

**STUDY & EVALUATION SCHEMES
OF
BACHELOR OF OPTOMETRY (BO)
(BO - III SEMESTER)**

[Applicable w.e.f. Academic Session 2020-21]



**INTEGRAL UNIVERSITY, LUCKNOW
DASAULI, P.O. BAS-HA KURSI ROAD, LUCKNOW – 226026**

Website: www.iul.ac.in

**Syllabus approved by Board of Study, Faculty Board, Academic Council,
Executive Council of the Integral University, Lucknow**

INTEGRAL UNIVERSITY, LUCKNOW
INTEGRAL INSTITUTE OF ALLIED HEALTH SCIENCES & RESEARCH
DEPARTMENT OF PARAMEDICAL & HEALTH SCIENCES

STUDY & EVALUATION SCHEME
BACHELOR OF OPTOMETRY (BO)
(w.e.f. July 2020)

II- Year

III-Semester

S. No	Code	Name of the Subject	Periods			Credits	Evaluation Scheme				Subject Total
			L	T	P		C	Sessional		Exam	
						CT		TA	Total	ESE	
1.	BO201	Optometric Optics-II	3	1	0	4	40	20	60	40	100
2.	BO202	Visual Optics-I	3	1	0	4	40	20	60	40	100
3.	BO203	Optometric Instruments	3	1	0	4	40	20	60	40	100
4.	BO204	Ocular Diseases-I	3	1	0	4	40	20	60	40	100
5.	BO205	General & Ocular Pathology/Microbiology	2	1	0	3	40	20	60	40	100
6.	ES101	Environmental Studies	2	1	0	3	40	20	60	40	100
7.	BO206	Optometric Optics-II - Lab	0	0	2	1	40	20	60	40	100
8.	BO207	Visual Optics-I - Lab	0	0	2	1	40	20	60	40	100
9.	BO208	Optometric Instruments - Lab	0	0	2	1	40	20	60	40	100
		Total	16	06	06	25	360	180	540	360	900

L: Lecture **T:** Tutorials **P:** Practical **C:** Credit **CT:** Class

Test

TA: Teacher Assessment **ESE:** End Semester Examination

Sessional Total: Class Test + Teacher Assessment

Subject Total: Sessional Total + End Semester Examination (ESE)

SUBJECT NAME: OPTOMETRIC OPTICS-II
SUBJECT CODE: BO201
(w.e.f July 2020)

L T P
3 1 0

OBJECTIVES: Skills/knowledge to be acquired at the end of this course:

1. To select the tool power for grinding process
2. Different types of materials used to make lenses and its characteristics
3. Lens designs–Bifocals, progressive lens
4. Tinted, Protective & Special lenses
5. Spectacle frames –manufacture process & materials
6. Art and science of dispensing spectacle lens and frames based on the glass prescription.
7. Reading of spectacle prescription. Counselling the patient
8. Lens edge thickness calculation
9. Frame & lens measurements and selection
10. Writing spectacle lens order

UNIT I-

(8 hours)

1. Raw materials - History and General Outline,
2. Manufacturing of Ophthalmic Blanks – Glass & Plastics,
3. Terminology used in Lens Workshops,
4. Surfacing process from Blanks to lenses
5. Definition & Materials (Glass, Plastics, Polycarbonate, Triology) types and Characteristics
6. Properties (Refractive index, specific gravity, UV cut off, impact resistance – include drop ball test, abbe value, Center thickness

UNIT II-

(8 hours)

1. Best form of lenses & Safety standards for Ophthalmic lenses (FDA, ANSI, ISI, Others)
2. Design of High Powered Lenses, Hi-index lenses
3. Calculation of Refractive index Aspheric lenses
4. High index lenses, Bifocal designs, their manufacturing & uses (Kryptok, Univis D, Executive, Invisible, Occupational)

UNIT III-

(8 hours)

1. Progressive Addition Lenses,
2. Modified near vision lenses (designs, advantages, limitations)
3. Lens enhancements (Scratch resistant coatings – spin/dip, Anti-reflection coating, UV coating, Hydrophobic coating, anti-static coating)
4. Lens defects – Description and Detection

UNIT IV-

(8 hours)

1. Glazing & edging (manual & automatic)
2. Special lenses
 - i. Lenticulars
 - ii. Aspherics
 - iii. Fresnel lenses & Prisms
 - iv. Aniseikonic lenses
 - v. Photochromics
 - vi. Polaroids
 - vii. Tinted lenses – Tints, filters
3. Tinted lenses – absorptive properties
4. Tinted lenses – examples and discussions, Special purpose lenses

UNIT V- SPECTACLE FRAMES:**(8 hours)**

1. Components of spectacle prescription & interpretation, transposition, Add and near
2. Frame selection –based on spectacle prescription, professional requirements, age group, face shape
3. Neutralization –Hand & lensometer, axis marking, prism marking
4. Faults in spectacles (lens fitting, frame fitting, patients complaints, description,
5. Final checking & dispensing of spectacles to customers, counseling on wearing & maintaining of spectacles, Accessories –Bands, chains, boxes, slevets, cleaners, screwdriver kit
6. Special types of spectacle frames
Monocles, Ptois crutches, Industrial safety glasses, Welding glasses

RECOMMENDED BOOKS:

1. Jalie MO: Ophthalmic lens and Dispensing, 3rd edition, Butterworth –Heinemann, 2008
2. Troy E. Fannin, Theodore Grosvenor: Clinical Optics, 2nd edition, Butterworth – Heinemann, 1996
3. C W Brooks, IM Borish: System for Ophthalmic Dispensing, 3rd edition, Butterworth - Heinemann, 2007
4. Michael P Keating: Geometric, Physical & Visual Optics, 2nd edition, Butterworth – Heinemann, 2002

SUBJECT NAME: VISUAL OPTICS-I
SUBJECT CODE: BO202
(w.e.f. July 2020)

L T P
3 1 0

OBJECTIVES: Upon completion of the course, the student should be able:

1. To understand the fundamentals of optical components of the eye
2. To gain theoretical knowledge and practical skill on visual acuity measurement, objective and subjective clinical refraction.

UNIT I- (8 hours)

1. Review of Geometrical Optics: Vergence and power
2. Conjugacy, object space and image space, Sign convention
3. Spherical refracting surface , Spherical mirror;
4. Catoptrics power, Cardinal points

UNIT II- (8 hours)

1. Magnification, Light and visual function
2. Clinical Relevance of: Fluorescence, Interference, Diffraction,
3. Polarization, Bi- refraction, Dichroism
4. Aberration and application Spherical and Chromatic

UNIT III- (8 hours)

1. Optics of Ocular Structure
2. Cornea and aqueous
3. Crystalline lens
4. Vitreous
5. Schematic and reduced eye

UNIT IV- (8 hours)

1. Measurements of Optical Constants of the Eye
2. Corneal curvature and thickness
3. Keratometry, Curvature of the lens and ophthalmometry
4. Axial and axis of the eye, Basic Aspects of Vision.
5. Visual Acuity, Light and Dark Adaptation, Color Vision, Spatial and Temporal Resolution, Science of Measuring visual performance and application to Clinical Optometry

UNIT V- (8 hours)

1. Refractive anomalies and their causes, Etiology of refractive anomalies
2. Contributing variability and their ranges
3. Populating distributions of anomalies.
4. Optical component measurements
5. Growth of the eye in relation to refractive errors

RECOMMENDED BOOKS:

1. A H Tunncliffe: Visual optics, The Association of British Optician, 1987
2. AG Bennett & RB Rabbets: Clinical Visual optics, 3rd edition, Butterworth Heinemann, 1998
3. M P Keating: Geometric, Physical and Visual optics, 2nd edition, Butterworth-Heinemann, USA, 2002
4. HL Rubin: Optics for clinicians, 2nd edition, Triad publishing company. Florida, 1974.
5. H Obstfeld: Optic in Vision- Foundations of visual optics & associated computations, 2nd edition, Butterworth, UK, 1982.
6. WJ Benjamin: Borish's clinical refraction, 2nd edition, Butterworth Heinemann, Missouri, USA, 2006
7. T Grosvenor: Primary Care Optometry, 4th edition, Butterworth – heinemann, USA, 2002

SUBJECT NAME: OPTOMETRIC INSTRUMENTS

SUBJECT CODE: BO203

(w.e.f. July 2020)

L T P
3 1 0

OBJECTIVES: Upon completion of the course, the student should be able to gain theoretical knowledge and basic practical skill in handling the following instruments-

1. Visual Acuity chart/drum
2. Retinoscope, Trail Box, Jackson Cross cylinder, Direct ophthalmoscope
3. Slit lamp Biomicroscope, Slit lamp Ophthalmoscopy (+90, 78 D)
4. Gonioscope, Tonometer: Applanation Tonometer, Keratometer
5. Perimeter, Electrodiagnostic instrument (ERG, VEP, EOG)
6. A –Scan Ultrasound, Lensometer

UNIT I- REFRACTIVE INSTRUMENTS

(8 hours)

1. Optotypes and MTF, Spatial Frequency
2. Test charts standards, Choice of test charts
3. Trial case lenses , Refractor (phoropter) head units
4. Optical considerations of refractor units, Trial frame design
5. Near vision difficulties with units and trial frames

UNIT II- RETINOSCOPE

(8 hours)

1. Retinoscope – types available, Adjustment of Retinoscopes- special features
2. Objective optometers, Infrared optometer devices.
3. Projection charts, Illumination of the consulting room.
4. Brightness acuity test, Vision analyzer
5. Pupilometer, Potential Acuity Meter, Abberometer

UNIT III- OPHTHALMOSCOPES AND RELATED DEVICES

(8 hours)

1. Design of ophthalmoscopes – illumination
2. Design of ophthalmoscopes- viewing
3. Ophthalmoscope disc, Filters for ophthalmoscopy, Indirect ophthalmoscope
4. Tonometer, Tonometer principles, Types of tonometers and standardization
5. Use and interpretation of tonometers

UNIT IV- SLIT LAMP

(8 hours)

1. Slit lamp systems
2. Viewing microscope systems
3. Slit lamps in production
4. Slit lamp accessories
5. Slit lamp techniques
6. Slit lamp appearances, Mechanical design instruments

UNIT V-

(8 hours)

1. Fundus Camera, The fundus camera – principles, The fundus camera – techniques
2. External eye photography - apparatus.
3. External eye photography - techniques
4. Corneal examination, Placidos Disc., Keratometer
5. Exophthalmometer
6. Orthoptic Instruments- haploscopes, home devices– pleoptics

RECOMMENDED BOOKS:

1. David Henson: Optometric Instrumentations, Butterworth- Heinnemann, UK, 1991
2. P R Yoder: Mounting Optics in Optical Instruments, SPIE Society of Photo- Optical Instrumentation, 2002
3. G Smith, D A. Atchison: The Eye and Visual Optical Instruments, Cambridge University Press, 1997

SUBJECT NAME: OCULAR DISEASES-I
SUBJECT CODE: BO204
(w.e.f. July 2020)

L T P
3 1 0

OBJECTIVES: At the end of the course the students will be knowledgeable in the following aspects of ocular diseases: Etiology, Epidemiology, Symptoms, Signs, Course sequelae of ocular disease, Diagnostic approach and Management of the ocular diseases.

UNIT I- ORBIT

(8 hours)

1. Proptosis (Classification, Causes, Investigations)
2. Enophthalmos
3. Developmental Anomalies (craniosynostosis, Craniofacial Dysostosis, Hypertelorism, Median facial cleft syndrome)
4. Orbital Inflammations (Preseptal cellulites, Orbital cellulitis Orbital Periostitis, cavernous sinus Thrombosis)
5. Grave's Ophthalmopathy
6. Orbital tumors(Dermoids, capillary haemangioma, Optic nerve glioma)
7. Orbital blowout fractures
8. Orbital surgery (Orbitotomy)
9. Orbital tumors
10. Orbital trauma
11. Approach to a patient with proptosis

UNIT II- LIDS

(8 hours)

1. Congenital anomalies (Ptosis, Coloboma, Epicanthus, Distichiasis, Cryptophthalmos)
2. Oedema of the eyelids(Inflammatory, Solid, Passive edema)
3. Inflammatory disorders (Blepharitis, External Hordeolum, Chalazion, Internal hordeolum, Molluscum Contagiosum).

4.

Lacrimal System

1. Tear Film
2. The Dry Eye (Sjogren's Syndrome)
3. The watering eye (Etiology, clinical evaluation)
4. Dacryocystitis
5. Swelling of the Lacrimal gland(Dacryoadenitis)

UNIT III- CONJUNCTIVA

(8 hours)

1. Inflammations of conjunctiva (Infective conjunctivitis – bacterial, chlamydial, viral , Allergic conjunctivitis, Granulomatous conjunctivitis)
2. Degenerative conditions(Pinguecula, Pterygium, Concretions)
3. Symptomatic conditions(Hyperaemia, Chemosis, Ecchymosis, Xerosis, Discoloration)
4. Cysts and Tumors

UNIT IV- CORNEA

(8 hours)

1. Congenital Anomalies (Megalocornea, Microcornea, Cornea plana, Congenital cloudy cornea)
2. Inflammations of the cornea (Topographical classifications: Ulcerative keratitis and Non ulcerative)
3. Etiological classifications: Infective, Allergic, Trophic, Traumatic, Idiopathic))
4. Degenerations (classifications, Arcussenilis, Vogt's white limbal girdle, Hassal-henle bodies, Lipoid Keratopathy, Band shaped keratopathy, Salzmann's nodular degeneration, Droplet keratopathy,
5. Corneal oedema, Corneal opacity, Corneal vascularisation
6. Penetrating Keratoplasty

UNIT IV- UVEAL TRACT AND SCLERA

(8 hours)

1. Classification of uveitis
2. Etiology
3. Pathology
4. Anterior Uveitis
5. Posterior Uveitis
6. Purulent Uveitis
7. Endophthalmitis
8. Panophthalmitis
9. Pars Planitis
10. Tumors of uveal tract(Melanoma)
11. Episcleritis and scleritis
12. Clinical examination of Uveitis and Scleritis

RECOMMENDED BOOKS:

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

SUBJECT NAME: GENERAL & OCULAR PATHOLOGY/MICROBIOLOGY
SUBJECT CODE: BO205
(w.e.f. July 2020)

L T P
2 1 0

OBJECTIVES At the end of the course students will acquire knowledge in the following aspects:

1. Inflammation and repair aspects.
2. Pathology of various eye parts and adnexa.
3. To prepare the students to gain essential knowledge about the characteristics of bacteria, viruses, fungi and parasites;
4. To acquire knowledge of the principles of sterilisation and disinfection in hospital and ophthalmic practice;
5. To understand the pathogenesis of the diseases caused by the organisms in the human body with particular reference to the eye infections and
6. To understand basic principles of diagnostic ocular Microbiology.

BASIC & OCULAR PATHOLOGY

UNIT I- (8 hours)

1. General pathology: Introduction, principle
2. Pathophysiology of ocular Angiogenesis
3. Neoplasia
4. Inflammation and repair

UNIT II- (8 hours)

1. Infection in general
2. Specific infections
3. Tuberculosis
4. Leprosy, Syphilis

UNIT III- (8 hours)

1. Anemia , Leukemia
2. Bleeding disorders, Examination of blood smears
3. Circulatory disturbances, Thrombosis , Infarction, Embolism
4. Clinical Pathology
5. Examination of urine

BASIC & OCULAR MICROBIOLOGY

UNIT IV- (8 hours)

1. Introduction to microbiology.
2. Types of microorganism
3. Introduction to Bacteria, Virus, Fungus and their differentiation
4. Sterilization and disinfection used in laboratory and hospital practice

UNIT IV- (8 hours)

1. Common bacterial infections of the eye
2. Common fungal infections of the eye
3. Common viral infections of the eye
4. Common parasitic infections of the eye

RECOMMENDED BOOKS:

1. S Ratnagar: Pathology of the eye & orbit, Jaypee brothers Medical Publishers, 1997
2. BURTON G.R.W: Microbiology for the Health Sciences, third edition, J.P. Lippincott Co., St. Louis, 1988.
3. MJ Pelczar (Jr), ECS Chan, NR Krieg : Microbiology ,fifth edition, TATA McGRAW-HILL Publisher, New Delhi,1993
4. CORTON KUMAR AND ROBINS: Pathological Basis of the Disease, 7th Edition, Elsevier, New Delhi, 2004.
5. S R Lakhani Susan AD & Caroline JF: Basic Pathology: An introduction to the mechanism of disease, 1993.
6. KJ Ryan, CG Ray: Sherris Medical Microbiology- An Introduction to infectious Diseases, fourth edition, McGRAW HILL Publisher, New Delhi, 1994 MACKIE & McCartney Practical Medical Microbiology

SUBJECT NAME: ENVIRONMENTAL SCIENCE
SUBJECT CODE: ES101
(w.e.f. July 2020)

L T P
2 1 0

OBJECTIVE:

The student will be made aware of our environment in general, natural resources, ecosystems, environmental pollution and social issues related to environment.

UNIT-I INTRODUCTION TO ENVIRONMENT AND ECOSYSTEMS:

Environment, its components and segments, Multidisciplinary nature of Environmental studies, Concept of Sustainability and sustainable development, Environmental movements, Ecosystem, Structure & Function, Energy flow in the Ecosystem, Ecological Pyramids and Ecological Succession.

UNIT-II NATURAL RESOURCES:

Energy Resources: Renewable and non renewable, Soil erosion and desertification, Deforestation, Water: Use and over exploitation, Impacts of large Dams, Case studies.

UNIT-III BIODIVERSITY AND CONSERVATION:

Levels of biological diversity, Hot spots of biodiversity, India as a Mega Diversity Nation, Endangered and endemic species of India, Threats to Biodiversity, Conservation of Biodiversity, Ecosystem and biodiversity services.

UNIT-IV ENVIRONMENTAL POLLUTION, POLICIES AND PRACTICES:

Environmental pollution, Solid waste management, Ill effects of fireworks, Climate change, Ozone layer depletion, acid rain and impacts on human communities and Environment, Environmental Laws: Environment Protection Act, Wildlife protection Act, Forest conservation Act, Convention on Biological Diversity (CBD), Tribal rights, Human wildlife conflicts.

UNIT-V HUMAN POPULATION AND THE ENVIRONMENT:

Human population growth: Impacts on environment, human health and welfare, Resettlement and rehabilitation of project affected persons, Environmental ethics, Environmental communication and public awareness, case studies.

RECOMMENDED BOOKS:

1. Agarwal, K.C. 2001 Environmental; Biology, Nidi Pub. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Pub. Pvt. Ltd., Ahmedabad-380, India.
3. Brunner R.C. 1989. Hazardous waste incineration, Mc Graw Hill.
4. Clark R.S. Marine Pollution, Clanderon Press Oxford (TB).
5. Cunningham W.P.2001.Cooper, T.H. Gorhani, E & Hepworth, Environmental encyclopedia, Jaicob Publication House, Mumbai.
6. De . A.K. Environmental chemistry Willey Eastern Limited.
7. Glick, H.P.1993 water in crisis, Pacific Institute for studies in dev, Environment & security, Stockholm Env, Institute, Oxford Univ, Press 473 p.
8. Hawkins R .E. Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay.
9. Heywood, V.H. & Watson , R. T.1995.Global biodiversity Assessment .Cambridge Univ.Press 1140 p.
10. Jadhve, H. and Bhosale,V. M. 1995 Environmental protection and laws, Himalaya pub, □ house,Delhi.284 p.

SUBJECT NAME: OPTOMETRIC OPTICS- II- LAB
SUBJECT CODE: BO206
(w.e.f. July 2020)

LT P
0 0 2

1. Recording and ordering of Ophthalmic lenses
2. Terminology used in lens workshop
3. Ophthalmic raw materials – history and general outline
4. Manufacturing of Ophthalmic blanks – Plastics
5. Plastic lenses – materials types and characteristics
6. Plastic lenses – manufacture
7. Ophthalmic lens designs – best form lenses
8. Design of high powered lenses
9. Bifocal design and manufacture
10. Unusual Lens forms
11. Faults in lenses – description
12. Faults in lenses – detection
13. Spectacle repairs –tools, methods, soldering, riveting, frame adjustments
14. Measuring Inter-pupillary distance (IPD) for distance & near, bifocal height

RECOMMENDED BOOKS:

1. Jalie MO: Ophthalmic lens and Dispensing, 3rd edition, Butterworth –Heinemann, 2008
2. Troy E. Fannin, Theodore Grosvenor: Clinical Optics, 2nd edition, Butterworth – Heinemann, 1996
3. C W Brooks, IM Borish: System for Ophthalmic Dispensing, 3rd edition, Butterworth - Heinemann, 2007
4. Michael P Keating: Geometric, Physical & Visual Optics, 2nd edition, Butterworth – Heinemann, 2002

SUBJECT NAME: VISUAL OPTICS- I - LAB
SUBJECT CODE: BO207
(w.e.f. July 2020)

L T P
0 0 2

1. Visual acuity, stereo acuity in emmetropia
2. Myopia and pseudomyopia, myopia and visual acuity
3. Measurement of accommodation: near and far points and range
4. Measurement of Convergence – near point and adduction and abduction range
5. Practice of Retinoscopy – Emmetropia
6. Practice of Retinoscopy - spherical ametropia
7. Practice of Retinoscopy – simple astigmatism
8. Practice of Retinoscopy – compound hyperopia
9. Practice of Retinoscopy – compound myopia
10. Practice of Retinoscopy – oblique astigmatism
11. Practice of Retinoscopy – media opacities
12. Practice of Retinoscopy – in irregular astigmatism
13. Interpretation of cycloplegic Retinoscopy findings

RECOMMENDED BOOKS

1. MP Keating: Geometric, Physical and Visual optics, 2nd edition, Butterworth-Heinemann, USA, 2002
2. HL Rubin: Optics for clinicians, 2nd edition, Triad publishing company. Florida, 1974.
3. H Obstfeld: Optic in Vision- Foundations of visual optics & associated computations, 2nd edition, Butterworth, UK, 1982.
4. WJ Benjamin: Borish's clinical refraction, 2nd edition, Butterworth Heinemann, Missouri, USA, 2006
5. T Grosvenor: Primary Care Optometry, 4th edition, Butterworth –heinneman, USA, 2002

SUBJECTS NAME: OCULAR INSTRUMENTS- LAB
SUBJECT CODE: BO208
(w.e.f. July 2020)

L T P
0 0 2

1. Near vision difficulties with units and trial frames
2. Adjustment of Retinoscope – special features
3. Special subjective test polarizing and displacement etc.
4. Colour vision testing devices
5. Field of vision and screening devices.
6. Perimeter and visual field
7. Results of field examination
8. Vision screeners – principles
9. Vision screeners – details
10. Analysis of screener results
11. Corneal examination- Placidos Disc., Keratometer
12. The fundus camera – techniques
13. Viewing microscope systems
14. The use of ophthalmoscopes in special cases.

RECOMMENDED BOOKS

1. P R Yoder: Mounting Optics in Optical Instruments, SPIE Society of Photo- Optical Instrumentation, 2002
2. G Smith, D A. Atchison: The Eye and Visual Optical Instruments, Cambridge University Press, 1997