

NIMS UNIVERSITY, JAIPUR



SYLLABUS

**MASTER OF OPTOMETRY AND OPHTHALMIC
TECHNOLOGY**

SCHEME OF EXAMINATION

S.N.	Subject	Theory	Practical	Subject Total
1.	Optometry-I	100	100	200
2.	Optometry in Special Need Group – LVA	100	-	100
3.	Contact Lens-I	100	-	100
4.	Optometric Instruments	100	50	150
5.	Ocular Diseases-I	100	-	100
6.	Optometric Investigation	100	50	150

Year – I
Optometry

OPTICS A**Lecture topics****1. NATURE OF LIGHT:**

- a) Wave nature of light – short comings of wave theory.
- b) Quantum theory – dual nature of light.
- c) Mathematical representation of wave – S.H.M. Energy composition of S.H.M. in a straight line and at right angles.
- d) Hugen's Principle – Laws of reflection and refraction at spherical surfaces and lenses.
- e) The paraxial region.
- f) Ray and wave velocity.

2. INTERFERENCE :

- a) Description of the phenomena – Young's experiments, coherent sources, phase and path difference, and intensity. Theory of interference fringes.
- b) Interference in thin films – interference due to reflected and transmitted light – eye's single mirror.
- c) Colours of thin films – wedge shaped thin films – testing of plainness of surface.
- d) Newton's rings experiment – refractive index of liquid.
- e) Non-reflecting films.
- f) Visibility of fringes.

3. DIFFRACTION :

- a) Single slit, qualitative and quantitative.
- b) Circular aperture
- c) Double slit pattern
- d) Multiple slit grating
- e) Reflection grating and the zone plate.

4. POLARISATION :

- a) Polarization of transverse waves – light as transverse waves.
- b) Double refraction, principal plans, Nicol prism – plane polarization
- c) Circular, elliptic polarization production, detection and behaviour.
- d) Optical activity – Fresnel's half shade polarimeter.
- e) Polarisation by selective absorption – dichroism.
- f) Basic principles of Holography.

5. SPECTRUM :

- a) Sources of spectrum, Bunsen – carbon – mercury - sodium
- b) Emission and absorption spectra – classification – visible – ultra violet and infra red spectra – electromagnetic spectrum.

6. SCATTERING :

- a) Rayleigh's scattering

b) Raman scattering

7. SURFACE TENSION

8. VISCOSITY

Lecture Topics for Principles of Lighting

1. Visual Tasks – Factors affecting Visual tasks.
2. Modern theory on light and colour synthesis of light
3. Additive and subtractive synthesis of colour
4. Light sources – Modern light sources, spectral energy, distribution, luminous efficiency, colour temperature, colour rendering
5. Illumination – Luminous flux, candela, solid angle
6. Illumination – Utilization factor, depreciation factor
7. Illumination laws
8. Lighting installation – glare, luminaries, lighting fixtures, types of lighting.
9. Requirements for illuminations of work place
10. Typical lighting installations
11. Specialized aspects of illumination, endoscopes, headlamps etc.
12. Photometry – measurement of illumination, photometers and filters.
13. Eye care and lighting – special case.

PHYSICAL OPTICS

PRACTICAL

1. Determination of cardinal points of lens systems.
2. Fresnel's biprism experiment
3. Grating – wavelength determination
4. Newton's Rings – radius of curvature, Newton's Rings – refractive index of a liquid.
5. Reflection grating
6. Resolving power of a telescope
7. Spectroscope, determination of refractive index of prism
8. Thickness of thin glass plate
9. Use of telescope in small observatory

Text and reference Books:

- a) Geometrical, Physical and Visual Optics – Micheale Keating Butterworth Heinemann.
- b) A Textbook of Optics N.SUBRAMANYAM & BRIJLAL
- c) Fundamental of Optics : F.A. JENKINS & H.E. WHITE

OPTICS B

Lecture Topics

1. **Photometry**
 - a. Basic concepts and definitions in Photometry.
 - b. Reflection co-efficient, transmission co-efficient, powers –transmitted and reflected – Lumen Bodhun photometer.
2. **Refraction Through Spherical Surfaces :**
 - a. Introduction – Lens shapes, vergences and conversion factors. Divergence and secondary focal points – predictable rays.

- b. Spherical refracting interfaces – convex, concave, derivation of vergence equation, sagittas, dioptric power – focal points, nodal points and plane. Symmetry point imaging examples, lateral magnification.
 - c. Thin lens equation – lenses in contact separated. Two lens systems – reduced systems using vergence techniques.
 - d. Application – calculation of image points, dioptric powers in reduced systems using vergence techniques.
 - e. Thick lenses – front and back vertex powers – reduced system – dioptric power of equivalent lenses, cardinal points. Application to calculate the equivalent dioptric power of thick meniscus lens. Plano convex, vertex powers, position of principal planes, dioptric powers using reduced systems. Matrix theory and lens matrices.
3. **Aberrations :**
- a. Chromatic aberrations – dispersion without deviation and deviation with dispersion.
 - b. Dispersion by a prism – angular dispersion – dispersion power – dispersion without deviation and deviation without dispersion. Achromatic prisms and lenses – prism diopters.
 - c. Monochromatic aberrations – first order and third order theory.
 - d. Spherical aberrations, coma, astigmatism, curvature, distortion – cause and the methods of minimizing aberrations.
 - e. Tangent condition for elimination of distortion
4. **Fiber optics** – Introduction and uses, general applications in Ophthalmic & Optical industry.
5. **Colour theories** – trichromatic colour measurement.
6. **Optical instruments** – spectrometer – simple and compound microscope – telescope. Fresnel's biprism – Resolving power of optical instruments – Dispersion power – magnifying power of simple and compound microscope, † telescope.
7. Applications of vergence technique to calculate dioptric powers, separation distances in microscopes and telescopes.

Geometrical Optics Lectures by Physics faculty

1. Rectilinear propagation, Shadows, Huygen's principle.
2. Reflection at plane mirrors, Multiple reflections.
3. Refraction, refractive index, velocity of light.
4. Vergence – Power of single surface. Ray tracing.
5. Thin lens image formation Conjugate foci.
6. Lens aberrations – general
7. Lens aberrations – correction
8. Astigmatic pencils
9. Chromatic aberrations of lenses and its correction.
10. Total internal reflection prism deviation.
11. Minimum and maximum deviation – achromatic prisms.
12. Spherical, Cylindrical and toric surfaces.
13. Aspheric surfaces and lenses.
14. Coaxial systems of spherical surfaces. Reduced vergence

15. Coaxial systems of thin lenses.
16. Stops and apertures in lens systems.
17. Thick lenses and lens systems
18. Thick lenses – advances
19. Dispersion Spectra
20. Magnification and magnifiers.
21. Microscopes introductory
22. Microscopes design
23. Telescopes – History and principles
24. Telescopes – Design and uses
25. Holograms

GEOMETRIC OPTICS

PRACTICAL

1. Refraction through a slab and a curved surface
2. Spherometer and lens gauge
3. Surface power, Spherometer and ray tracing
4. Apparent depth method for refractive index
5. Critical angle – glasses and water
6. Prism deviation and internal reflection
7. Dispersion of prisms
8. Lens system, effects of separations
9. Chromatic aberrations of simple lens
10. Magnifiers measurements of effects
11. Magnifying power of a simple and compound microscope telescope
12. Microscope systems.

Text and reference Books

- a. Geometrical, Physical and Visual Optics – Micheale Keating Butterworth Heinemann
- b. A Text Book of Optics : N. Subramaniam & Brij Lal
- c. Fundamentals of Optics : F.A. Jenkins & H. E. White
- d. Physics for Ophthalmologist – Douglas J.Coster

OPTICS C

Lecture Topics

Ophthalmic Lenses Theory Basics (i)

1. Introduction – Light, mirror, reflection, refraction & absorption.
2. Definitions – Prisms, lenses, frames, spectacles.
3. Prisms – definition, properties, refraction through prisms units.
4. Prisms – uses of prisms. Nomenclature prisms.
5. Thickness difference and base – apex notation.
6. Sign Conventions.
7. Lenses – Definition, Terminology used to describe lenses.
8. Form of Lenses – Convex lenses & concave lenses
9. Refraction & image formation through convex and concave lenses.
10. Determination of focal length and dioptric power of iris.
11. Surface power and radius, refractive index values.
12. Vertex distance and vertex power.

13. Effectivity and effective powers.
14. Lens shape, size, Types i.e. Spherical, Cylindrical, Sphero cylindrical
15. Toric surfaces and their significance, Toric lenses
16. Sturm's conoid.
17. Neutralization of lenses
18. Spherometer and sag formula
19. Focimeter – power of lens and prisms
20. Center marking & Axis marking by focimeter.
21. Simple Transposition.
22. Toric transposition.
23. Prismatic effect, Centeration. Decentration, Prentice's rule.
24. Prismatic effect of sphero-cylinders and Plano cylinders.
25. Differential prismatic effects.
26. Decentration of lenses and edge thickness.
27. Decentration examples.
28. Components and interpretation of spectacles prescription.
29. Prescription mistakes commonly made.
30. Prismatic effect of sphero-cylindrical lenses.
31. Aberrations in Ophthalmic lenses
32. Tilt induced power in spectacles lenses
33. Magnification in high plus lenses
34. Minification in high minus lenses

Ophthalmic Lenses Types, Manufacturing, Workshop Practice

1. Prescription laboratory in action.
2. Instruments for making lenses
3. Outline of lens surfacing and polishing
4. Recording and ordering of Ophthalmic lenses
5. Terminology used in Lens workshops
6. Ophthalmic raw material – history and general outline.
7. Manufacturing of Ophthalmic blanks – Glass
8. Glass lenses – material types and characteristics
9. Glass working –spherical surfaces
10. Glass working – Toric and Aspherical
11. ISI Standards for lenses
12. Ophthalmic lens designs – best form lenses
13. Design of high powered lenses
14. Bifocal design and manufacture
15. Faults in lenses – description
16. Faults in lenses – detection

Spectacles Frames – theory basics (1)

1. History of spectacles
2. Nomenclature and terminology
3. Types and Parts of spectacle frames
4. Spectacles frames – sides and joints
5. Spectacle frame bridge
6. Shapes of spectacle frames – advantages and disadvantages
7. Spectacle frame measurements and markings.

Text and reference Books

- a) Spectacle Lenses – Theory and practice – Coling Fowler, Butterworth Heinemann.
- b) Ophthalmic Lenses and dispensing – M.Jalie, Butterworth Heinemann.
- c) Spectacles Lenses – Theory & Practice – Colin Fowler, Keziah Latham
- d) Ophthalmic Lenses and Dispensing – M.Jalie

Optometry in Special Need Group – LVA

Lecture Topics

Unit-I

1.
 - a. Correction of spherical ametropia
 - b. Axial versus refractive ametropia
 - c. Ocular refraction versus spectacle refraction
 - d. Ocular accommodation versus spectacle accommodation
 - e. Rational image blur, depth of focus and depth of field.
2. Measurement of the optical constants of the eye
 - a. Corneal curvature and thickness
 - b. Keratometry
 - c. Curvature of the lens and ophthalmic phakometry
 - d. Axial and axis of the eye
 - e. Far and Near Point of Accommodation
 - f. Subjective Methods of refractions
 - g. Objective Methods of refraction
 - h. Guideline for correction of refractive error
 - i. Patient Management

Unit-II

3. Introduction to Orthoptics
 - a Extra Ocular Muscles
 - b. Laws of ocular motility
 - c. Accommodation & Convergence
 - d Binocular vision
 - e. Diplopia, Confusion
 - f. Type of deviations
 - g. Introduction to Orthoptic examination
 - h. Introduction to Orthoptic instruments

Optometric Optics Practical Demonstrations

1. Visual acuity, stereo acuity in emmetropia
2. Myopia and pseudomyopia, myopia and visual acuity
3. Myopic correction-subjective verification and monocular and binocular
4. Hypermetropia – determination of manifest error subjectively
5. Hypermetropio correction – subjective verification

6. Demonstration of astigmatism: Use of slit and keratometry to find the principal meridians
7. Astigmatism: Fan – subjective verification tests.
8. Astigmatism: Cross-cyl. Subjective verification tests.
9. Measurement of accommodation: near and far points and range
10. Presbyopic correction and methods: accommodative reserve, balancing the relative accommodation and cross grid cylinder test.
11. Methods of differentiating axial and refractive ametropia
12. Practice of Retinoscopy – Emmetropia
13. Practice of Retinoscopy - spherical ametropia
14. Practice of Retinoscopy – simple astigmatism
15. Practice of Retinoscopy – compound hyperopia.

Unit-III: Low Vision Aids

1. Identifying a low vision patient
2. History
3. Refraction
4. Evaluation of near vision Amsler grid and the field defects
5. Demonstrating aids
6. Teaching the patient to use aids
7. Guide to selected low vision aids
8. Fitting spectacles telescope and glasses
9. Children with low vision
10. Effects of the eye condition of functional vision
11. Light, glare and contrast in low vision care rehabilitation
12. Diagnostic procedures in low vision care management
13. Optics of low vision aids
14. Bioptic telescopes
15. Optical devices that help people with field defects

Text Book & Reference Books

- a. Practice of Refraction – Duke Elders, Edn. 9, 1991
- b. Optics & Refraction – A.K. Khurana
- c. Clinical Optics – Budd Appleton
- d. Low Vision Aids – Monika Chaudhry

Contact Lens I

Lecture Topics

Unit-I

1. History of Contact lenses
2. Related ocular anatomy and physiology
3. Related Visual Optics
4. Contact Lens materials, terminology, classification
5. Optics of contact Lenses, comparison spectacles
6. Indications and contraindications
7. Advantages and disadvantages of types of Contact lenses
8. Manufacturing Rigid and Soft Contact lenses – various methods
9. Pre-Fitting examination – steps, significance, recording of results
10. Instruments used for examination
11. Special Investigations in pre-fitting examinations
12. Keratometry and Cornea; topography
13. Slit Lamp examination
14. Discussion with patient, choice of lens type

Unit-II

1. Fitting philosophies of contact Lenses – general outline
2. Fitting Rigid Contact lenses
3. Using trial lenses – calculations involved
4. Methods of assessment of Contact Lens fit.
5. Types of fit – Steep, Flat, Optimum – on spherical cornea.
6. Types of fit – Steep, Flat, Optimum – on Toric cornea with spherical lenses
7. Types of fit – Steep, Flat, Optimum – on Toric cornea with toric lenses

Unit-III

1. Calculation and finalizing of Contact Lens parameters
2. Ordering Rigid verifying Contact Lens – writing a prescription to the Laboratory.
3. Checking and verifying Contact Lens from Laboratory
4. Modifications possible with Rigid lenses
5. Components of Lens Care systems for Rigid lenses
6. Contact lens solutions- composition necessity advantages.
7. Teaching the patient to insert and remove Rigid lenses.
8. Common handling instructions to first time wearers
9. Special instructions to the patient wearing Rigid Gas Permeable Contact Lenses.

Text and reference books

- a. Contact Lenses – Dr. V.K. Dada
- b. Contact Lenses Practice – MONTAGUE RUBEN

Optometric Instruments

Lecture Topics

Unit-I

1. Binocular Vision

Unit-II

1. Refractive Instruments
 - a. Test charts standards
 - b. Choice of test charts
 - c. Trial case lenses
 - d. Refractor (phoropter) head units
 - e. Optical considerations of refractor units
 - f. Trial frame design
 - g. Near vision difficulties with units and trial frames
 - h. Retinoscope – types available
 - i. Adjustment of Retinoscope – special features
 - j. Cylinder retinoscopy
 - k. Objective optometers
 - l. Coincidence optometers-principals and details
 - m. Infrared optometer devices
 - n. The interpretation of objective findings
 - o. Special subjective test polarizing and displacement etc.
 - p. Projection charts
 - q. Illumination of the consulting room
 - r. Time and motion study in refraction
 - s. Furniture and accessories in the practice
 - t. Instruments of the future

Unit-III

1. Ophthalmoscopes and related devices
 - a. Design of ophthalmoscopes- illumination
 - b. Design of ophthalmoscopes- viewing
 - c. Ophthalmoscopes disc
 - d. Filters for ophthalmoscopes
 - e. Indirect ophthalmoscopes
 - f. The use of ophthalmoscopes in special cases.
2. Lensometer, lens gauge or clock

Unit-IV

1. Slit Lamp
 - a. Slit lamp systems
 - b. Viewing microscope systems
 - c. Slit lamps in production
 - d. Slit lamp accessories
 - e. Slit lamp techniques
 - f. Slit lamp appearances

- g. Mechanical design instruments
- 2. Tonometer
 - a. Tonometer principles
 - b. Types of tonometers and standardization
 - c. Use and interpretation of tonometers
- 3. Fundus Camera
 - a. The fundus camera - principles
 - b. The fundus camera – techniques
- 4. External eye photography - apparatus.
 - a. External eye photography - techniques
- 5. Corneal examination
 - a. Placidos Disc.
 - b. Keratometer
 - c. Video Keratoscopy
 - d. Corneal Topography
 - e. Specular Microscope
 - f. Aesthesiometer
- 6. Exophthalmometer
- 7. Refractionometer
- 8. Orthoptic Instruments
 - a. Orthoptic instruments - haploscopes
 - b. Orthoptic instruments – home devices
 - c. Orthoptic instruments – pleoptics
 - d. Historical instruments

Unit-V

- 1. Colour vision testing devices
- 2. Field of vision and screening devices.
 - a. Perimeter and visual field
 - b. Campimeters and fixation devices
 - c. Illumination of field testing instruments
 - d. Projection perimeters and Campimeters
 - e. e Screening devices for field defects
 - f. Results of field examination
 - g. Vision screeners – principles
 - h. Vision screeners – details
 - i. Analysis of screener results

Text and reference Books

- a. Basic Ophthalmology - Renu Jogi 3rd Ed., Jaypee published
- b. Parson's Diseases of the eye – Ramanjit Sihota. Radhika Tandon 20th Ed. Elsevier Pvt. Ltd.
- c. Low Vision Aids – Monica Chaudhry 2006 Jaypee published
- d. Practical Manual of Ophthalmology – Vinod Lohiya 2006, Jaypee published
- e. Basic Ophthalmology – Basak

Ocular Diseases – I

Lecture Topics

Unit-I: Eyelids

1. Eyelid anatomy
2. Congenital and developmental anomalies
3. Blepharospasm
4. Ectropion
5. Entropion
6. Trichiasis and symblepharon
7. Eyelid inflammations
8. Eyelid tumors
9. Ptosis
10. Eyelid retraction
11. Eyelid trauma

Lacrimal System

1. Lacrimal anatomy
2. Lacrimal pump
3. Methods of lacrimal evaluation
4. Congenital and development anomalies of the lacrimal system
5. Lacrimal obstruction
6. Lacrimal sac tumors
1. Lacrimal trauma

Unit-II: Sclera, Episclera

1. Ectasis and staphyloma
2. Scleritis and episcleritis

Orbit

1. Orbital anatomy
2. Incidence of orbital abnormalities
3. Methods of orbital examination
4. Congenital and developmental anomalies of the orbit
5. Orbital tumors
6. Orbital inflammation
7. Sinus disorders affecting the orbit
8. Orbital trauma

Unit-III: Conjunctiva and Cornea

- a. Inflammation
- b.
 1. Therapeutic principles,
 2. Specific inflammatory diseases
- c. Tumors
 1. Tumors of epithelial origin
 2. Glandular and adenexa tumors
 3. Tumors of neuroectodermal origin
 4. Vascular Tumors
 5. Xanthomatous origin

6. Inflammatory tumors
7. Metastatic lesions
- d. Degeneration and dystrophies
 1. Definition
 2. Degeneration's
 3. Dystrophies
- e. Miscellaneous conditions
 1. Keratoconjunctivitis Sicca (K-Sicca)
 2. Tear function tests
 3. Steven Johnson syndrome
 4. Ocular Rosacea
 5. Atopic eye disorders
 6. Benign mucosal pemphigoid (BMP)-ocular pemphigoid
 7. Vitamin A deficiency
 8. Metabolic diseases associated with corneal changes

Unit-IV: IRIS, Ciliary Body and Pupil

- a. Congenital anomalies
- b. Primary and secondary disease of the iris and ciliary body
- c. Tumors
- d. Anomalies of pupillary reaction

Choroid

- a. Congenital anomalies of the choroid
- b. Diseases of the choroid
- c. Tumors

Text and reference books

- a. Parsons Diseases of the eye, Ramanjit Sihota, Radhika Tondon. 20th Ed. Elsevier. Pvt. Ltd.
- b. Clinical Ophthalmology – JACK J. KANSKI, 2nd Ed., 1989 Butterworths.
- c. Modern Ophthalmology – L.C. Dutta 3rd Ed., Jaypee publishers.
- d. Ophthalmology for undergraduate students – M.L Agrawal, L.C. Gupta, Sanjeev Agarwal - Jaypee published 1st Ed.
- e. Text book of ophthalmology – H.V. Nema 4th Ed., Jaypee publishers.
- f. Basic Ophthalmology – Renu Jogi Jaypee publishers.

Optometric Investigations

Lecture Topics

Unit-I

1. Visual Acuity Testing & Theory
2. Colour Vision Testing & Theory
3. Electro Retino Graphy, E.R.G.
4. Electro Oculo Graphy, E.O.G.
5. Electro Myo Graphy, E.M.G.
6. Electro Nystagmo Graphy, E.N.G.

Unit-II

1. Fluorescein Angiography F.A.
2. Ultrasono Graphy U.S.G.
3. Visual Evoked Response / Potential V.E.R. or V.E.P.
4. Tonometer, Tonometry & Tonography
5. Visual Field Charting & Perimetry
6. Adaptation & Adaptometry
7. Berman's Locator

Unit-III

1. Cryo Technique
2. Diathermy
3. Photo-coagulation
4. Method's of examination (Focal illumination)
5. Slit lamp and attachments
6. Goinoscopy
7. Pachymetry
8. Ocular Photography (Ant.Seg.)
9. Contact & Trans-illumination

Unit-IV

1. pH Testing & Schirmer's Test
2. Fluorescein Staining & Techniques
3. Syringing & Lacrimal Function Test
4. Ophthalmomolscopy
5. Retinoscopy
6. Auto-Refracton
7. Keratometry
8. Ophthalmic Lens Measuring Instruments

Text and reference books

- a. Clinical procedures in Primary Eye Care – David Elliott, Butterworth Heinemann
- b. Basic and Clinical Science Course, American Academy of Ophthalmology (AAO)
- c. Clinical Ophthalmology – JACK J. KANSKI, 2nd Ed. 1989 Butterwosths.

Year - II**SCHEME OF EXAMINATION**

S.N.	Subject	Theory	Practical	Subject Total
1.	Optometry-II	100	100	200
2.	Evidence Based Optometry	100	-	100
3.	Ocular diseases - II	100	-	100
4	Contact Lenses-II	100	-	100
5.	Community Optometry	100	-	100
6.	Applied & Clinical Optometry	100	50	150
7.	Systemic Diseases & the Eye	100	50	150
8.	Major Eye Diseases & Operative Procedure	100	50	150

Optometry-II

OPTICS A

Lecture Topics

1. Introduction Vergence and vergence techniques revised. Lens power, prism power, and cylindrical lenses.
2. Gullstrand's schematic eyes, visual acuity, Stile Crawford experiment and binocular telescopes.
3. Emmetropia and ametropia
4. Correction of spherical ametropia.
5. Thin lens model of the eye – angular magnification – magnification of microscope telescope, spectacle and relative spectacle magnification.
6. Applications- to calculate the angular magnification, dioptric power of the spectacles, spectacles magnification, entrance and exit pupils, vertex distances.
7. Presbyopia.
8. Aphakia
9. Astigmatism – Applications – for e.g. To calculate the dioptric power, angular magnification of spectacles in aphakic, presbyopic patients. To calculate the position of the line image in a sphere cylindrical lens.
10. Laser optics- basic laser principles, - spontaneous and emission. Coherencespatial, temporal, laser pumping, population inversion optical feedback laser resonator stability condition. Gas lasers, and solid lasers, Helium-neon laser Argon ion laser-ruby laser. Monocular laser – carbondioxide, eximer laser. Semi conductor lasers. Lasers in medicine.
11. Holography
12. Spatial distribution of optical information- modulation transfer functions- Spatial filtering – applications.

GEOMETRICAL OPTICS II PRACTICALS

1. Spectrometer – minimum deviation and narrow angled prism
2. Focimeter and neutralization of optical lenses.
3. Dispersive power of a prism
4. Toric lens and meniscus lens
5. Refractive index of various Optical lenses.

Text and reference Books

- a. Optics, WHA Fincham, 9th edition, Butterworths, 1980.
- b. Optics of human eye – Smith Etichision.

OPTICS B

Lecture Topics

Unit-I: Review of Geometrical Optics

1. Vergence and power
2. Sign convention
3. Spherical refracting surface
4. Spherical mirror; catoptric power
5. Cardinal points

6. Magnification

Unit-II: Optics of Ocular Structure

1. Cornea and aqueous
2. Crystalline lens
3. Vitreous
4. Schematic and reduced eye

Unit-III**(A) Refractive conditions of eye**

1. Emmetropia
2. Myopia
3. Hyperopia
4. Astigmatism
5. Presbyopia

(B) Refractive Anomalies and Their Cause

1. Aetiology of refractive anomalies
2. Contributing variabilites and their ranges
3. Populating distributions of anomalies
4. Optical component measurements
5. Growth of the eye in relation to refractive errors

Unit-IV: Accommodation and Convergence

1. Far and Near point of accommodation, range of accommodation emplitude
2. Methods of measurement of Accommodation
3. Near point of convergence of significance
4. Methods of measurements of Convergence
5. Accommodative Convergence Accommodation ratio

Unit-V: Retinoscopy – Principles and Methods

1. Retinoscopy – speed of reflex and optimum condition
2. Retinoscopy – design consideration
3. Review of objective refractive methods
4. Review of subjective refractive methods
5. Cross cylinder methods for astigmatism
6. Difficulties in subjective tests and their avoidance
7. Transposition of lenses
8. Spherical equivalent.

Optometric Optics Practical Demonstrations

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 retinoscopic findings

Text and reference books

- a. Optics and Refraction – L.P. Aggarwal
- b. Principles of Optics and Refraction – Duke Elder
- c. Optics & Refraction – A.K. Khurana
- d. Visual Optics and Refraction – A clinical approach DAVID D. MICHAELS. The C.V. Mosby & Co. 1985.
- e. Principles & Practice of Refraction – N.C. Singhal

OPTICS C

Lecture Topics

Unit-I: Ophthalmic Lenses Types, Manufacturing, Workshop Practice

1. Recording and ordering of Ophthalmic lenses
2. Terminology used in lens workshop
3. Ophthalmic raw materials – history and general outline
4. ISI Standards for lenses
5. Manufacturing of Ophthalmic blanks – Plastics
6. Plastic lenses – materials types and characteristics
7. Plastic lenses – manufacture
8. Ophthalmic lens designs – best form lenses
9. Design of high powered lenses
10. Bifocal design and manufacture
11. Unusual Lens forms
12. Faults in lenses – description
13. Faults in lenses – detection

Unit-II: Types of Ophthalmic lenses

1. Aspheric lenses
2. High index lenses
3. Bifocal and multifocal lenses – types and characteristics.
4. Bifocal and multifocal lenses - purposes and choice
5. Photo chromic lenses
6. Polaroid lenses
7. Tinted lenses – absorptive properties
8. Tinted lenses – examples and discussions
9. Special purpose lenses

Unit-III: Spectacle Frames – theory basics (I)

1. History of spectacles
2. Nomenclature and terminology
3. Classification of frames – Temple position, colouration
4. Types of frame materials – advantages and disadvantages
5. Frame materials – Gold
6. Frame materials – Basic metal
7. Frame materials – Plastics
8. Manufacturing of spectacle frames – overview
9. Face and frame measurement
10. Dyes and colorants – lenses and frames

Unit-IV: Spectacle manufacturing – Optician shops (II)

1. Dispensing counter organization
2. Types of spectacle frames available
3. Types of human faces
4. Face and frame measurements
5. Choice of frames
6. Cosmetic dispensing – different types of faces colours etc.
7. Functional dispensing – various professions and age groups
8. Special purpose frames and accessories
9. Testing of frames – general
10. Testing of frames – special
11. Recording and ordering of frames and appropriate lenses
12. Measurement for ordering spectacles – IPD, marking center, vertex distance calculations.
13. Special measurements for fitting special lenses – Bifocals, multifocals, prism lenses etc.
14. Fitting of lenses in various types of frames.
15. Glazing and Edging Processes
16. Glazing of Bifocals, high powered, other special lenses.
17. Faults in lenses – description and detection
18. Final checking, adjustments to prescription spectacles
19. Final dispensing of spectacles to customer
20. Patient complaints, handing and correction
21. Repairs to spectacles – Soldering, rivets for metal plastics frames
22. Special types of spectacles and appliances
23. Monocells and Ptosis crutches

Text and reference books

- a. Principles of Ophthalmic Lenses : M.JALIE
- b. Spectacle Lenses : Theory & Practice – Colin Fowler & Keziah Latham
- c. Ophthalmic Lenses and Dispensing – M Jalie

Evidence Based Optometry

OPTICS & REFRACTION

Lecture Topics

1.
 - a. Tinted and protective lenses
 - b. Characteristics of tinted lenses
 - c. Absorptive glasses
 - d. Polarizing filters
 - e. Photochromaic filters
 - f. Reflecting filters
2. Bifocal lenses
3. Trifocal lenses
4. Progressive addition lenses
5. Lenticular lenses
6.
 - a. Spectacle magnifiers
 - b. Recumbent prisms and present prisms
 - c. Reflections from spectacle lenses, ghost images reflection in bifocals at the dividing line.
 - d. Anti-reflection coating
 - e. Field of the view of the lenses.
 - f. Size, shape and mountings of the ophthalmic lenses
7. Effective power of spectacles, vertex distance effects
8. Spectacle magnification and relative spectacle magnification

Text and reference books

- a. Principle of Ophthalmic Dispensing : M.JALIE
- b. Spectacle Lens Theory & Practice – COLIN FOWLER

BINOCULAR VISION AND OCULAR MOTILITY

Lecture Topics

Unit-I

General introduction

Binocular vision and space perception development

- a. Fusion, diplopia, correspondence
- b. Stereopsis, Panum's area. BSV
- c. Stereopsis and monocular cue - significance
- d. Egocentric location, clinical applications
- e. Theories of Binocular vision
- f. Relative subjective visual direction
- g. Alternation – theory of Binocular Vision

- h. Projection theory of Binocular Vision
- i. Motor theory of visual orientation

Unit-II

Summary of Anatomy of Extra Ocular Muscles

Rectli and Obliques, PLS

Innervation & Blood supply

Physiology of Ocular movements

Center of rotation, Axes of Fick

Action of individual muscle

Laws of ocular motility

Donder's and Listing's law

Sherrington's law

Hering's law

Unit-III

Unocular & Binocular movements – fixation, saccadic & pursuits

Version & Vengence

Fixation & field of fixation

Nystagmus

Near vision complex

a. Accommodation

i) Definition and mechanism (process)

ii) Methods of measurement

Stimulus and innervations

Types of accommodations

Anomalies of accommodation – aetiology and management

Unit-IV

Convergence

i) Definition and mechanism

ii) Methods of measurement

iii) Types and components of convergence – Tonic, accommodative
fusional proximal

iv) Anomalies of Convergence – aetiology and management

Pupillary Construction

a. Relation to Accommodation and convergence

b. Physiologic significance

c. Reaction to fusion

Unit-V

Visual Acuity

Definition and basic concepts

Factors of affecting visual acuity

Optical effects of spectacles

Aniseikonia

Sensory adaptations

Confusion

Suppression

Abnormal Retinal Correspondence

Blind spot syndrome

Amblyopia

- a. Definition and types
- b. Investigations
- c. Management

Text and reference books

- a. Ocular Motility - VIRGINIA CARLSON HANSEN
- b. Practical Orthoptics in the treatment of the squint – T. KETHLYLE & KANETH W.HYPER
- c. Handbook of Orthoptics principles = G.T. Wilonghby Cashell, Isobel Durrant, Churchill Living stone.

ADVANCED ORTHOPTICS**Lecturer Topics****Unit-I**

Orthoptic check up and special instruments

- a. Routine Orthoptic examination
- b. Special Orthoptic investigation
- c. Instruments used in Orthoptics
- d. Diagnosis, prognosis & management methodologies

Neuro muscular anomalies

- a. Classification
- b. Hetrophoria & hetrotopia
- c. Orthophoria
- d. Concomitant & non concomitant
- e. Paralytic squint

Unit-II

Aetiology

Factors responsible

Role of accommodation & convergence

Genetics and occurrence of squint and binocular vision problems.

Outline of Routine Orthoptics examination

Subjective symptoms – description and significance

Unit-III

History – recording and significance

Measurement of angles of deviation

Sensory signs of patients

Clinical picture of types of squint

- a. Accommodative
- b. Intermittent
- c. Alternate
- d. A & V. Phenomenon

Unit-IV

Paralytic squint

Special forms of squint

Text and reference books

- a. Ocular motility = VIRGUNIA CARLSON HANSAN
- b. Practicle Orthoptics in the treatment of a squint = KETHLYLE & KENNTN WYPER
- c. Handbook of Orthoptic principles – G.T.Willonghby Cashell, Isobel Durrant Churchill Livingstone.

Ocular Diseases II

Lecture Topics

Unit-I: Vitreous

- a. Developmental abnormalities
- b. Hereditary hyaloidoretinopathies
 - Juvenile retinoschisis
 - Asteroid hyalosis
 - Cholestrolosis
- c. Vitreous hemorrhage
 - Blunt trauma and vitreous
 - Inflammation and vitreous
 - Parasitic infestations
 - Pigment granules in the vitreous
- d. Vitreous complications in cataract surgery

Unit-II: Retina

- a. Retinal vascular anomalies
- b. Diseases of the choroidal vasculature, Bruch's membrane, and retina pigment epithelium (RPE)
- c. Retinal tumors and retinoblastoma
- d. Other retinal disorders
 1. Retinal inflammations
 2. Metabolic diseases affecting the retina
 3. Miscellaneous disorders
 4. Electromagnetic radiation effects on the retina
- e. Retinal physiology and psychophysics
- f. Hereditary macular disorders (including albinism)
- g. Peripheral retinal degeneration
- h. Retinal holes and detachments
- i. Intraocular foreign bodies
- j. Photocoagulation

Unit-III: Neuro-Ophthalmology

- a. Neuro-ophthalmic examination
 1. History & Visual function test
 2. Technique of pupillary examination
 3. Ocular motility
 4. Checklist for testing
- b. Visual sensory system
 1. The retina optic disc, optic nerve, optic chiasma, optic tracts
 2. The lateral geniculate body, optic radiations, visual cortex
 3. The visual field
 4. Disorders of visual system
- c. Ocular motor system
 1. Supranuclear control of eye movements
 - i. Saccadic system

- ii. Clinical disorders of the saccadic system
 - Gaze palsies
 - Parkinson's disease.
 - iii. Smooth pursuit system and disorders
 - iv. Non visual reflex system
 - v. Position maintenance system
 - vi. Nystagmus
2. Ocular motor nerves and medial longitudinal fasciculus
 - a. The facial nerve
 - b. Pain and sensation from the eye
 - c. Autonomic nervous system
 - d. Selected system disorders with neuro-ophthalmologic signs

Unit-IV:**Lens**

- a. Anatomy and pathophysiology
 1. Normal anatomy and aging process
 2. Developmental defects
 3. Acquired lenticular defects
- b. Management of lenticular defects

Trauma

- a. Anterior segment trauma
- b. Posterior segment trauma

Blindness

- b. Blindness definitions
 1. Causes
 2. Social implications
 3. Rationale therapy
- c. Drug induced ocular disease.

Text and reference books

- a. Parsons Diseases of the eye, Ramanjit Sihota, Radhika Tondon. 20th Ed. Elsevier. Pvt.Ltd.
- b. Clinical Ophthalmology – JACK J.KANSKI, 2nd Ed., 1989 Butterworths.
- c. Modern Ophthalmology – L.C.Dutta 3rd Ed., Jaypee published.
- d. Ophthalmology for undergraduate students – M.L Agrawal, L.C. Gupta, Sanjeev Agarwal Jaypee published 1st Ed.
- e. Text book of ophthalmology – H.V. Nema 4th Ed., Jaypee published
- f. Basic Ophthalmology – Renu Jogi Jaypee published

Contact Lenses II

Lecturer Topics

Unit-I

1. Soft contact lens – Law materials, classification, terminology, etc.
2. Manufacturing Soft Contact Lenses –various methods- advantages & disadvantages
3. Various designs Soft Contact Lenses - advantages & disadvantages
4. Pre- Fitting examination – steps, significance, recording of result
5. Special points for in pre-fitting examination of Soft Contact Lenses
6. Discussion with patient choice of lens – type
7. Fitting Soft Contact Lenses general outline
8. Fitting Soft Contact Lenses – methods –Trial set method
9. Using trial lenses, calculations involved

Unit-II

1. Fitting Soft Contact Lenses methods first fit method
2. Methods of assessment of Soft Contact Lenses fit.
3. Types of fit – steep , Flat, Optimum – on spherical cornea
4. Types of fit – steep , Flat, Optimum – on Toric cornea with spherical lenses
5. Types of fit – steep , Flat, Optimum – on Toric cornea with toric lenses
6. Calculation and finalizing of Soft Contact Lenses parameters
7. Ordering Soft Contact Lenses – writing a prescription to the Laboratory
8. Fitting Soft Contact Lenses from stock – advantages, limitations, precautions

Unit-III

1. Checking and verifying Soft Contact Lenses
2. Components of Lens care systems for Soft Contact Lenses
3. Contact lens solutions – composition, necessity, advantages
4. Teaching the patient to insert and remove soft lenses
5. Common handling instruction to first time wearers
6. Special instructions to the patient for using soft lenses
7. Special soft lenses – cosmetics, Disposable , Toric
8. Special Rigid Lenses and designs – Toric, Keratoconus, etc.

Unit-IV

1. Special considerations for fitting Contact Lenses, - Children, irregular cornea, Univocal Aphakia, sports one eyes patients post RK, post PRK
2. Ortho – keratology and myopia
3. Fitting Bifocal and multifocal – RGP & Soft lenses
4. After care and follow up for all Contact Lens patients.
5. Patient Problems – identification, differential diagnosis and management

Text and reference books

- a. Contact Lenses – Dr.V.K.Dada
- b. Contact Lenses Practice – MONTAGUE RUBBEN

Community Optometry

PUBLIC RELATIONS

Defining the Subject – Theory and Practice

1. Definitions
2. Public Relations – its distinction from publicity propaganda and advertising
3. The universe of Public Relations – internal and external aspects of PR.
4. Phases of P.R. – Analysis of the internal and external environment – formulating and implementing PR policy feedback, research and evaluation.
5. The benefits of PR – Image building, promotion of product or services, better employee, government and community relations.

Methods of Public Relations

1. Press Relations: Writing and issuing a press release-press conference-facility visit and open house-letters to the editor-assembling press activity.
2. The printed word: Style, color, and design-knowledge, of topography and layouts-direct mails, publicity material and house journal. Use of photographs for publications and special events.
3. The spoken word: Public speaking-microphone techniques
4. Radio and other Audio media: communicating by cassettes- radio interview, discussion and other programs.
5. Film and television: Publicity and educational use of these media-production and distribution.
6. Research in P.R: Opinion and panel research – drawing up of a Questionnaire – interpreting the results.

Public Relations in Action

- a) The employee public: The working relationship-labour management relations- Establishing effective leadership-high cost of breakdowns and alienation-planned effort at P.R.
- b) The customer public: Needs of customers-efficiency and effectiveness of Customer service-feedback and suggestion system.

- c) The government public: Knowledge has and interaction with the central government-state government and municipal government.
- d) The community public: Community opinion-community relations-open house and volunteer activities

Specialised Public Relations

1. Public relations for welfare agencies
2. Public relations for health agencies
3. Public relations for hospitals
4. The perspective: rising demands-escalating costs-charitable heritage-public opinion consciousness-growing consumer movement
5. The P.R. program, employee relations – volunteer groups-medical staff, patients sensitivity to the press and other media.

OCULAR HYGENE

HEALTH EDUCATION

EYE BANKING

Applied & Clinical Optometry

PEDIATRIC OPTOMETRY

Lecturer Topics

1. History - Genetic factors, Prenatal factors, Perinatal factors, Postnatal factors
2. Measurement of visual acuity
3. Normal appearance, pathology and structural anomalies of:
4. Orbit, Eyelids , Lacrimal system, Conjunctiva, Cornea, Sclera
5. Anterior chamber, uveal tract, pupils
6. Lens, vitreous, fundus
7. Oculomotor system
8. Measurement of the refractive system
9. Determining binocular status
10. Determining sensory motor adaptability
11. Compensatory treatment and remedial therapy for
12. Myopia, Pseudomyopia, Hyperopia, Astigmatism, Anisometropia, Amblyopia.
13. Remedial and compensatory treatment for strabismus and nystagmus
14. Vergence and accommodation
15. Delayed development

Text and reference Books

- a. Pediatric Optometry – JEROME ROSNER, Butterworth, London 1982.
- b. Binocular Vision and Ocular Motility – VON NOORDEN G.K. Burian Von Noorden's 2nd Ed. C.V. Mosby Co. St. Louis, 1980
- c. Assessing children's vision – Susan Leat - Butterworth Heinemann

- d. Clinical Pediatric optometry – Leonard Press, Bruce Moore, Butterworth Heinemann
- e. Pediatric Neuro-ophthalmology – Robert Tomsak - Butterworth Heinemann
- f. Vision Problems in childhood – Terry Buckingham, Butterworth Heinemann

OCCUPATIONAL OPTOMETRY

Lecturer Topics

1. Introduction to occupational health, hygiene and safety International Bodies like ILO. WHO, National bodies like Labor institutes, National institute of occupational health, National Safety Council etc.
2. Acts and Rules
Factories Act, and Rules
Workmen's compensation
ESI Act, etc.
3. Occupational diseases/occupational related diseases caused by-physical agents, chemical agents and biological agents
4. Occupational hygiene, environmental monitoring, Recognition, evaluation, control of hazards.
Illumination – definition, measurements, standards.
5. Occupational safety.
Causes of accidents. Vision, Lighting, color and their role.
Accident analysis. Accident prevention
6. Ocular and visual problems of occupation
Electromagnetic radiation
Ionising Non-ionising-infrared, Ultra violet , Microwave laser
Injuries-mechanical, chemical
Toxicology – metals, chemicals
7. Prevention of occupational diseases
Medical examination / medical monitoring
Pre-employment / pre placement
Periodic
8. Personal protective equipment
General
Goggles, face shields etc.
Selection and use
Testing for standards
9. Standards
Visual standards for jobs.
10. Problems of special occupational groups
Drivers, pilots and others
11. Field work – submission of reports
Visits to: Regional Labour Institute selected industries
12. Visual display units (terminals) VDU/VDT
Contact lens and work
Pesticides - general and visual and ocular defects

Text and reference books

- a. Encyclopedia of Occupational Health and Safety, ILO Publication, 1983, Vol. I & II.

- b. IES Lighting Handbook (LH) 1984, IES Publication, NY 1985.
- c. IES Lighting Education introductory lighting (LE) 1985, IES Publication N.Y.1985
- d. Guide to Occupational and other Visual needs – HOLMES C. JOLLIES H. & GREGG J. 1958.
- e. Occupational eye diseases and injuries – JOSEPH MINTON, William Heineann Medical Book Ltd., 1949.
- f. Environmental Vision – Donald Pits - Butterworth Heinemann
- g. Work and the eye – Rachel North - Butterworth Heinemann
- h. Ophthalmic research and epidemiology – Stanley Hatch - Butterworth Heinemann
- i. Professional communication in eye care – Carolyn Begley - Butterworth Heinemann
- j. Sports Vision – D.F.C. Loran, C.J.Mac Eween, Butterworth Heinemann

GERIATRIC OPTOMETRY

Lecturer Topics

1. Structural changes of the eye
2. Physiological changes of the eye
3. Optical and refractive changes of the eye
4. Aphakia, – its correction
5. Ocular diseases common in the old eye, with special reference to cataract, glaucoma Macular disorders, vascular diseases of the eye etc.

Text and reference books.

- a. Vision of the Aging Patient – HIESCH M.J. & WICK R.E. (An Optometric Symposium) 1960.
- b. Vision and Aging – A.J.ROSSENBLOOM Jr. & M.W.MORGAN, Butterworth Heinemann 1993.
- c. Clinical Genatric Eye Care – Sheree Aston, Joseph Maino- Butterworth Heinemann
- d. Clinical Decision making in Optometry – Eilen Ettinger, Michael Rouse, Butterworth Heinemann

Systemic Diseases and The Eye

Lecture Topics

2. ARTERIAL HYPERTENSION
 - Pathophysiology, classification, clinical examination, diagnosis, complications and management.
 - Hypertension and the eye
3. DIABETIS MELLITUS
 - Pathology, classification, clinical features, diagnosis, complications and management.
 - Diabetes mellitus and the eye
4. ACQUIRED HEART DISEASE – EMBOLISM
 - Rheumatic fever – pathophysiology, classification, diagnosis, complications and management.
 - Embolism
 - Subacute bacterial endocarditis
5. CANCER – INTRODUCTION
 - Definitions, nomenclature, characteristics of benign and malignant neoplasm.
 - Grading of staging of cancer, diagnosis principles of treatment.
 - Neoplasia of the eye.
6. CONNECTIVE TISSUE DISEASE
 - Anatomy and pathophysiology : Arthritis
 - Eye and connective tissue disease.
7. THYROID DISEASE
 - Anatomy and physiology of thyroid gland, Classification of thyroid disease.
 - Diagnosis, complications, clinical features, management, thyroid disease of the eye
8. TUBERCULOSIS
 - Etiology, pathology, clinical feature, pulmonary tuberculosis, diagnosis, complications, treatment, tuberculosis and the eye
9. HELMINTHIASIS
 - Classification of helminthic disease, schistosomiasis, principles of diagnosis and management.
 - Helminthic disease and the eye (Taenia, echinococcus, larvae migrans)
10. COMMON TROPICAL ILLS, (Malaria, leprosy, etc.)
 - Introduction to tropical diseases : Malaria.
 - Tropical diseases and the eye – leprosy, toxoplasmosis, syphilis, trachoma.
11. MALNUTRITION
 - Etiology, protein energy malnutrition, water electrolytes, minerals, vitamins, nutritional disorders and the eye.
12. INTRODUCTION TO IMMUNOLOGY

- Introduction, components of the immune system, principle of immunity in health.
- Immunology in disease, Immunology and the eye.

13. NEUROLOGICAL DISORDERS-STROKE/CVA

- Disseminated sclerosis and subacute combined degeneration
- Anatomy and patho-physiology
- Disseminated sclerosis, subacute combined degeneration
- Eye and connective tissue disease.

14. GENERAL, MEDICAL EMERGENCIES – FIRST AID

- Ocular and first aid

15. GENETICS

- Introduction to genetics
- Organisation of the cell
- Chromosome structure and cell division
- Gene structure and basic principles of genetics
- Genetic disorders and their diagnosis
- Genes and the eye
- Genetic counselling and engineering

Text and reference books

- Parson's Diseases of the eye – Stephen J.H. Miller, 17th edition, Churchill Livingstone.
- Clinical Ophthalmology – Jack Kanski (JKK), 1st edition, Butterworths
- Principles and practice of ophthalmology – Vol.1 & 3 – Peyman, Sanders, Goldberg Jaypee publishers 1st Ed.
- System of ophthalmology Vo. XV- Sir Stewart Duke Elder 1976, Henry Kimpton – London.
- Modern Ophthalmology – Arnold Sorsby, systemic aspects – Vol 2. 2nd Ed. 1977 R.J. Acford Ltd.

Major Eye Diseases & Operative Procedure

Lecture Topics

1. Cataract
2. Glaucoma
3. Retinal detachment
4. Cornea ulcer & opacities
5. Visual loss – ophthalmic lesion
6. Diabetic Retinopathy
7. Macular degeneration
8. Chemical burns

Text and reference books

- a. Manual of Ocular fundus examination – Theo Dorion - Butterworth Heinemann
- b. Cataract – William Douthwaite, Butterworth Heinemann
- c. Glaucoma – A colour manual for diagnosis and treatment, 2nd edition – Kanski, Salim, Butterworth Heinemann
- d. The Glaucoma handbook – Anthony Litwak, Butterworth Heinemann
- e. Macular Disorders – Anthony Cavallerano, Butterworth Heinemann