Maulana Abul Kalam Azad University of Technology, WB
(Formerly known as West Bengal University of Technology)
Syllabus of Bachelor of Optometry
Effective from academic session 2023-24

B.Sc in OPTOMETRY **Course Name: Geometrical Optics**	
Course Code: BOC101+BOC191	**Semester: I**
	Maximum Marks: 100+100
Teaching Scheme	**Examination Scheme**
Lecture: 3	**End semester Exam: 70**
Tutorial: 0	**Attendance: 5**
Practical: 2	**Continuous Assessment: 25**
Credit: 5	**Practical/Seasonal internal continuous evaluation: 40**
MODE: Offline	**Practical/Seasonal external examination: 60**

Aim of the Course: The aim is to achieve knowledge of the fundamentals of geometrical optics and how they apply to the human eye.

Course Objectives: The course is aimed to build knowledge in fundamental laws of geometrical optics, their relation to the physical laws. It also considers operation of optical components and simple optical systems. Upon completion of this course, students should understand the physical principles underlying geometrical optics and develop intuitive understanding of optical systems. They should understand how light propagates through optical systems and how to design/build simple systems. They should be able to characterize properties of common optical systems such as telescopes, imagers, luminaires and concentrators.

Sl	**Course Outcome**	**Mapped modules**
CO1	The student will get an introduction to the discipline of optics and its role in the modern society.	**M1**
CO2	The student shall get expertise inFermat's principles, and the paraxial formulation for refractive and reflective surfaces.	**M1**
CO3	The student shall master the geometrical approximation, including Gauss thin lens formula. The student will be able to analyze typical optical imaging systems, with emphasis on the human eye, the camera, the telescope and the microscope.	**M2**
CO4	The students will understand prisms and basic geometrical structure of optical fiber and optical wave guiding in fiber.	**M3**
CO5	The students will get a basic knowledge in photometric quantities and units.	**M4**

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Learning Outcome/ Skills:

The candidates should demonstrate fundamental knowledge and insight into geometrical optics in order for the candidate to be able to understand and solve problems related to the eye and optical instruments/lenses, their function and correction.

Knowledge and understanding should be demonstrated in the areas of: (1) refraction at single spherical or plane surfaces, (2) thin lenses, (3) thick lenses, (4) aberrations, (5) apertures, (6) spherocylindrical lenses, (7) thin prisms, (8) mirrors, and (ophthalmic and optical instruments.

Module Number	Content	Total Hours	% of questions	Bloom Level (applicable)	Remarks,if any
THEORY					
M1	Fundamentals of Optics	**10**	**25**	**1,2**	**NA**
M2	Refraction and Lenses	**10**	**30**	**1,2,3**	**NA**
M3	Prism and Optical Fibers	**10**	**20**	**1,2**	**NA**
M4	Photometric Quantities and Illuminance	**15**	**25**	**1,2,3**	**NA**
Total Theory		**45**	**100**		
Practical		**30**			
	TOTAL	**75**			

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Detailed Syllabus

Module 1: Fundamentals of Optics

What is light- dual nature- particle & wave nature, speed, wavelength & frequency of light. Fermats' principle- laws of relation & refraction at a plane surface using Fermats' principle. Snells' law, relative and absolute refractive indices, total internal reflection and Critical angle, refraction by plane parallel slab of glass. Geometrical path length & optical path length of rays, Concept of wave fronts & rays, concept of vergence- divergence, convergence

Total Hours: 10

Module 2: Refraction and Lenses

Refraction by spherical surfaces- convex & concave, Derivation of vergence equation, focal points, deportee power, image point, lateral & axial magnification, simple numerical.
Thin Lens- shapes, derivation of lens makers' formula, thin lens vergence equation, equivalent focal length of two thin lenses separated by a distance & placed in contact, lateral magnification of thin lenses in contact, simple numerical, concept of reduced systems.
Thick Lens- Cardinal points & planes, front & back vertex power. Different types of aberrations & their effects.

Total Hours: 10

Module 3: Prism and Optical Fibers

Prism- Dispersion of prism, reflecting prisms , prisms diopters.
Geometrical theory of optical fibers. Uses of optical fibers.
Eye and Vision: Spectroradiometric curve- V - curve- photopic and scotopic vision CIE standard observes.

Total Hours: 10

Module 4: Photometric Quantities and Illuminance

Photometric quantities and units- Luminous Flux, Lumen- Illuminance, lux Luminous intensity, Candela Luminance, Candela/m2. Inverse square law and Cosine law of illumination (Illuminance)

Total Hours: 10

PRACTICAL

Credit: 2

Total Hours: 30
BO 191

1. Determination of the focal length & hence the power of a convex & Concave lens by displacement method.
2. Determination of the refractive index of a transparent liquid by using a traveling microscope.
3. Determination of the refractive index of the material of a convex lens measuring its focal length, using the lens & a plane mirror.
4. Determination of refractive index of the material of a prism by minimum deviation method.
5. To draw i-δ curve of a prism by a spectrometer & hence to find out the angle of minimum deviation

Suggested Readings:

1. GEOMETRICAL OPTICS- R. S. LONGURST, OPTICS- E.HECHT
2. Introduction to Geometrical Optics- Milton Katz
3. Fundamentals of GEOMETRICAL OPTICS- Virendra N. Mahajan

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B.Sc in OPTOMETRY **Course Name: General Anatomy & Physiology**	
Course Code: BOC102+BOC192	**Semester: I**
	Maximum Marks: 100+100
Teaching Scheme	**Examination Scheme**
Lecture: 3	**End semester Exam: 70**
Tutorial: 0	**Attendance: 5**
Practical: 2	**Continuous Assessment: 25**
Credit: 5	**Practical/Seasonal internal continuous evaluation: 40**
MODE: Offline	**Practical/Seasonal external examination: 60**

Aim of the Course
The course aims to create a fundamental knowledge about the general anatomy and physiology of the human system.

Course Objectives: Fundamentals of General Anatomy & Physiology gives students in-depth instruction in the organization, structures, and functions of the human body. Students will learn the terminology, anatomy and physiology, and pathology of each body system and how they interrelate to maintain homeostasis. Upon successful completion of this course, students will use anatomical terminology to identify and describe locations of major organs of each system covered. Students will be able to explain interrelationships among molecular, cellular, tissue, and organ functions in each system and can describe the interdependency and interactions of the systems.

Sl	**Course Outcome**	**Mapped modules**
CO1	Explain the anatomy, physiology and functions of various Tissues and cell, organization of cellular system. Basic fundamentals of life.	**M1**
CO2	Understand the Basic principles of biophysics and its application	**M1**
CO3	Classify different types of tissue and explain anatomy and physiology of skeletal system and joints	**M2**
CO4	Describe the Physiology of muscle contraction and its disorders	**M2**
CO5	Describe the Anatomy and physiology of nerve cell and its transmission process.	**M3**
CO6	Explain the anatomy and Physiology of cardiovascular system	**M4**
CO7	Explain the anatomy and Physiology of Renal System	**M5**

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Learning Outcome/ Skills:

- Students will be able to understand the detail structure of major human organs and explain their role
- Students will able understand the skeleto-muscular system and interconnection of nervous system
- Students will understand the basics of the cardiovascular system and gain the knowledge of various parameters of the blood indices.

Module Number	Content	Total Hours	% of questions	Bloom Level (applicable)	Remarks, if any
THEORY					
M1	Fundamentals of Human Physiology	**10**	**10**	**1,2**	**NA**
M2	Human Skeleto-muscular System	**10**	**30**	**1,2,3**	**NA**
M3	Fundamentals of Nervous System	**10**	**20**	**1,2,3**	**NA**
M4	Basics of Cardio-Vascular system	**10**	**30**	**1,2,3**	**NA**
M5	Basics of Renal system	**05**	**10**	**1,2**	**NA**
Total Theory		**45**	**100**		
PRACTICAL		**30**			
	TOTAL	**75**			

Detailed Syllabus

Module 1: Fundamentals of Human Physiology

Cell Structure: Ultra structure and functions of cell - Plasma membrane- Nucleus – Mitochondria- Centrosome- Ribosome -Endoplasmic reticulum- Golgi body & lysosome. Nucleus – Ultra structure & functions. Cell Division: Mitosis- Meiosis- Significance of mitosis & meiosis- Cell cycle. Gametogenesis(spermatogenesis & oogenesis). Tissues:- Structure, position and functions of epithelial, connective, muscular & nervous tissue.
Nucleic acids-structure of DNA and RNA, their types, properties, replication of DNA, genetic code. Chromosomal Aberration brief idea on structural and numerical aberration, gene mutation-definition and classification , Application-genetics of colour blindness, ocular albinism, practical application of mutation

Phases of embryonic development – formation of three germ layers- derivatives of germ layers –Embryonic or Foetal membrane (chorion, amnion, allantois, yolk sac)

Basic principles of Biology (Biophysical)and its application a. Diffusion-definition, factors affecting diffusion, biomedical or biological application of diffusion, b. Osmosis- definition, factors affecting osmosis, biomedical or biological application of osmosis, laws of osmosis. c - Acids, Bases, Ph-general overview

Total Hours: 10

Module 2 Human Skeleto-Muscular System

Introduction of anatomy – gross human anatomy & their relations : • The skeleton – axial & appendicular (over view), Cavities of body- (cranial, thoracic, abdominal, pelvic). Structure of bone, Type & function of bone, Blood & nerve supply of the bone. Planes of the body. Anatomical terminology. • Skull – General features, Cranial bones (frontal, parietal, temporal, occipital, sphenoid, ethmoid). Facial bone – (nasal, maxilla, zygomatic, lacrimal, palatine, inferior nasal conchae, vomar, mandible). Special feature of the skull (sutures, paranasal sinuses, foramina, fontanels, nasal septum). • Joints – classification, fibrous joints, cartilaginous joints, synovial joints(structure & types). Types of movement at sinovial joints.

Microscopic structure of skeletal, smooth and cardiac muscles and their differences. Properties of muscle. Red and white muscle. Single unit and multi-unit smooth muscles. Motor point. Slow and fast muscle fibers. Isotonic and Isometric contractions. The Sarcotubular system. Muscle contraction-E.C.Coupling, Rigor mortis.Anatomy of muscular system – Skeletal muscle structure. Important skeletal muscle (muscles of facial expression, mastication. Muscles that move the head). Overview of Trunk muscles, upper limb muscles, lower limb muscles.

Total Hours: 10

Module 3 Fundamentals of Nervous System

Structure and functions of neuron /nerve cell. Neuroglia. Myelinated and unmyelinated nerve fiber with their conduction velocity. Properties of nerve fiber. Action potential of nerve fibre. synapse-structure, types, synaptic transmission, synaptic potential, neurotransmitter. ANS-Introduction, types, comparison of autonomic and somatic nervous system. NMJ-structure and events in transmission. Anatomy of the nervous system – spinal cord anatomy (external & internal anatomy). Connection & distribution of spinal nerves-overview(Branches, plexuses. Intercostal nerves). Overview of brain organization & blood supply. Brief anatomical idea on – brain stem, cerebellum, diencephalon, cerebrum. Cranial nerves.

Total Hours: 10

Module 4 Basics of Cardio-Vascular system

Structures and functions of blood vessel types and their differences. Composition and functions of blood. Plasma proteins-types, origin, normal values, functions. Bone marrow-types and functions. Formed elements of blood-origin, formation, function, life span and fate, abnormalities of formed elements(both size and number)and related disease .Haemoglobin- structure , function and types of haemoglobin, abnormal haemoglobin and related diseases. Blood coagulation-factors, process, anticoagulants, CT and BT. Blood groups-ABO system, Rh factors, blood transfusion and consequences of incompatible blood transfusion. Terminologies-TC,DC,ESR,PCV,MCV,MCH, MCHC,ESR and their significances.

Structure and functions of heart. blood circulation types .special junctional tissues of heart and their importance. ECG. Cardiac cycle. Heart sounds. Cardiac output. blood pressure-definition, types, measurement method, significance of blood pressure measurement, controlling factors and regulation of blood pressure.

Total Hours: 10

Module 5 Basics of Renal system

Structure and functions of kidney. Structure and functions of nephron. Formation of urine (filtration, reabsorption, secretion).Anomalies of urine concentration. Counter current system of urine concentration.

Total Hours: 05

PRACTICAL
Credit: 2

Total Hours: 30

BO 192

1.Demonstration of compound microscope.
2. Identification of histological tissues: Epithelial tissue-squamous, columnar, cuboidal , Connective tissue-skeletal muscle, cardiac muscle, smooth muscle ,artery, vein, liver, kidney, cerebrum, cerebellum, spinal cord, blood film,adrenal gland, thyroid.
3. Hemoglobin estimation.
4. Determination of blood pressure.
5. Determination of BT, CT and demonstration of ESR.
6. Blood film making & identification of different blood corpuscle.
7. Measurement of TC of RBC & WBC & DC of WBC.
8. Determination of Blood Group (ABO; Rh).
9. Identification of Bones

Suggested Readings:

1.Human Physiology: Vol 1 And Vol 2-C.C.Chatterjee
2. Principles Of Anatomy And Physiology- Tortora,
3. Essentials Of Anatomy & Physiology- Martini,
4. Essentials Of Anatomy- I. Singh

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B.Sc in OPTOMETRY **Course Name: Physical Optics**	
Course Code: BOC201+BOC291	**Semester: II**
	Maximum Marks: 100+100
Teaching Scheme	**Examination Scheme**
Lecture: 3	**End semester Exam: 70**
Tutorial: 0	**Attendance: 5**
Practical: 2	**Continuous Assessment: 25**
Credit: 5	**Practical/Seasonal internal continuous evaluation: 40**
MODE: Offline	**Practical/Seasonal external examination: 60**

Aim of the Course: It aims to explain the properties of light, how it interacts with matter, and what instruments can be used to detect it.

Course Objectives: To explain principles of physical optics. Relationship of length contraction, time dilation and Einstein energy mass relation and to apply the concepts of special theory of relativity in various fields of physics. Apply knowledge of light waves to explain natural physical processes and related technological advances.

Sl	**Course Outcome**	**Mapped modules**
CO1	The student shall master in Huygen's principles. This will give the student a basic knowledge of coherent and non-coherent light sources.	**M1**
CO2	The student shall become able to analyze and calculate interference between waves generated from division of wavefront and division of amplitude	**M1**
CO3	The students shall understand the antireflection coating and interference filter.	**M1**
CO4	The student shall know the conditions for near and far-field diffraction and be able to calculate the far-field diffraction from gratings and simple aperture functions. The student shall have knowledge about and be able to explain concepts such as numerical aperture, F-number, spatial resolution and image quality for optical systems that originates from diffraction.	**M2**
CO5	The student shall understand how the polarization of light changes at reflection and transmission at interfaces and understand the basics of laser.	**M3**
CO6	The students shall recognise the factors associated to the methods of lighting design. They shall get in-depth knowledge in the types of lamps.They also get knowledge about VDU and eye protectors.	**M4**

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Learning Outcome/ Skills:

The student shall master the geometrical approximation, including Fermat's and Huygen's principles, and refractive and reflective surfaces.

The student will be able to analyze typical optical imaging systems, with emphasis on the human eye, the camera, the telescope and the microscope.

Module Number	Content	Total Hours	% of questions	Bloom Level (applicable)	Remarks,if any
THEORY					
M1	Interference	**10**	**25**	**1,2**	**NA**
M2	Diffraction	**10**	**25**	**1,2**	**NA**
M3	Polarization & Crystal Optics	**10**	**20**	**1,2,3**	**NA**
M4	Lighting and Workstation	**15**	**30**	**1,2,3**	**NA**
Total Theory		**45**	**100**		
Practical		**30**			
	TOTAL	**75**			

Detailed Syllabus

Module 1: Interference

HUYGENS' principle – laws of reflection and refraction at plane and spherical surfaces. Wave velocity & group velocity; determination of velocity of light (any one method.)

Interference: Coherence; path and phase difference; Theory of interference fringes-intensity distribution infringes; Young's double slit experiment- Fresnels' bi-prism, Lloyds' error experiments; visibility of fringes.

Interference in thin films due to reflected and transmitted light- Interference in wedge Shaped films; Newton's ring experiment; Colour of thin films; Thin film antireflection coating and filters.

Total Hours: 10

Module 2:Diffraction

Diffraction: Diffraction by single slit; double slit, multiple slit grating, circular aperture – amplitude & intensity distribution (final expressions only)

Circular aperture- airy pattern, resolution by circular apertures.

Diffraction grating- reflection, traasnussion , amplitude & phase gratings(definitions in brief) Grating dispersion & dispersive power, spectral resolution; zone plates.

Total Hours: 10

Module 3:Polarization & Crystal Optics

Polarization & Crystal Optics: Concept of polarization, polarizes, analyzers,

- Linear Scattering- Raleigh & Mie
- Principles of LASERs.

Total Hours: 10

Module 4:Lighting and Workstation

Lumen method of lighting design utilization factor, light loss factor,

Glare and glare index- disability glare- discomfort glare. control of glare-

Daylight, its properties.

Color lamp – Incandescent lamps - low pressure Hg-lamp.Low-pressure NA- lamp - Typical applications.

Recommended level of illuminance for various including those in optometry and ophthalmology driving etc.

VDU- Design of workstation – Flicker color contrast.Regulations regarding the use of VDU.

Eye Protectors- their constructions standard relating to eye protection

Total Hours: 15

PRACTICAL
Credit: 2
BO 291
Total Hrs:30

1.To determine the wavelength of a monochromatic light source with the help of Fresnel's Biprism.
2.To determine the radius of curvature of convex surface of a lens by Newton's ring method.
3.To determine Planck's constant using photocell.
4.To study the diffraction through a single slit & to determine its width.
5. To determine the slit width & the separation between the slits of a double slit system from its Fraunhofer diffraction pattern.
6.Determination of the wavelength of monochromatic light using diffraction grating.
7.To calibrate a Polarimeter & hence to determine the unknown concentration of sugar solution.
8.To determine the wavelength of the Laser source by forming a diffraction pattern with transmission grating.
9. Use a calibrated Luxmeter to measure the levels of illumination at least 15 working places in the college. Identify the locations & note the measured levels at each location, indicating whether the measured values agree with the prescribed values for comfortable vision. If there are considerable deviations,

Reference books

1. OPTICS- E. HECHT
2. FUNDAMENTALS OF OPTICS- JENKINS

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B.Sc in OPTOMETRY **Course Name: Ocular Anatomy & Physiology**	
Course Code: BOC202+BOC292	**Semester: II**
	Maximum Marks: 100+100
Teaching Scheme	**Examination Scheme**
Lecture: 3	**End semester Exam: 70**
Tutorial: 0	**Attendance: 5**
Practical: 2	**Continuous Assessment: 25**
Credit: 5	**Practical/Seasonal internal continuous evaluation: 40**
MODE: Offline	**Practical/Seasonal external examination: 60**

Aim of the Course: The aim of the course is to understand the fundamental anatomical and physiological properties of human eye

Course Objectives:

Ocular anatomy and physiology introduces the structure and function of the human visual system.It covers the anatomy and physiology of the eyeball, orbit, and ocular adnexa with an emphasis on ocular terminology. Upon completion of this course students should be able to:

1. Identify and describe the structures and functions of the visual system, eye, and adnexal structures.
2. Describe the physiology of the visual system.

Sl	Course Outcome	Mapped modules
CO1	Understanding the ocular embryology	M1
CO2	Understanding about orbit,cornea,conjunctiva ,uveal tissue, lens, aqueous humor ,pupil.	M1
CO3	Basic outline of retina,sclera, vitreous humor,optic nerve and visual pathway.	M2
CO4	Knowing about parts of ocular adnexa	M3
CO5	Understanding different types of mechanisms of eye like blinking, tear film and lacrimation,IOP,accommodation, light and dark adaptation, color vision and visual acuity.	M4
CO6	Knowing the ocular nutrition and their role in eye	M5

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Learning Outcome/ Skills:

1. Define and correctly use anatomical and physiological terms as they relate to the eye;
2. Recognise and describe the macroscopic and microscope structures of the eye, and how they contribute to perception;
3. Discriminate between normal and abnormal ocular anatomy and physiology;
4. explain the structure and function of the anatomy (e.g. skull, sinuses, meninges, vasculature, ocular adnexa etc) supporting normal function of the eye; and
5. explain how and where visual information processing occurs within the visual pathway.

Module Number	Content	Total Hours	% of questions	Bloom Level (applicable)	Remarks,if any
THEORY					
M1	Embryology and anterior segment of eye	**12**	**20**	**1,2**	**NA**
M2	Posterior segment of eye	**08**	**20**	**1,2,3**	**NA**
M3	Ocular adnexa	**10**	**20**	**1,2**	**NA**
M4	Mechanisms of eye	**10**	**30**	**1,2,3**	**NA**
M5	Ocular nutrition	**05**	**10**	**1,2**	**NA**
Total Theory		**45**	**100**		
PRACTICAL		**30**			
	TOTAL	**75**			

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Module 1: Embryology and anterior segment of eye

1. Embryology –ocular (brief overview) : Formation of optic vesicle & optic stalk, formation of lens vesicle, formation of optic cup, changes in associated mesoderm, development of various structure of eye ball – retina, optic nerve, crystalline lens, cornea, sclera, choroid, cilliary body, iris, viterous. Development of accessory structures of eyeball – eyelids, lacrimal apparatus, extraocular muscles, orbit. Milestones in the development of the eye.

2.Orbit: Bony orbit→ Size, shape & relations, walls of the orbit , Base of the orbit, Apex of orbit. Orbital fascia →Fascial bulbi, Fascial sheaths of extraocular muscles, intermuscular septa. Spaces of orbit → Orbit fat & reticular tissue - Apertures at the base of orbit- Contents of the orbit - Orbital nerve→ oculomotor , Trochlear, Abducent, Trigeminal, facial nerves - their functional components, course & distribution, clinically applied aspects.

3.Cornea: Brief idea about ultra & histological structure of cornea. Factors regulating corneal transparency. Biochemical composition of cornea. Sources of Nutrients-Oxygen, Glucose, Amino acid. Metabolic pathway in cornea – Glycolysis, HMP shunt.

4.Conjunctiva - Palpebral Conjunctiva, Bulbar Conjunctiva, Conjunctival Fornix, Microscopic Structure of the conjunctiva- Epithelium, Substantia Propria. Conjunctival Glands→ Krause's Glands, Wolfring's Glands, Henley's Glands, Manz Glands. Blood Supply of the Conjunctiva, Nerve Supply of the Conjunctiva, Caruncle, Plica Semilunaris

5. Uveal tissue(Iris and ciliary body): Brief idea about uvea. Uveal meshwork. Uveo-scleral drainage. Schlemm's canal switch. →(a). Iris macroscopic & microscopic appearance . (b) ciliary body – Macroscopic structure.(c). Choroid - Macroscopic structure.(d) Blood supply to uveal structure-

6. Lens: Basic idea about human lens. Function of lens. Lens transparency.Changes in aging lens. Biochemical composition of lens. Lens protein – their types & characteristics. Lens Metabolism - Carbohydrate metabolism, protein metabolism. Antioxidant mechanism in the lens.

7. Aqueous humour :Angle of the anterior chamber. Formation of Aqueous humour. Drainage & circulation of Aqueous Humour. Rates of production & flow. Functions of Aqueous humour.

8. Pupil – Normal pupil, Physiological changes in pupil size – Isocoria, Pupillary unrest, Hippus. Pupillary reflex – Light reflex, Near reflex, Darkness reflex , Psycho sensory reflex, Lid closure reflex. Anatomy of sphincter & dilator muscle. Ciliary muscle – Anatomy, types .The nerve supply.

Total Hours: 12

Module 2 :Posterior segment of eye

1.Retina: Retinal structure-Gross anatomy and layers of retina. Brief idea about rod & cones. Organization of retina. Microscopic structure of fovea.Function of retina.Brief outline of visual cycle and transducin cycle.

2.Optic Nerve: Anatomy and Physiology of optic nerve. Visual pathway. Lateral Geniculate body, optic radicalism , visual cortex, Arrangement of nerve fibers.

3.Sclera – Brief overview of structure and function of sclera.

4.Vitreous Humour: Composition & distribution of vitreous humour, Physiology & function of vitreous humour, Optical role of vitreous humour.

Total Hours: 08

Module 3:Ocular adnexa

1. Anatomy of the Ocular Adnexa & glands; Lids - a. Structures of 4 the lids: - Skin, Subcutaneous Areolar Layer, Layer of Striated muscle, Submuscular Areolar Tissue, Fibrous Layer, Conjunctiva. Glands of the Lids- - Meibomian Glands, Glands of Zeis and Glands of Moll. Blood Supply of the Lids, Lymphatic Drainage of the Lids, Nerve Supply of the Lids

2. Extra ocular muscles, nerve supply, motor nuclei, supra nuclear motor center

Total Hours: 08

Module 4:Mechanisms of eye

1.Protective Mechanism of the eye –

a. Blinking – muscles of ld closer & lid opening (orbicularis oculi, levatorpalpebre, Muller's muscle, blinking reflexes.

b. Lacrimation – i)lacrimal apparatus -.The lacrimal apparatus→ (a) Lacrimal gland, (b) Palpebral part, (c) Duets of lacrimal gland, (d) structure of the lacrimal gland, (e) Blood supply & nerve supply of the lacrimal gland, (f) lacrimal passages ii) Pre corneal layers of tear film iii) Chemistry of lachrymal secretion tear film iv) Tear film dynamics (secretion of tear, formation of tear, retention & redistribution of tear, displacement phenomena, evaporation from tear film, drying & breakup of tear film, dynamic events during blinking, elimination of tear.) v) Functions of Tear film. Chemical composition of tears. Tear film abnormalities. Tests for tear film Adequacy.

2.Intraocular pressure – Features of normal IOP, Factors influencing the IOP,Control of IOP,Measurement of IOP.

3.Light & Dark adaptation – Dark adaptation curve, Mechanism of dark adaptation, Factors influencing dark adaptation, Time course of light adaptation, Mechanism of light adaptation, Rod vs. cone light adaptation. Purkinje shift of spectral sensitivity.

4.Accommodation – a. Far point , near point, range & amplitude of Accommodation b. Mechanism of accommodation – Increased tension theory, Relaxation theory, Role of lens capsule, Gullstrand mechanical

model of accommodation, c. Stimulus for accommodation d. Ocular changes in accommodation. e. Changes in accommodation with arc (Presbyopia)

5.Visual acuity – visual angle, Components of Visual acuity (Minimum visible, Resolution , Recognition Hyperacidity), Factors affecting, Measurement of visual acuity.

6.Color vision- a. Physiological, Photochemical & neurological basis of color vision b. Electrophysiology of color vision c. Granit's modulator and dominator theory, Purkinje phenomenon. Young-Helmholtz theory d. Types of color defects e. Color blindness f. Neural analysis

Total Hours: 10

Module 5 :Ocular nutrition

Ocular Nutrition a.Vitamin & its Role in eye b. Role of Antioxidant c. Role of Omega 3 & 6 Fatty acid in eye care

Total Hours: 05

Practical:
1. Identification of the structure of orbit.
2. Identification of parts of the eye.
3. Demonstration of cornea.
4. Demonstration of Schirmer's test I
5. Demonstration of Ishihara test.
6. Demonstration of Gullstrand mechanical model of accommodation.
7. Identification of parts of Schiotz tonometer.

Suggested Readings:

1. ANATOMY AND PHYSIOLOGY OF EYE- A.K.KHURANA, INDU KHURANA
2. Clinical Anatomy and Physiology of the Visual System- by Lee Ann Remington and Denise Goodwin,
3. Physiology of the eye-Adlers