motor fusion

2.1 Retinal disparity, and its relation to the horopter
2.2 Sensory fusion and the Panum's fusional area
2.3 Motor fusion – vergence eye movements
2.4 Fixation disparity – the steady-state error in vergence
2.5 Diplopia and its relation to abnormal fusion

Learning outcome: 1) Describe the concept of horizontal and vertical disparities, in relation to the horopter; 2) Define the relation between retinal disparity, viewing distance, interpupillary distance and distance of object from fixation point; 3) Describe how motor vergence helps the visual system achieve correspondence of the two monocular images; 5) Describe the cross-link between vergence and accommodation responses and demonstrate measurements of the AC/A and CA/C ratios; 5) Describe the concept of fixation disparity in the context of the visual system's sensitivity to retinal disparities and 6) Describe the perceptual consequences of poor fusionthrough measures of diplopia and introduce the reader to the concept of strabismus.

Module: 3

3D perception

3.1 Stereopsis and its relation to retinal disparity
3.2 Stereoacuity
3.3 Measurement of stereoacuity in the clinic
3.4 Relationship between stereoacuity and degraded retinal image quality

Learning outcome: 1) Describe the general concept of how the visual system re-constructs 3D information from 2D retinal images; 2) Define stereoacuity as the smallest disparity that can elicit a sense of 3D perception; 3) Describe the importance of stereoacuity as a token measure of binocularity in the clinic; 4) Describe and demonstrate the different types of stereo tests used in the clinic and their advantages and disadvantages;5) Describe and demonstrate how stereoacuity deteriorates as a function of different ocular pathologies (e.g., anisometropia).

Module: 4

Kinematics of eye movements

4.1 Introduction to the types and purpose of eye movements and general kinematics of solid bodies
4.2 The extraocular muscles, their orientation and clinical diagnostics positions of gaze
4.3 Fundamental laws of eye movement controls – Hering's law, Sherrington's law,Donders' law and Listing's law
4.4 Neural control of eye movements and hierarchy of eye movement control

Learning outcomes: 1) Describe the fundamental purpose of different types of eye movements; 2) Describe the anatomy of the extraocular muscles and their origins and insertion in the orbit; 3) Describe the primary, secondary and tertiary action of the extraocular muscles in the context of their angle of insertion in the eyeball; 4) Demonstrate the 9-diagnostic positions of gaze and the extraocular muscles whose actions are tested in these positions of gaze;5) Describe the overall scheme of eye movement control by the brain in the context of the three fundamental laws of eye movements.

Module: 5

Neural control of different classes of eye movements

5.1 Eye movements that optimize vision during self-motion – vestibulo-ocular reflex and optokinetic nystagmus
5.2 Eye movements that optimize vision during object motion – Pursuits and saccades
5.3 Eye movements that optimize focus – ocular accommodation
5.4 Measurements of eye movements

Learning outcome: 1) Describe the purpose, properties, neural control and evaluation techniques for vestibulo-ocular reflex and optokinetic nystagmus; 2) Describe the purpose, properties, neural control and evaluation techniques for saccades and pursuits; 3) Describe the purpose, properties, neural control and evaluation techniques for ocular accommodation; 4) Demonstrate the measurement of accommodative lag, accommodative facility and the AC/A ratio; 5) Describe the different types of eye movement recording techniques; 6) Describe the Hirschberg test, the Hirschberg ratio and the determinants of this ratio during eye movement recording.

Prescribed text books:

1. Normal Binocular Vision - Theory, Investigation and Practical Aspects: David Stidwell and Robert Fletcher
2. The Neurology of Eye movements: Roger Leigh and David Zee
3. Primary care Optometry: Theodore Grosvenor
4. Clinical Procedures in Optometry: J. Boyd Eskridge, Jimmy D. Bartlett, and John F. Amos
5. Adler's Physiology of the Eye: Albert Alm and Paul L. Kaufman

Reference text books:

6. Clinical management of binocular vision: Mitchell Schieman and Bruce Wick
7. Seeing in Depth Vols. 1 and 2: Ian Howard and Brian Rogers

MICROBIOLOGY (Practical)

1. Introduction and study of different equipments and processing, e.g.. B.O.D. incubator. Laminar flow, aseptic hood, autoclave. hot air sterilizer. deep freezer. refrigerator, microscopes used in experimental microbiology.

2. Sterilization of glassware. Preparation and sterilization of media.

3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.

4. Staining methods- Simple. Grams staining and acid fast staining (Demonstration with

Practical).

5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other

techniques.

GITAM University & L V Prasad Eye Institute,
Brien Holden Institute of Optometry and Vision Sciences,
GPR Campus, Kismatpur.

Ophthalmic Dispensing – II Lab

SEMESTER V

Course No. OPT 313

GITAM University & L V Prasad Eye Institute,
Brien Holden Institute of Optometry and Vision Sciences,
GPR Campus, Kismatpur.

Course No.	:	OPT 313
Course Title	:	Ophthalmic dispensing II Lab
Semester	:	V
Practical	:	2/week
Credits	:	1
Course lead	:	Srikanth Maseedupalli

Preamble: This course deals with intermediate skills in dispensing ophthalmic lenses in complex and or unusual cases. The practical approach would help the student offer suitable lenses and frames for specific occupations and lifestyles, lens correcting concepts along with routine correction. This course would also help the student to apply the rationale, problem solve and classify the troubleshooting cases according to the source of the problem.

Learning outcome:

Upon completion of the course, the student would be able to guide suitable ophthalmic lenses for typical and atypical spectacles prescriptions and for diverse occupations and lifestyles by understanding the intricacies of ophthalmic lenses and frames. Should be able to indulge in verification, quality control and multiple pair dispensing with all the expertise required to calculate and communicate professionally.

MODULE-I: **9 hours**
Professional communication

Seven Cs of communication: Clarity, Crispness, Concrete, Cohesiveness, Correct, Completeness and Courteousness. Empathy and sympathy, verbal, non-verbal and written communication, zones of acquaintance – intimate space, personal space, social space, and public space. Grooming and presenting to the client and interacting with them professionally.

Learning objectives:

At the end of the topic, the student will be able to

1. Communicate effectively in the verbal, non-verbal and written modes
2. Able to deliver empathy and sympathy based on the situation
3. Able to present themselves professionally and communicate with the clients effectively

MODULE-II: **12 hours**
Lensometry and advanced/special frames and lenses

Occupational progressive addition lenses, Myopia control lenses, PALs and prisms, Fresnel prisms, recumbent spectacles, smart bifocals, Rx sunglasses, safety eyewear and strobe specs.

Learning objectives:

At the end of the topic, the student will be able to

1. Identify and comment on the optical principles of the lenses, frames, and spectacles.
2. Would be able to brief the indications of dispensing these advance and special lenses to the clients
3. Able to understand the limitations of manual lensometry to measure the power of these lenses and would be able to perform extended lensometry for high-end prescriptions

MODULE-III: **9 hours**
Alignment tools and Standard alignment.

Base curve pliers, chipping and curbing pliers, nose-pad pliers. Alignments – X-ing, Temples' parallelism, temple fold angle, Face form angle, pantoscopic angle, bench and on-face alignment, four-point-touch and three-point touch and fitting triangle. Nose-pad angles – Splay angle, Frontal angle, and Crest angle. Performing standard alignment for metal and plastic frames

Learning objectives:

At the end of the topic, the student will be able to

1. Comment on the alignment of the spectacles on-face and off-face
2. Name the tools required for standard alignment
3. Able to use the appropriate tool for the alignment
4. Able to restore the physical comfort of the spectacles for the wearer

MODULE-IV: **9 hours**
Lens and Frame suggestions and multiple paid dispensing concepts.

Based on the acquired knowledge about the spectacles' prescription, lens designs, occupation, lifestyle, and ocular optical and health condition, suggest suitable lenses and frames that are compatible with each other and comply the contemporary needs.

Learning objectives:

At the end of the topic the student will be able to

1. Analyze the spectacles prescription
2. Analyze the occupational visual needs
3. Analyze the lifestyle visual needs
4. Suggest appropriate pair/s of spectacles based on the above analyses

MODULE-V: **6 hours**
Components of order form; Verification and quality control

Components of the spectacles order form, verification and quality control difference and verifying and quality check for the spectacles.

Learning objectives:

At the end of the topic, the student will be able to

1. Describe the components of the spectacles in order-form
2. Differentiate the verification and quality check
3. Verify and quality check the pair of spectacles
4. Decide whether we can correct or replace the impaired spectacles

MODULE-VI: **9 hours**
Investigations with calculations.

Curve variation factor, refractive index, magnification, change in the Rx with the medium, prismatic effects and changes in phoria, compounding and resolving prisms, obliquely crossed cylinders, addition and near power, transposition, base curve, minimum blank size, estimated thickness of the lens, iseikonic lens calculations.

Learning objectives:

At the end of the topic, the student will be able to

1. Calculate the spectacle magnification
2. Calculate the specifics to address the client's questions evidently

Reference Books:

1. Clifford W. Brooks, Irvin Borish, *System for Ophthalmic Dispensing*, Butterworth-Heinemann; 3rd edition (16 October 2006).

2. Troy E. Fannin, Theodore Grosvenor, Clinical *Optics*, Butterworth-Heinemann, 22-Oct-2013.

3. Mohammed Jalie, *Ophthalmic Lenses and Dispensing*, Elsevier/Butterworth Heinemann, 2008.

Course No.	:	OPTxxx
Course Title	:	Binocular Vision I
Semester	:	V
Lectures	:	xx
Credits	:	xx
Course lead	:	LVPEI (Dr Shrikant R. Bharadwaj)

Preamble: This course will focus on the ability of the two eyes to work as a team, thereby allowing humans to experience the external environment binocularly. The course will focus on the advantages of this teaming ability for 3D space perception and how various stages of this teaming ability is achieved. The course will also focus on how we use our eye movements to explore the world to achieve and maintain binocular vision.

Learning Objectives:

1. Describe the advantages of binocular vision over using each eye independently
2. Describe the three stages of binocular vision and how each of these stages are achieved
3. Describe the different types of eye movements, their purposes and how they are controlled by the nervous system.
4. Describe the techniques used to measurement various aspects of sensory binocular vision and eye movements.

Module: 1

Establishing the spatial sense for the visual system

1.1 Introduction of coordinate systems
1.2 First and second laws of visual directions
1.3 Hering's law of identical visual directions
1.4 Correspondence mapping and the Veith-Muller circle (theoretical horopter)
1.5 Empirical horopter and its properties

Learning outcome: 1) Describe how direction and distance of an object is computed monocularly and binocular in 3D space; 2) Describe the different coordinate systems used by the visual system to compute distance and direction; 3) Describe how features from the two eyes are mapped into a single cyclopean percept using the concept of retinal correspondence; 4) Describe the concept of the horopter and its extension across the horizontal and visual vertical.

Module: 2

Sensory and motor fusion

2.1 Retinal disparity, and its relation to the horopter
2.2 Sensory fusion and the Panum's fusional area
2.3 Motor fusion – vergence eye movements
2.4 Fixation disparity – the steady-state error in vergence
2.5 Diplopia and its relation to abnormal fusion

Learning outcome: 1) Describe the concept of horizontal and vertical disparities, in relation to the horopter; 2) Define the relation between retinal disparity, viewing distance, interpupillary distance and distance of object from fixation point; 3) Describe how motor vergence helps the visual system achieve correspondence of the two monocular images; 5) Describe the cross-link between vergence and accommodation responses and demonstrate measurements of the AC/A and CA/C ratios; 5) Describe the concept of fixation disparity in the context of the visual system's sensitivity to retinal disparities and 6) Describe the perceptual consequences of poor fusionthrough measures of diplopia and introduce the reader to the concept of strabismus.

Module: 3

3D perception

3.1 Stereopsis and its relation to retinal disparity
3.2 Stereoacuity
3.3 Measurement of stereoacuity in the clinic
3.4 Relationship between stereoacuity and degraded retinal image quality

Learning outcome: 1) Describe the general concept of how the visual system re-constructs 3D information from 2D retinal images; 2) Define stereoacuity as the smallest disparity that can elicit a sense of 3D perception; 3) Describe the importance of stereoacuity as a token measure of binocularity in the clinic; 4) Describe and demonstrate the different types of stereo tests used in the clinic and their advantages and disadvantages;5) Describe and demonstrate how stereoacuity deteriorates as a function of different ocular pathologies (e.g., anisometropia).

Module: 4

Kinematics of eye movements

4.1 Introduction to the types and purpose of eye movements and general kinematics of solid bodies
4.2 The extraocular muscles, their orientation and clinical diagnostics positions of gaze
4.3 Fundamental laws of eye movement controls – Hering's law, Sherrington's law,Donders' law and Listing's law
4.4 Neural control of eye movements and hierarchy of eye movement control

Learning outcomes: 1) Describe the fundamental purpose of different types of eye movements; 2) Describe the anatomy of the extraocular muscles and their origins and insertion in the orbit; 3) Describe the primary, secondary and tertiary action of the extraocular muscles in the context of their angle of insertion in the eyeball; 4) Demonstrate the 9-diagnostic positions of gaze and the extraocular muscles whose actions are tested in these positions of gaze;5) Describe the overall scheme of eye movement control by the brain in the context of the three fundamental laws of eye movements.

Module: 5

Neural control of different classes of eye movements

5.1 Eye movements that optimize vision during self-motion – vestibulo-ocular reflex and optokinetic nystagmus
5.2 Eye movements that optimize vision during object motion – Pursuits and saccades
5.3 Eye movements that optimize focus – ocular accommodation
5.4 Measurements of eye movements

Learning outcome: 1) Describe the purpose, properties, neural control and evaluation techniques for vestibulo-ocular reflex and optokinetic nystagmus; 2) Describe the purpose, properties, neural control and evaluation techniques for saccades and pursuits; 3) Describe the purpose, properties, neural control and evaluation techniques for ocular accommodation; 4) Demonstrate the measurement of accommodative lag, accommodative facility and the AC/A ratio; 5) Describe the different types of eye movement recording techniques; 6) Describe the Hirschberg test, the Hirschberg ratio and the determinants of this ratio during eye movement recording.

Prescribed text books:

1. Normal Binocular Vision - Theory, Investigation and Practical Aspects: David Stidwell and Robert Fletcher
2. The Neurology of Eye movements: Roger Leigh and David Zee
3. Primary care Optometry: Theodore Grosvenor
4. Clinical Procedures in Optometry: J. Boyd Eskridge, Jimmy D. Bartlett, and John F. Amos
5. Adler's Physiology of the Eye: Albert Alm and Paul L. Kaufman

Reference text books:

6. Clinical management of binocular vision: Mitchell Schieman and Bruce Wick
7. Seeing in Depth Vols. 1 and 2: Ian Howard and Brian Rogers

OPTO2091 Microbiology & Pathology

L	T	P	C
2	0	0	2

Course Description: This course introduces students to the fundamental concepts and principles, including the diversity of microorganisms, their structure, function, growth, and genetics. Also contain topics such as microbial pathogenesis and host-microbe interactions, clinical microbiology and diagnostic techniques, and the control of microbial infections of microbiology and pathology. Additionally, the concepts of pathology such as mechanisms of disease and pathology, cellular responses to injury, tissue repair and regeneration, neoplasia and cancer biology, etc., also included. Finally, the course ends with the applied aspects of microbiology and pathology, including microbial biotechnology, environmental microbiology, emerging infectious diseases, and ethics and safety in microbiology research and practice.

Course Syllabus:

Module 1: **6 h**

Introduction to Microbiology

- Microbial diversity and classification
- Microbial structure and function
- Microbial growth and reproduction
- Microbial genetics and gene transfer
- Microbial ecology and interactions with the environment

Course Outcomes: By completing this module, the student will be able to:

1. Recognize the diversity of microorganisms and their ecological roles
2. Describe the basic principles of microbial taxonomy, morphology, and physiology
3. Compare and contrast the various mechanisms of microbial growth and reproduction
4. Explain the concepts of genetics and genetic variation in microorganisms

Module 2: **6 h**

Microbial Pathogenesis

- Host-microbe interactions
- Microbial virulence factors
- Pathogenesis of bacterial, viral, fungal and parasitic infections
- Mechanisms of antimicrobial resistance
- Immune responses to microbial infections

Course Outcomes: By completing this module, the student will be able to:

1. Explain the mechanisms of microbial pathogenesis, including virulence factors and host-microbe interactions
2. Describe the immune response to microbial infections
3. Identify the mechanisms of antimicrobial resistance
4. Use diagnostic techniques to identify microbial infections

Module 3: **6 h**

Medical Microbiology

- Clinical microbiology and diagnostic techniques
- Epidemiology and public health microbiology
- Microbial identification and characterization
- Laboratory techniques for microbial culture and analysis
- Control of microbial infections in healthcare settings

Course Outcomes: By completing this module, the student will be able to:

1. Define the basic principles of molecular biology, including gene expression, DNA replication and repair, and protein synthesis
2. Describe the principles of microbial genetics and gene regulation
3. Explain the role of molecular biology in microbial pathogenesis and the development of antimicrobial therapies

Module 4: **6 h**

Pathology

- Introduction to pathology and disease
- Mechanisms of disease and pathology
- Cellular responses to injury and inflammation
- Tissue repair and regeneration
- Neoplasia and cancer biology

Course Outcomes: By completing this module, the student will be able to:

1. Describe the basic principles of cellular responses to injury and inflammation
2. Explain the mechanisms of tissue repair and regeneration
3. Define the pathogenesis of neoplastic and non-neoplastic diseases
4. Identify the impact of environmental factors on health and disease

Module 5: **6 h**

Applied Microbiology and Pathology

- Microbial biotechnology and industrial microbiology
- Microbial ecology and environmental microbiology
- Microbial interactions with plants and animals

- Emerging infectious diseases and global health challenges
- Ethics and safety in microbiology research and practice

Course Outcomes: By completing this module, the student will be able to:

1. Apply the principles of microbiology and pathology to real-world scenarios, such as microbial biotechnology and the diagnosis and treatment of infectious diseases
2. Analyze the ethical considerations and implications of microbiology and pathology in society
3. Develop critical thinking and problem-solving skills related to microbiology and pathology.

Assessment: Continuous Evaluation (40) & End Semester Exam (60):

- Class participation and minimum attendance criterion (75%) for eligibility of assessment
- 3 Midterm exams for 15 mark each and the performance in the best two will be considered for 30 marks.
- Assignment/Presentation on a selected ocular pharmacology topic for 10 marks.
- Performance in an external end semester exam for 60 marks.

Textbooks:

1. Tortora, G. J., Funke, B. R., & Case, C. L. (2016). Microbiology: An Introduction. Pearson.
2. Murray, P. R., Rosenthal, K. S., & Pfaller, M. A. (2015). Medical Microbiology. Elsevier.
3. Kumar, V., Abbas, A. K., & Aster, J. C. (2014). Robbins and Cotran Pathologic Basis of Disease. Elsevier.
4. Alberts, B., Johnson, A., Lewis, J., Morgan, D., Raff, M., Roberts, K., & Walter, P. (2017). Molecular Biology of the Cell. Garland Science.
5. Garrity, G. M. (Ed.). (2011). Bergey's Manual of Systematic Bacteriology (2nd ed.). Springer.

Note: The projected course outcomes aim to challenge and engage students by incorporating and limiting the action verbs to within the first three levels of Blooms taxonomy.

1. Anesthetics
    a. Mechanism of Action
    b. Commonly available anesthetics
    c. Topical and Systemic side effects

2. Antibiotics
    a. Types of antibiotics
    b. Mechanism of action
    c. Topical & systemic side effects
3. Antifungal
    a. Types of antifungals
    b. Action of anti fungals
4. Antiviral drugs
    a. Types of Antivirals
    b. Mechanism of action
    c. Side effects
5. Anti Inflammatory
    a. Types of anti-inflammatories
    b. Mechanism of action
    c. Side effects
6. Mydriatics and Cycloplegics
    a. Types/Classification
    b. Mechanism of action
    c. Side effects
7. Anti glaucoma medications
    a. Classification
    b. Mechanism of action
    c. Topica and systemic Side effects
8. Ophthalmic Dyes

MICROBIOLOGY (Practical)

1. Introduction and study of different equipments and processing, e.g.. B.O.D. incubator. Laminar flow, aseptic hood, autoclave. hot air sterilizer. deep freezer. refrigerator, microscopes used in experimental microbiology.

2. Sterilization of glassware. Preparation and sterilization of media.

3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.

4. Staining methods- Simple. Grams staining and acid fast staining (Demonstration with

Practical).

5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other

techniques.

GITAM University & L V Prasad Eye Institute,
Brien Holden Institute of Optometry and Vision Sciences,
GPR Campus, Kismatpur.

Course No.	:	OPT 302
Course Title	:	Visual Development and Aging
Semester	:	VI
Lectures	:	2
Credits	:	2
Course lead	:	LVPEI

Preamble: This course will give a detailed understanding of visual development. Factors that influence visual development. Normal physiological aging changes of the eye structures, including optical and refractive changes with age will be discussed. Common pediatric and geriatric eye disorders will also be covered. Special considerations for ophthalmic dispensing in this cohort will also be covered.

Learning objective:
To understand the normal aging of eye and visual system
To understand the common eye conditions that is seen in childhood and adulthood

MODULE-I: 7 hours
Visual development, factors influencing it, genetic factors, appearance of normal ocular structures

Learning Outcomes:
At the end of the Topic the student will be able to

- Describe birth history (prenatal, perinatal & postnatal)
- Describe normal development of eye and its adnexa
- Describe oculomotor system development
- Describe pedigree mapping and basic genetics

MODULE-II: 7 hours
Optical and refractive changes in eye with age, measurement of visual acuity in children, special charts and tests used for children, determining binocular status and sensory motor adaptability

Learning Outcomes:
At the end of the topic the student will be able to

- Describe developmental changes in optics and refraction
- Describe visual acuity testing methods in children
- Describe binocular, sensory and motor adaptability

MODULE-III: 8hours
Measure refractive status in pediatric and geriatric population, management options of myopia, hyperopia, astigmatism, spasm of near reflex, guidelines for prescribing spectacles, compensatory treatment for strabismus and nystagmus, amblyopia, aphakia and pseudophakia

Learning Outcomes:
At the end of the topic the student will be able to

- Describe refraction in pediatric population

- Describe refraction in geriatric population
- Describe special considerations required for prescribing spectacles
- Describe the management of amblyopia, aphakia and pseudophakia
- Describe presbyopia spectacle prescription

MODULE-IV: 8 hours

Common pediatric eye conditions, including congenital and developmental anomalies. Role of early intervention, children with developmental delay and multiple disabilities. Specifically congenital cataract, congenital glaucoma, TORCH, ROP, systemic associations, syndromic conditions will be learnt.

Learning Outcomes:
At the end of the topic the student will be able to

- Describe the common pediatric eye disorders
- Describe role of early intervention
- Describe management techniques for childhood vision disorders

MODULE-V: 7 hours

Common geriatric eye conditions, optometric gernontology, principles of aging, common systemic diseases of old age, special considerations in managing elderly patients

Learning Outcomes:
At the end of the topic the student will be able to

- Describe geriatric eye disorders
- Describe principles of aging
- Describe common systemic conditions due to aging

Textbooks:

1. Visual development, diagnosis and treatment of the pediatric patient. Duckman. 2006.
2. Geriatric Ophthalmology. Lee & Beaver. 2010.
3. Vision & Aging. Rosenbloom & Morgan. 2006.

Reference Books:

1. Clinical Pediatric Optometry. Press & Moore. 1993

L. V. PRASAD EYE INSTITUTE – KISMATPUR CAMPUS
Bausch & Lomb School of Optometry

Course Title : Systemic Disease and nutrition

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

2. **Diabetes Mellitus**
   - Pathology, classification, clinical features, diagnosis, complications, management
   - Diabetes mellitus and the eye

3. **Connective Tissue Disease**
   - Anatomy and Pathophysiology : Arthritis
   - Eye and connective tissue disease

4. **Thyroid Disease**
   - Anatomy and physiology of the thyroid gland,
   - Classification of thyroid disease
   - Diagnosis, complications, clinical features, management,
   - Thyroid disease and the eye

5. **Tuberculosis**
   - Aetiology, pathology, clinical features, pulmonary tuberculosis, diagnosis, complication, treatment, tuberculosis and the eye.

Nutition

- History of Nutrition
- Nutrition as science
- Food groups, RDA
- Balanced diet, diet planning
- Assessment of nutritional status

Introduction to all food components its resources and deficiencies

Course code : OPTO3111
Course Title : Research methodology and Biostatistics

Unit I
Research overview:
Introduction to research
Why, What and how aspects of research
Do and Don'ts in research - an overview
Timelines and milestones

Research Journey:
Types of research
Steps in conducting research

Building your research project:
Identifying topics for research
Developing a research question, objectives and hypotheses
Identifying and defining your key concepts
Feasibility and practical issues in undertaking proposed research

Unit II
Literature review:
Rationale for literature review?
Systematic approach to searching the literature using various search techniques
How to read the scientific literature (critical review of literature and synthesizing evidence)
Interpreting and assessing the quality and credibility of retrieved literature

Bibliographic management and writing:
Citations and referencing
Overview of research writing and presentation

Unit III
Research proposal:
How to write a research proposal
Different sections of proposal
Guidelines
Plagiarism

Research methodology:
Study designs over-view
Types of data
Sample size calculation

How to design your study
Introduction to conducting pilot study

Ethical considerations and processes:
Research ethics, professional conduct and IRB
Informed consent, confidentiality of research data, participant's details
What is tenets of the declaration of Helsinki?
How to approach for ethics approval

Unit IV
Statistics – introduction of collection of data – presentation including classifications and diagrammatic representations – frequency distribution.
Measures of central tendency; measures of dispersion.
Correlation and Regression (linear)
Probability – simple ideas
Theoretical distributions

1.1 Binomial
1.2 Normal

Sampling – necessity of methods and techniques
Chi. Square test (2x2)

Hospital Statistics
Collection of hospital statistical date – presentation – analysis of daily hospital service – monthly and annual reports. Computation of percentages in patient census, bed occupancy rate

Unit V

Effectively communicating research
preparing project report/thesis/Abstracts/Publication

Open for discussion - Formatting - Report - Presentation

Course No.	:	OPT 305
Course Title	:	Monocular Sensory Perception
Semester	:	V
Lectures	:	12
Credits	:	2
Course lead	:	LVPEI (Dr Amithavikram)

Preamble: Through this course, we will explore the fundamental principles, techniques, and physiology of monocular visual perception. By the end of this course, you will not only possess a comprehensive understanding of monocular visual perception but also be equipped with knowledge to apply these principles to clinical scenarios.

Learning Objectives:

1. Describe the foundational aspects that underpin visual perception and visual processing
2. Describe the techniques used to measurement various aspects of perception
3. Describe how colour vision is processed by the visual system
4. Describe how spatial and temporal vision is processed

Module: 1

Introduction to visual perception and measuring perception

1.1 Introduction to perception
1.2 Measuring perception
1.3 Object perception – Gestalt laws
1.4 Psychophysical methods
1.5 Clinical examples of visual perception

Learning outcomes: 1) Describe what is perception and how is vision processed; 2) Describe the different psychophysical methods to understand the perception; 3) Describe the clinical examination techniques which uses psychophysical methods to measure visual perception

Module: 2

Colour perception

2.1 Colour vision basics
2.2 Basics of inherited colour vision deficiency
2.3 Principles of colour vision testing and standard colour vision tests
2.4 Learn about acquired colour vision deficiencies
2.5 Neural correlates of colour vision

Learning outcomes: 1) Learn what are the types of colour vision deficiency and its causes. 2) Understand the principles of colour vision testing and how it is applied in various colour vision tests 3) learn about the colour vision deficiencies that manifest due to ocular diseases. 4)Learn how is colour processed through the visual system

Module: 3

Spatial and Temporal vision

3.1 Describe spatial vision and understanding of basics of sine wave gratings.
3.2 Describe the human contrast sensitivity function and relation to visual acuity.
3.3 Describe the basics of flicker modulation.
3.4 Describe temporal modulation transfer function and CFF
3.5 Understand the physiological basis of limit of CSF

Learning outcomes: 1. Understand what spatial vision is and how contrast sensitivity is related to clinical visual acuity. 2. Understand the concepts of temporal vision and what is CFF. 3. Learn about the neurophysiological basis for CSF and CFF

Module: 4

Adaptation and summation

4.1 Describe the mechanism of light and dark adaptation
4.2 Physiological Basis of adaptation
4.3 Spatial and temporal summation
4.4 Summation in healthy and disease models

Learning outcomes: 1) Understanding of the adaptation characteristics of the eyes 2) Know the physiological basis of adaptation and know what happens in diseases 3) Knowledge of spatial and temporal summation 4) Develop understanding of summation in healthy and in disease models

Module: 5

Motion perception and Illusions

5.1 Describe the basics of motion perception
5.2 Dynamic visual acuity and saccadic suppression
5.3 Visual Illusions – Lateral inhibition
5.4 Lateral inhibition and perception

Learning outcomes: 1) Introduction to motion perception 2) Basics of dynamic visual acuity and how does saccadic suppression help? 3) How do we perceive illusions and what is the neural basis?

Prescribed textbooks:

1. Schwartz, S. H. (2004). Visual perception: A clinical orientation (p. 287). McGraw-Hill Medical Pub. Division.
2. Chalupa, L. M., & Werner, J. S. (2004). Visual Neurosciences, Vols. 1 & 2. MIT press.

Reference textbooks:

3. Goldstein, E. B., & Cacciamani, L. (2021). Sensation and perception. Cengage Learning.

Course No.	**:**	OPTO3141
Course Title	**:**	Low Vision Rehabilitation
Semester	**:**	6th
Lectures	**:**	38 (40 hours, approx. 3 hours per week)
Credits :	:	3
Course lead	:	LVPEI (Dr Deepak Kumar Bagga)

Preamble: This course aims to impart knowledge about identification of persons with functional vision impairment, their assessment and management.

Learning Objectives:

At the end of semester students will be

1. Able to identify patients with low vision
2. Able to describe the International Classification of Functioning, Disability and Health (ICF).
3. Able to understand various components of low vision assessment and testing tools applied for comprehensive low vision assessment
4. Able to calculate magnification required for distance and near tasks.
5. Able to describe the indication of various types of assistive devices
6. Able to understand role of multidisciplinary team members in providing early intervention
7. Able to recognize common functional limitations in specific ocular conditions and suggest low vision rehabilitation plan to address them.

Module	Topics	Duration (in minutes)	Faculty
1.	**Understanding low vision**	**300**	
1.1	Definitions	30	Deepak
1.2	Causes, and prevalence of functional low vision	30	Deepak
1.3	Categories of vision impairment	30	Deepak
1.4	Impact of vision impairment	30	Deepak
1.5	International Classification of Functioning, Disability and Health	30	Deepak
1.6	Identifying a person with vision impairment	30	Deepak
1.7	Basics of cerebral visual impairment	60	Rebecca
1.8	Integrating low vision services into optometry practice	60	Deepak
2.	**Assessment of a person with low vision**	**540**	
2.1	Components of low vision examination	30	Deepak

Module	Topics	Duration (in minutes)	Faculty
2.2	Setting goals for vision rehabilitation	30	Deepak
2.3	Assessment of visual functions	60	Deepak
2.4	Functional vision assessment	60	Deiva
2.5	Refraction in patients with low vision	120	Deepak
2.6	Approaches to magnification	60	Deepak
2.7	Calculating magnification for distance and near	60	Deepak
2.8	Assessment and management of children with CVI	120	Rebecca
3.	**Assistive devices and technology**	**570**	
3.1	Definition and classification	30	Deepak
3.2	Optical assistive devices (Optics, indication)	120	Deepak
3.3	Non-optical devices	60	Jahnavi
3.4	Absorptive lenses	60	Jahnavi
3.5	Electronic assistive devices	60	Jahnavi
3.6	Accessing computer and smartphones	60	Pavani
3.7	Selection of assistive devices	120	Deepak
3.8	Barriers to use of assistive devices	60	Deepak
4.	**Vision rehabilitation**	**540**	
4.1	Overview of vision rehabilitation – components of vision rehabilitation	60	Mahalakshmi
4.2	Psychological aspects and patient counseling	60	Deiva
4.3	Support services: Government schemes and concessions for persons with benchmark disability	30	Shobitha
4.4	Skills training (Eccentric viewing training, use of assistive device, orientation, and mobility)	150	Shobitha
4.5	Early intervention in vision rehabilitation: Multi-disciplinary approach	60	Karthik
4.6	Vision and the brain: understanding Cortical/Cerebral Vision Impairment	60	Beula
4.7	Educational rehabilitation	60	Mahalakshmi
4.8	Community-based rehabilitation (including vocational rehabilitation)	60	Ravindra
5.	**Case studies**	**450**	
5.1	Managing a case with oculocutaneous albinism	90	Deepak
5.2	Managing a case with Stargardt's disease	60	Deepak
5.3	Managing a case with retinitis pigmentosa	90	Deepak, Venkatesh
5.4	Managing a case with diabetic retinopathy	60	Deepak
5.5	Managing a case with retinopathy of prematurity	90	Deepak, Deiva
5.6	Managing a case with hemianopia	60	Premnandhini

References

1. Dickinson, C. (1998). *Low vision: principles and practice*. Butterworth-Heinemann.
2. Brilliant, R. L. (Ed.). (1999). *Essentials of low vision practice*. Butterworth-Heinemann.
3. LVPEI, Handbook on 'Early Intervention"
4. Roman-Lantzy, C. (2007). *Cortical visual impairment: An approach to assessment and intervention*. American Foundation for the Blind.
5. Lueck, A. H., & Dutton, G. (2015). *Vision and the brain: Understanding cerebral visual impairment in children* (Vol. 2). Arlington, VA: AFB Press, American Foundation for the Blind.
6. Lueck, A. H. (2004). *Functional vision: A practitioner's guide to evaluation and intervention*. American foundation for the blind.
7. https://www.swavlambancard.gov.in/schemes/search (Government schemes and concessions)

Course No. : OPT xxx
Course Title : Binocular Vision II
Semester : VI
Lectures : xx
Credits : xx
Course lead : LVPEI (Dr Shrikant R. Bharadwaj)

Preamble: This course will build on the Binocular Vision I course delivered in the Vth semester, focusing on the ability of the two eyes to work as a team, thereby allowing humans to experience the external environment binocularly. The course will focus on eye movements, non-strabismic and strabismic binocular vision anomalies and the various management strategies currently used to manage these anomalies.

Learning Objectives:

1. Describe the different types of eye movements, their purposes, neural control, and measurement techniques.
2. Describe the evaluation of sensory and motor binocular vision in the clinic.
3. Describe various non-strabismic binocular vision anomalies, their clinical presentation and management using prisms and vision therapy.
4. Describe the various strabismic binocular vision their clinical presentation and management using prisms and surgery.
5. Describe various developmental anomalies related to binocular vision, their clinical presentation and management strategies.

Module: 1

Neural control of different classes of eye movements

1.1 Eye movements that optimize vision during self-motion – vestibulo-ocular reflex and optokinetic nystagmus.
1.2 Eye movements that optimize vision during object motion – Pursuits and saccades.
1.3 Measurements of eye movements.

Learning outcome: 1) Describe the purpose, properties, neural control and evaluation techniques for vestibulo-ocular reflex and optokinetic nystagmus; 2) Describe the purpose, properties, neural control and evaluation techniques for saccades and pursuits; 3) Describe the purpose, properties, neural control and evaluation techniques for ocular accommodation; 4) Describe the different types of eye movement recording techniques; 5) Describe the Hirschberg test, the Hirschberg ratio and the determinants of this ratio during eye movement recording.

Prescribed textbooks:

1. Normal Binocular Vision - Theory, Investigation and Practical Aspects: David Stidwell and Robert Fletcher
2. The Neurology of Eye movements: Roger Leigh and David Zee
3. Adler's Physiology of the Eye: Albert Alm and Paul L. Kaufman

Reference textbooks:

4. Clinical management of binocular vision: Mitchell Schieman and Bruce Wick
5. Seeing in Depth Vols. 1 and 2: Ian Howard and Brian Rogers

Module: 2

Sensory and motor evaluation of binocular vision

2.1. Introduction to the logic and testing of different grades of binocular vision
2.2. Evaluation of simultaneous macular perception, fusion, and stereopsis
2.3. Evaluation of vergence eye movements, accommodation, and their interaction

Learning outcome: 1) Describe the purpose and logic of evaluating the three grades of binocular vision; 2) Describe the techniques involved in measuring the three grades of binocular vision along with normative values; 3) Demonstrate the measurement of fusional vergence amplitude, vergence facility, accommodative lag, accommodative facility, and the AC/A ratio.

Prescribed textbooks:

1. Clinical management of binocular vision: Mitchell Schieman and Bruce Wick
2. Primary care Optometry: Theodore Grosvenor
3. Clinical Procedures in Optometry: J. Boyd Eskridge, Jimmy D. Bartlett, and John F. Amos

Module: 3

Non-strabismic binocular vision anomalies

3.1. Introduction to the logic of categorizing different forms of non-strabismic binocular vision anomalies.
3.2. Clinical presentations of the different forms of non-strabismic binocular vision anomalies.
3.3. Clinical evaluation and management strategies for the different forms of non-strabismic binocular vision anomalies.

Learning outcome: 1) Describe the logic of categorizing different forms of non-strabismic binocular vision anomalies; 2) Describe the clinical presentations of these non-strabismic binocular vision anomalies using the techniques described in Module 2; 3) Describe the management of these non-strabismic binocular vision anomalies using prisms and other evidence-based vision therapy techniques.

Prescribed textbooks:

1. Clinical management of binocular vision: Mitchell Schieman and Bruce Wick
2. Primary care Optometry: Theodore Grosvenor
3. Clinical Procedures in Optometry: J. Boyd Eskridge, Jimmy D. Bartlett, and John F. Amos
4. Visual development, diagnosis, and treatment of the pediatric patient: Robert H. Duckman

Module: 4

Common and unique forms of strabismus

4.1. Clinical presentation and evaluation of common forms of horizontal, vertical and cyclovertical eye deviations.
4.2. Clinical presentation and evaluation of special forms of strabismus.

4.3. Clinical evaluation and non-surgical/surgical management strategies for the different forms of strabismus.

Learning outcome: 1) Describe the clinical presentation and evaluation of common forms of horizontal, vertical and cyclovertical eye deviations; 2) Describe the clinical presentation and evaluation of special forms of strabismus (e.g., syndromic strabismus, A- and V-pattern deviations, etc); 3) Describe the clinical evaluation and non-surgical/surgical management strategies for the different forms of strabismus.

Prescribed textbooks:

1. A Systematic Approach to Strabismus, Second Edition: Virginia Karlsson
2. Strabismus: Practical Pearls You Won't Find in Textbooks: Burton K. Kushner

Module: 5

Developmental anomalies of binocular vision

5.1. Introduction to critical periods of visual development, with special focus on binocular vision development.
5.2. Introduction of various forms of amblyopia.
5.3. Clinical presentation and evaluation of the sensory-motor deficit in amblyopia.
5.4. Evidence-based management of amblyopia.

Learning outcome: 1) Describe the concept of critical periods of visual development, with special focus on binocular vision development; 2) Describe the sensory and motor deficient in amblyopia and its relation to the critical periods of visual development; 3) Describe the traditional and contemporary management of amblyopia using various monocular and binocular therapies.

Prescribed textbooks:

1. Visual development, diagnosis, and treatment of the pediatric patient: Robert H. Duckman
2. Clinical management of binocular vision: Mitchell Schieman and Bruce Wick
3. Handbook of Pediatric Strabismus and Amblyopia: Kenneth H. Wright, Peter H. Spiegel and Lisa S. Thompson

Course No. : OPTO3161
Course Title : Practice management

Unit I

Defining The Subject – Theory And Practice
Definitions, Public Relations – its distinction from publicity, propaganda and Advertising,
The universe of public relations – internal and external aspects of PR, Phases of PR, Analysis of the internal and external environment – formulating and implementing PR policy – feedback, research and evaluation, The benefits of PR : Image building, promotion of product or services, better employee, government and community relations.

Unit II
Press relations : Writing and issuing a press release – Press conference – facility visit and open house – letters to the editor – assembling press activity

The spoken word : Public speaking – microphone technique – telephone manners

Film ads Television ; Publicity and educational use of these media – production and distribution

Research in PR : Opinion and panel research – drawing up of a Questionnaire – interpreting the results.

Unit III
Public Relations In Action
The customer public : Need of customer – efficiency and effectiveness of customer service – feedback and suggestion system
The government public : knowledge of and interaction with the central government – state government and municipal government
The community public : community opinion - community relations – open house and volunteer activities

Specialized Public Relations
Public relations for welfare agencies
Public relations for health agencies
Public relations for hospitals
The perspective : Rising demands-
Escalating costs – charitable heritage – public opinion
Consciousness – growing consumer movement
The PR program : Employee relations – volunteer groups – medical staff- patients – sensitivity to the press and other media

Unit IV

Introduction
Terms used in accounts
Principles of accountancy

Journal and journalizing

Ledger and ledger posting

Trial balance
Subsidiary books
Cash book
Petty cash book
Sales register
Purchases register

Bank reconciliation

Depreciation and other adjustments

Balance sheet and profit and loss accounts statements
Preparation of final accounts

Income tax and sales tax (general ideas only)

Unit V
Legal environment and techniques – history – law and equity

History and theory of licensure

Licensure as a means of internal and external discipline – unprofessional conduct – incompetence – gross immortality

International optometry – importance foreign optometry law

The optometrist in court

Malpractice – theory of liability – damages – minimising malpractice claims

Insurance

Negligence

Ethics – professional ethics

Laws governing practice of medical profession and para-medical profession in India

Registered medical practitioner – laws against practice of medicine of those unregistered – medical council of India – dental council – nursing council

Present rules and regulations – laws regard optical product manufactures – dispensing in India

Opticians – are they registered? Dispensing Opticians – Rules in UK

GITAM University & L V Prasad Eye Institute,
Brien Holden Institute of Optometry and Vision Sciences,
GPR Campus, Kismatpur.

Course No.	:	OPTO3171
Course Title	:	Contact Lenses II
Semester	:	VI
Lectures	:	1
Credits	:	
Course lead	:	Dr.Ruby Kala Prakasam, LVPEI

Introduction: The major focus of this course module is to equip students with a comprehensive understanding of contact lenses, ranging from historical developments to modern advancements. The module covers various aspects of contact lens practice, from terminology and materials to fitting techniques and patient interaction. The module emphasizes both theoretical knowledge and practical skills, ensuring that students can confidently interact with patients, assess ocular health, select appropriate lenses, and address fitting challenges. Additionally, the module introduces students to emerging technologies and trends, fostering an awareness of the evolving landscape of contact lens practice.

Course Learning Objectives:

- A comprehensive understanding of contact lenses, including their historical development, classification, materials, and design considerations.
- Interact effectively with patients, elicit relevant contact lens histories, and perform thorough pre-fitting evaluations, including ocular examinations and measurements.
- Become proficient in contact lens optics, understanding how to calculate lens powers, select appropriate designs, and utilize instrumentation like keratometer, slitlamp, and radioscope.
- Possess practical skills in fitting and managing contact lenses, including soft and RGP lenses, and will be capable of troubleshooting common fitting issues.
- Develop an awareness of emerging trends and technologies in the contact lens field, enabling them to stay informed about advancements beyond the course.

Course Syllabus

Module: 1 Contact Lens Materials and Designs – II

1.1 Contact lens terminology – revision

1.2 Contact lens materials and their properties – revision

1.3 Soft contact lens special designs – Toric, aspheric, and multifocal designs

1.4 RGP contact lens specialty designs – Bifocal, Toric, keratoconus lenses, piggyback, hybrid lenses

1.5 Effect of contact lens materials on the ocular surface

Module: 2 RGP Contact Lens

2.1 Pre-fitting evaluation and ocular measurements for initial trial lens selection

2.2 Spherical RGP fitting Philosophies

2.3 Les fitting assessment methods

2.4 RGP lens finalizing (over-refraction, lens order)

Module: 3 Contact Lens Troubleshooting

3.1 Soft Contact Lens – post-fitting troubleshooting

3.2 Soft contact lens complications (non-infectious and infectious) and management

3.3 RGP Contact Lens – post-fitting troubleshooting.

3.4 RGP contact lens complications and management

Module 4: Lens Care Products

4.1. Contact lens cleaning and disinfection methods – revision

4.2 Soft contact lens solutions – chemical composition and its function

4.3 RGP contact lens solutions

4.4 Contact lens kit – lens case and other accessories

4.5 Commercial lens care products

Module 5: Specialty Contact Lenses

5.1 Contact lens in keratoconus

5.2 Contact lens in post-surgical corneas

5.3. Contact lens in corneal scars

5.4 Contact Lens Fitting in Children (include Aphakic correction)

5.4. Orthokeratology lenses for myopic treatment

5.5 Scleral contact lenses

5.6 Cosmetic and prosthetic contact lenses

5.7 Therapeutic contact lenses

Module 6

6.1 current trends in contact lens practice

Course No.	:	OPTO3181
Course Title	:	Contact Lenses II – LAB
Semester	:	VI
Lectures	:	1
Credits	:	
Course lead	:	Dr.Ruby Kala Prakasam, LVPEI

Contact Lens II- LAB Syllabus

Practical session 1: Lens Cleaning and Handling Techniques (revision)

1.1 Insertion and removal techniques

1.2 Lens cleaning with appropriate MPS Solution

1.3 Lens care and maintenance – dos and don'ts

1.4 Simulation training /role plays on lens care, maintenance, patient-trainee interaction

Practical session 2 Soft Spherical Contact Lenses

2.1 Slit lamp techniques and accessories in contact lens fitting

2.2 Soft lens fitting and assessment

2.3 Determining final lens parameters

2.4 Final prescription writing

Practical session 3: Soft Toric Contact Lenses

3.1 Soft Toric lens fitting and assessment

3.2 Axis compensation and final lens determination

3.3 Final prescription writing

Practical session 4: RGP Spherical Contact Lenses

4.1 RGP lens selection (simulation-based training)

4.2 RGP lens insertion and removal training

4.3 RGP lens fitting and assessment training

4.4 Tear lens calculations

4.5 Final lens determination

4.6 Final prescription writing

Practical session 5: Contact Lens Troubleshooting

5.1 Simulation-based training on visual complaints/troubleshooting

Unit: 1

1. Introduction to innovation and product development – ophthalmic
    a. Introduction to the concept of product development
    b. Who are the teams involved, what resources needed and how to set up development project

2. Product development lifecycle and role of optometrists in different phases- (2 classes)
    a. Complete walk through the lifecycle of the product while discussing role of optometrists at each step, will discuss with examples of some products that are developed at CFTI.

Unit: 2

1. Introduction to clinical trials and device validation methods

    a. Introduction to clinical trials- regarding CTRI registration and different methods of conducting clinical trials.
    b. Setting up research study related to medical device validation

Unit: 3

1. Regulatory requirements to market medical devices
    a. Importance of regulation and safety standards for medical devices.
    b. Introduction to CSDCO, ISO, EU, FDA, ANSI etc.

Internship I

Credits: 16

The clinical internship in optometry is an intensive, hands-on training program designed to provide aspiring optometry third-year students with practical experience in a clinical setting. This internship spans over 1000 hours in the first semester, during which interns engage in various activities crucial for their professional development. During the internship, an intern examines patients and manages different ocular conditions under the guidance of an optometry and ophthalmology consultant. This practical experience is vital for developing clinical, diagnostic, and professional skills. Under the supervision of senior optometry and ophthalmology consultants, interns manage patients' eye care needs, including treatment plans. Senior optometry and ophthalmology consultants provide oversight and mentorship, ensuring that interns receive the necessary guidance and support in the clinics. This mentorship is critical for building confidence and competence in clinical practice and becoming an independent clinical practitioner. Interns attend one-hour classes each morning, a total of 140 hours of theory sessions, including hands-on sessions, are provided to the interns in the first semester. These sessions cover various topics in optometry, ensuring that interns are well-versed in both theoretical knowledge and practical skills. These practical workshops complement the clinical experience, allowing interns to refine their techniques and apply them in clinics. An intern rotates through regular clinics like emergency, comprehensive, cornea, retina, glaucoma, paediatrics & ophthalmology, elderly, and oculoplasty clinics. During these rotations, typically, an intern examines between 15 and 20 patients, including new, long, and short follow-ups. An intern is also posted in optometry sub-specialty clinics like, contact lenses, orthoptics and binocular vision, and low vision and rehabilitation clinics. Typically, an intern examines and assists about 5-8 new and follow-up patients. The learning in the internship is evaluated at regular intervals using theory and practical examinations.

Objectives

- To develop comprehensive clinical skills in optometry.
- To gain proficiency in patient examination and management.
- To enhance diagnostic and therapeutic abilities.
- To build confidence in independent practice while benefiting from expert supervision.
- To integrate theoretical knowledge with practical applications through hands-on sessions.

Outcomes

By the end of the internship, interns will be equipped with the knowledge, skills, and experience necessary to excel in the field of optometry. They will have a deep understanding of patient care, the ability to manage various ocular conditions, and the confidence to practice independently under appropriate supervision.

Internship II

Credits: 16

The clinical internship in optometry is an intensive, hands-on training program designed to provide aspiring optometry third-year students with practical experience in a clinical setting. This internship spans over 1000 hours in the first semester, during which interns engage in various activities crucial for their professional development. During the internship, an intern examines patients and manages different ocular conditions under the guidance of an optometry and ophthalmology consultant. This practical experience is vital for developing clinical, diagnostic, and professional skills. Under the supervision of senior optometry and ophthalmology consultants, interns manage patients' eye care needs, including treatment plans. Senior optometry and ophthalmology consultants provide oversight and mentorship, ensuring that interns receive the necessary guidance and support in the clinics. This mentorship is critical for building confidence and competence in clinical practice and becoming an independent clinical practitioner. Interns attend one-hour classes each morning, a total of 140 hours of theory sessions, including hands-on sessions, are provided to the interns in the first semester. These sessions cover various topics in optometry, ensuring that interns are well-versed in both theoretical knowledge and practical skills. These practical workshops complement the clinical experience, allowing interns to refine their techniques and apply them in clinics. An intern rotates through regular clinics like emergency, comprehensive, cornea, retina, glaucoma, paediatrics & ophthalmology, elderly, and oculoplasty clinics. During these rotations, typically, an intern examines between 15 and 20 patients, including new, long, and short follow-ups. An intern is also posted in optometry sub-specialty clinics like, contact lenses, orthoptics and binocular vision, and low vision and rehabilitation clinics. Typically, an intern examines and assists about 5-8 new and follow-up patients. The learning in the internship is evaluated at regular intervals using theory and practical examinations.

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- To gain proficiency in patient examination and management.
- To enhance diagnostic and therapeutic abilities.
- To build confidence in independent practice while benefiting from expert supervision.
- To integrate theoretical knowledge with practical applications through hands-on sessions.

Outcomes

By the end of the internship, interns will be equipped with the knowledge, skills, and experience necessary to excel in the field of optometry. They will have a deep understanding of patient care, the ability to manage various ocular conditions, and the confidence to practice independently under appropriate supervision.

Research project – I

Credits: 5

Students shall participate in a research work, either individually or a group. Student should conduct a thorough review of existing literature relevant to the chosen research topic. Develop a detailed project proposal and submit the application for ethical approval. In addition to this, student should present and defend the literature review and research protocol presentation to an evaluation team. Students are expected to demonstrate strong research skills, critical thinking, and effective communication throughout the research work. Regular meetings with the guide or mentor will provide the necessary guidance and support at each stage of the research work. Students are expected to work collaboratively, manage their time effectively, adhere to all ethical guidelines throughout the research process and meet the timelines of the research work. The student presentations shall be evaluated by the panel of faculty.

Research project – II

Credits: 5

Students shall participate in a research work, either individually or a group. Studeny should carry on with project work, which was carried out in the previous semester, he or she builds up on the existing research work. He or she shall present the preliminary findings and progress updates at regular intervals. Students are expected to present final research findings in the form of a poster or oral (regular research poster format) presentation and submit a written thesis (4000-5000 words). Regular meetings with the guide or mentor will provide the necessary guidance and support at each stage of the research work. Students are expected to work collaboratively, manage their time effectively, adhere to all ethical guidelines throughout the research process and meet the timelines of the research work. The student presentations shall be evaluated by the panel of faculty.

Case discussions I:

Credits: 3

As part of the undergraduate optometry program, students will engage in case discussions including recording of cases in logbook and presenting orally one case per semester. Over a period of six months, each student will record 140 cases in a logbook, which will be evaluated for thoroughness and accuracy. Additionally, students shall present an oral case presentation from his/her documented cases. This case discussion component aims to bridge the gap between theoretical knowledge and practical application, ensuring that students are well-prepared for clinical practice in optometry. Optometry faculty will provide guidance on case selection, documentation standards, and presentation techniques. Students are encouraged to reflect on each case, noting what they learned and how it can be applied to future clinical situations. The logbook and case presentations will be evaluated by the in-charge faculty.

Objectives:

- To develop comprehensive case documentation skills.
- To enhance clinical reasoning and diagnostic abilities.
- To improve oral presentation and communication skills.
- To foster a deeper understanding of patient management in optometry.

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