

**MRSPTU (B. SC. OPTOMETRY) SYLLABUS BATCH 2020 ONWARDS
(4 YEARS COURSE)**

Semester 2 nd		Contact Hours			Max Marks		Total Marks	Credits
Subject Code	Subject Name	L	T	P	Int.	Ext.		
BOPTS1-201	Physical Optics (Optics II)	3	1	0	40	60	100	4
BOPTS1-202	Ocular Physiology & Nutrition	3	1	0	40	60	100	4
BOPTS1-203	Anatomy (Ocular)	3	1	0	40	60	100	4
BOPTS1-204	Environment & Ecology	3	1	0	40	60	100	4
BOPTS1-205	Computer Fundamentals	3	1	0	40	60	100	4
BOPTS1-206	Physical Optics (Optics II)-LAB	0	0	4	60	40	100	2
BOPTS1-207	Computer Fundamentals -Lab	0	0	2	60	40	100	1
Total		--	--	--	320	380	700	23

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PHYSICAL OPTICS

Subject Code: BOPTS1-201

**L T P C
3 1 0 4**

Duration: 60 (Hrs.)

Course Objectives:

- The student should demonstrate fundamental knowledge and insight into physical 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.

Course Outcomes:

- To learn the fundamental principles of classical physical optics. To learn the mathematical techniques employed in physical optics. To use these principles and techniques to solve problems in optics. To become familiar with the ray-tracing program BEAM-2 used in optical design.

Unit:1.

(15 Hrs)

- **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 in fringes; Young's double slit experiment- Fresnel's biprism, Lloyd's error experiments; visibility of fringes.
- **Interference in thin films due to reflected and transmuted light-** Interference in wedge shaped films; Newton's ring experiment ; Color of thin films; Thin film antireflection coating and filters.

Unit:2.

(15 Hrs)

- **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, transmission , amplitude & phase gratings(definitions in brief) Grating dispersion & dispersive power, spectral resolution; zone plates.

Unit:3.

(15 Hrs)

- **Polarization & Crystal Optics:** Concept of polarization , polarizers, analyzers, Linear Scattering- Rayleigh & Mie Principles of LASER. Lumen method of lighting design utilization factor, light loss factor, Glare and glare index- disability glare- discomfort glare- control of glare-Daylight, its properties.

Unit:4.

(15 Hrs)

- **Color lamp** – Incandescent lamps - low pressure Hg-lamps- Low-pressure NA- lamp - Typical applications. Recommended level of illuminance for various including those in optometry and ophthalmology driving etc. VDU- Design of work station – Flicker color

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contrast- Regulations regarding the use of VDU Eye Protectors- their constructions standard relating to eye protection

Reference books-

- Optics- e. Hecht
- Fundamentals of optics- jenkins.

OCULAR PHYSIOLOGY & NUTRITION

Subject Code: BOPTS1-202

L T P C
3 1 0 4

Duration: 60 (Hrs.)

Course Objectives:

- Introduces the structure and function of the human visual system. Covers the anatomy and physiology of the eyeball, orbit, and ocular adnexa with an emphasis on ocular terminology

Course Outcomes:

- A brief overview of the updated literature on the role of antioxidants and micronutrients in the prevention and treatment of ocular diseases is to be presented with an emphasis on cataract. PubMed search and individual papers from journals. The review discusses linkages of various micronutrients and antioxidants as well as oxidative stress with cataract. Dietary interventions as strategy for prevention of cataract and other ocular disorders are also reviewed

Unit:1.

(15 Hrs)

- **Cornea:** Brief idea about ultra & histological structure of cornea. Corneal transparency & hydration, Regulation of corneal transparency & hydration. Corneal vascularization. Maurice theory & Goldman's theory. Biochemical composition of cornea. Sources of Nutrients-Oxygen, Glucose, Amino acid. Metabolic pathway in cornea – Glycolysis, HMP shunt.
- **Uveal tissue:** Brief idea about uvea. Uveal meshwork. Uveo-scleral drainage. Schlemm's canal switch.
- **Lens:** Basic idea about human lens. Function of lens. Lens transparency. Lens culture. Changes in ageing lens. Biochemical composition of lens. Lens protein – their types & characteristics. Lens Metabolism - Carbohydrate metabolism, protein metabolism. Antioxidant mechanism in the lens.
- **Aqueous humour:** Formation of Aqueous humour. Drainage & circulation of Aqueous Humor. Rates of production & flow. Functions of Aqueous humour.

Unit:2.

(15 Hrs)

- **Vitreous Humour:** Composition & distribution of vitreous humour, Physiology & function of vitreous humour, Optical role of vitreous humour.
- **Retina:** Retinal structure-layers of retina. Brief idea about rod & cones. Organization of retina. Function of retina.

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- **Optic Nerve:** Physiology of optic nerve. Photopigments – Rhodopsin & Iodopsin. Chemical nature of Rhodopsin. Visual cycle (Bleaching of Rhodopsin, Transducin cycle, Role of Phosphodiesterases).
- **Ocular Circulation:** Vascular structure of the eye – ocular circulation, blood-ocular barrier (Blood-retinal, blood Vitreous & blood aqueous barrier). Regulation of ocular circulation.

Unit:3.

(15 Hrs)

- **Protective Mechanism of the eye** –Blinking – muscles of lid closure & lid opening (orbicularis oculi, levator palpebre, Muller's muscle, blinking reflexes).
- **Lacrimation** –
 - i) Lacrimal glands
 - ii) Pre corneal 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. Different layers of Tear film. Chemical composition of tears. Tear film abnormalities. Tests for film Adequacy.
- **Intraocular pressure** :Features of normal IOP, Factors influencing the IOP, Control of IOP, Measurement of IOP.
- **Pupil – Normal pupil, Physiological changes in pupil size:** Isocoria, Pupillary unrest, Hippies. Pupillary reflex – Light reflex, Near reflex, Darkness reflex , Psycho sensory reflex, Lid closure reflex.

Unit:4.

(15 Hrs)

- **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. Parkinje shift of spectral sensitivity.
- **Visual acuity:** visual angle, Components of Visual acuity (Minimum visible, Resolution , Recognition Hyperacidity), Factors affecting, Measurement of visual acuity.
- **Color vision:** Physiological, Photochemical & neurological basis of color vision Electrophysiology of color vision.
 - Granit's modulator and dominator theory, Purkinje phenomenon. Young-Helmholtz theory.
 - Types of color defects
 - Color blindness
 - Neural analysis

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Reference books:

- Anatomy and physiology of eye- a. k. khurana, indu khurana.
- Principles of anatomy and physiology- tortora,
- Essentials of anatomy & physiology- martini, essentials of anatomy- i. Singh.
- Ross and wilson, 'anatomy & physiology.

ANATOMY (Ocular)

Subject Code: BOPTS1-203

L T P C
3 1 0 4

Duration: 60 (Hrs.)

Course Objectives:

- Introduces the structure and function of the human visual system. Covers the anatomy and physiology of the eyeball, orbit, and ocular adnexa with an emphasis on ocular terminology

Course Outcomes:

- Identify and describe the structures and functions of the visual system, eye, and adnexal structures.

Unit:1.

(15 Hrs)

- **Embryology –ocular:** 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, ciliary body, iris, vitreous. Development of accessory structures of eyeball – eyelids, lacrimal apparatus, extra-ocular muscles, orbit. Milestones in the development of the eye.
- **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 , Trochler, Abducent, Trigeminal, facial nerves - their functional components, course & distribution, clinically applied aspects.

Unit:2.

(15 Hrs)

- **Uveal Tract & its vascular supply:**
 - i) Iris macroscopic & microscopic appearance .
 - ii) ciliary body – Macroscopic structure.
 - iii) chloride - Macroscopic structure.
 - iv) Blood supply to uveal structure- short & Long Posterior artery & Anterior Artery.

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- v) Venous drainage.
- **Vitreous:** Main masses of vitreous. Base of the vitreous. Hyaloidean vitreous. Vitreous cells.
- **Sclera :** Anterior, posterior & middle apertures. Episclera. Sclera proper. Lamina fusca. Blood supply of the sclera. Nerve supply of the sclera.
- **Anterior chamber and its angle-**Angle of the anterior chamber. Trabecular meshwork. Canal of Schlemm. Schwalbe's line. Drainage of aqueous humor.
- **Retina & its vascular supply:**
 - i) Gross anatomy,
 - ii) Microscopic structure of fovea centralize,
 - iii) Anatomy of optic nerve,
 - iv) Anatomy of optic nerve,
 - v) optic chiasma optic tracts,
 - vi) Lateral Geniculate body,
 - vii) optic radicalism
 - viii) visual cortex,
 - ix) Arrangement of nerve fibers
 - x) Blood supply of visual pathways (Arterial circle of willis & its branches).

Unit:3.

(15 Hrs)

- **The Ocular motor system :** Extra ocular muscles, nerve supply, motor nuclei, supra nuclear motor centers.
- **The pupillary & ciliary muscle :** Anatomy of sphincter & Dilator muscle. Ciliary muscle – Anatomy, types 12. The nerve supply of the eye ball.
- **The lachrymal apparatus:** Lachrymal gland, Palpebral part, Duets of lachrymal gland, structure of the lachrymal gland, Blood supply & nerve supply of the lachrymal gland, lachrymal passages.

Unit:4.

(15 Hrs)

- **Anatomy of the Ocular Adnexa & glands; Lids - a. Structures of 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.
- **Conjunctiva** - Palpebral Conjunctiva, Bulbar Conjunctiva, Conjunctival Fornix, Microscopic Structure of the conjunctiva- Epithelium, Substantia Propria. Conjunctival Glands→ Krause's Glands, Wofring's Glands, Henley's Glands, Manz Glands. Blood Supply of the Conjunctiva, Nerve Supply of the Conjunctiva, Caruncle, Plica Semilunaris.

Reference books:

1. Anatomy and physiology of eye- A.K.khurana,Indu khurana.

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ENVIRONMENT & ECOLOGY

Subject Code: BOPTS1-204

L T P C
3 1 0 4

Duration: 60 (Hrs.)

Course Objectives:

- This course introduces students to environment concerns. Students are expected to learn about environment, factors affecting it, environmental ethics and its protection through lectures, presentations, documentaries and field visits

Course Outcomes:

- Appreciate concepts and methods from ecological and physical sciences and their application in environmental problem solving. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems

Unit:1.

(15 Hrs)

General

- Introduction, components of the environment, environment degradation.

Ecology

- Elements of Ecology; Ecological balance and consequences of change, principles of environmental impact assessment.

Unit:2.

(15 Hrs)

- **Air Pollution and Control:** Atmospheric composition, energy balance, climate, weather, dispersion, sources and effects of pollutants, primary and secondary pollutants, green house effect, depletion of ozone layer, standards and control measures.
- **Water Pollution and Control:** Hydrosphere, natural water, pollutants: their origin and effects, river/lake/ground water pollution, standards and control.

Unit:3.

(15 Hrs)

- **Land Pollution:** Lithosphere, pollution (municipal, industrial, commercial, agricultural, hazardous solid wastes); their origin and effects, collection and disposal of solid waste, recovery and conversion methods.

Unit:4.

(15 Hrs)

- **Noise Pollution:** Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation; psycho-acoustics and noise criteria, effects of noise on health, annoyance rating schemes; special noise environments: Infra-sound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices.

Reference books:

1. Environment & Ecology- Sunakar Panda

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COMPUTER FUNDAMENTALS

Subject Code: BOPTS1-205

L T P C
3 1 0 4

Duration: 60 (Hrs.)

Course Objectives:

- Introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet, networking and mobile computing

Course Outcomes:

- Bridge the fundamental concepts of computers with the present level of knowledge of the students. Understand binary, hexadecimal and octal number systems and their arithmetic. Understand how logic circuits and Boolean algebra forms as the basics of digital computer

Unit.1.

(15 Hrs)

- **Computer Fundamentals:** Block diagram of a computer, characteristics of computers and generations of computers. Categories of Computers - Supercomputer, mainframe computer, network server, Workstation, Desktop computers, notebook computer, Tablet PC, handheld PC, smart phone.
- **Input Devices:** Keyboard, Mouse, Joy tick, Track Ball, Touch Screen, Light Pen, Digitizer, Scanners, Speech Recognition Devices, Optical Recognition devices – OMR, OBR, OCR
- **Output Devices:** Monitors, Impact Printers – Dot matrix, Character and Line printer, Non Impact Printers – DeskJet and Laser printers, Plotter.

Unit.2.

(15 Hrs)

- **Memories:** Memory Hierarchy, Primary Memory – RAM, ROM, Cache memory. Secondary Storage Devices - Hard Disk, Compact Disk, DVD, Flash memory.
- **Software:** Types of Software- System Software, Application Software, Firmware. Type of System Software: Operating Systems, Language Translators, Utility Programs, Communications Software.
- **Commonly Used Application Software:** Word Processor, Spreadsheet, Database, Education, Entertainment Software.
- **Computer Languages:** Machine language, assembly language, high level language, 4GL.

Unit: 3

(15Hrs)

- **Number System:** Non-positional and positional number systems, Base conversion, Concept of Bit and Byte, binary, decimal, hexadecimal, and octal systems, conversion from one system to the other. Binary Arithmetic: Addition, subtraction and multiplication, 1's complement, 2's complement, subtraction using 1's complement and 2's complement.
- **Computer Codes:** Weighted and non-weighted code, BCD, EBCDIC, ASCII, Unicode.
- **Computer Network:** Network types, network topologies.

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Unit: 4.

(15 Hrs)

- **Internet Related Concepts:** Internet, World Wide Web, Hypertext, Uniform Resource Locator, Web Browsers, IP Address, Domain Name, Internet Services Providers, Internet Security, Web Search Engine, Net Surfing, web portal, Wiki, Blog.
- **Advanced Trends in IT :** Mobile Internet, GPS, 3G, 4G, Wi-Fi, Bluetooth, Cloud Technology, Virtual LAN Technology, Firewall, E-Commerce, M-Commerce, Nanotechnology, Virtual Reality, BPO and KPO, Online shopping, Social Media - YouTube, FaceBook, LinkedIn, Twitter, Google+.
- **Applications of IT:** IT in Business and Industry, IT in Education & training, IT in Science and Technology, IT and Entertainment, Current Trends in IT Application - AI, Virtual Reports, voice recognition, Robots, Multimedia Technology.

Reference Books:

- Peter Nortorn, Introduction to Computers, Seventh Edition
- V. Rajaraman, Fundamentals of Computers, PHI.
- Larry E. Long and Nancy Long, Computers: Information Technology in Perspective, PHI.
- N. Subramanian, Introduction to Computers, Tata McGraw-Hill.

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(4 YEARS COURSE)**

PHYSICAL OPTICS (Optics II)-LAB

Subject Code: BOPTS1-206

**L T P C
0 0 4 2**

Duration: 30 (Hrs.)

Course Objectives:

- The student should demonstrate fundamental knowledge and insight into **physical** 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.

Course Outcomes:

- To learn the fundamental principles of classical physical optics. To learn the mathematical techniques employed in physical optics. To use these principles and techniques to solve problems in optics. To become familiar with the ray-tracing program BEAM-2 used in optical design.

Experiments

- To determine the wavelength of a monochromatic light source with the help of Fresnel's Biprism.
- To determine the radius of curvature of convex surface of a lens by Newton's ring method.
- To determine Planck's constant using photocell.
- To study the diffraction through a single slit & to determine its width.
- To determine the slit width & the separation between the slits of a double slit system from its Fraunhofer diffraction pattern.
- Determination of the wavelength of monochromatic light using diffraction grating.
- To calibrate a Polarimeter & hence to determine the unknown concentration of sugar solution.
- To determine the wavelength of the Laser source by forming diffraction pattern with transmission grating.
- 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,

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COMPUTER FUNDAMENTALS –LAB

Subject Code: BOPTS1-207

**L T P C
0 0 2 1**

Duration: 15 (Hrs.)

Course Objectives:

- Introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet, networking and mobile computing

Course Outcomes:

- Bridge the fundamental concepts of computers with the present level of knowledge of the students. Understand binary, hexadecimal and octal number systems and their arithmetic. Understand how logic circuits and Boolean algebra forms as the basics of digital computer

Experiment-

- Design a questionnaire using a word processing package to gather information about a particular disease.
- Create a HTML web page to show personal information.
- Retrieve the information of a drug and its adverse effects using online tools.
- Creating mailing labels Using Label Wizard , generating label in MS WORD.
- Create a database in MS Access to store the patient information with the required fields Using access.
- Design a form in MS Access to view, add, delete and modify the patient record in the database.
- Generating report and printing the report from patient database.
- Creating invoice table using – MS Access.
- Drug information storage and retrieval using MS Access.
- Creating and working with queries in MS Access.
- Exporting Tables, Queries, Forms and Reports to web pages.
- Exporting Tables, Queries, Forms and Reports to XML pages.

Recommended books (Latest edition):

- Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.
- Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
- Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA).