

**THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY
CHENNAI-600 032**



**REGULATIONS AND SYLLABUS
BACHELOR OF OPTOMETRY DEGREE COURSE
2008-2009**

THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY
CHENNAI – 600 032
B.Sc. OPTOMETRY

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| | 5. Basic Biochemistry (I & II) | |
| | 6. Computing and Computer Applications | |
| | 7. Nutrition | |
| | 8. Principles of Lighting | |
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| | 10. Management Principles and Basic Accountancy | |
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| | 1. Optometric Optics (I & II) | |
| | 2. Ocular Diseases (I & II) | |
| | 3. Visual Optics (I & II) | |
| | 4. Pharmacology | |
| | 5. Pathology and Microbiology | |

Internal Papers:

- 6. Marketing and Consumer Behaviour**
- 7. Optometric Instruments**
- 8. Clinical Examination of Visual System**
- 9. Clinical Psychology**
- 10. Clinics (I & II)**

THIRD YEAR 11

- 1. Binocular Vision**
- 2. Glaucoma**
- 3. Low Vision Aids**
- 4. Dispensing Optics**
- 5. Paediatric Optometry and Geriatric Optometry**
- 6. Contact Lens**
- 7. Law & Optometry and Occupational Optometry**

Internal Papers:

- 8. Systemic Diseases**
- 9. Epidemiology and Bio Statistics**
- 10. Public Health and Community Optometry**
- 11. Clinics and Special Clinics (I & II)**
- 12. Project**

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THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY, CHENNAI-600 032.
REGULATIONS FOR BACHELOR OF OPTOMETRY DEGREE COURSE
Regulations of the University

In exercise of the powers conferred by Section 44 of The Tamilnadu Dr. M.G.R. Medical University, Chennai , Act, 1987 (Tamilnadu Act 37 of 1987), the Standing Academic Board of the Tamilnadu Dr. M.G.R. Medical University, Chennai, hereby makes the following regulations.

1. SHORT TITLE AND COMMENCEMENT:

These regulations shall be called “THE REGULATIONS FOR THE Bachelor of OPTOMETRY DEGREE COURSE OF THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY, CHENNAI”.

They shall come into force from the academic year 2008 -2009 session.

The regulation and syllabi are subject to modifications by the Standing Academic Board from time to time.

2. ELIGIBILITY FOR ADMISSION:

- (a) A candidate desiring to join the four year programme leading to the Bachelor of Optometry Degree course should have passed the HSC / CBSE / ISC or equivalent examination with
- i Physics, Chemistry, Biology and Mathematics subjects taken together at the qualifying examination after a period of 12 years of study.
 - ii A pass in English with a minimum of 35% marks is mandatory for all categories for admission to the course.
- (b) A candidate shall, at the time of admission, submit to the Head of the Institution, a Certificate of Medical Fitness from an authorized Medical Officer certifying that the candidate is physically fit to undergo the academic course and does not suffer from any disability or contagious disease.

3. AGE LIMIT FOR ADMISSION:

Every candidate should have completed the age of 17 years as on 31st December of the year of admission.

4. ELIGIBILITY CERTIFICATE:

The candidates who have passed any qualifying examination other than the Higher Secondary Course examination conducted by the Government of Tamilnadu shall obtain an Eligibility Certificate from the University by remitting the prescribed fees along with the filled in Application Form (which can be downloaded from the University website (www.tnmmu.ac.in), Mark Sheet, Transfer Certificate and other relevant documents required by the University before seeking admission to any one of the affiliated Institutions.

5. REGISTRATION:

A candidate admitted to the Bachelor of Optometry Degree Course in any one of the affiliated Institutions of this University shall register his / her name in the prescribed application form for registration duly filled along with the prescribed fee and a declaration in the format, (as in Annexure) to the Academic Officer of this University through the affiliated Institution within 60 days from the Cut-off date prescribed for Bachelor of Optometry Degree Course for admission.

6. DURATION OF THE COURSE:

The duration of the Bachelor of Optometry Degree course shall be three academic years and one year internship.

7. COMMENCEMENT OF THE COURSE:

The course shall commence ordinarily from 1st August of the academic year.

8. COMMENCEMENT OF THE EXAMINATIONS:

Regular Examinations will commence from 1st August and supplementary Examinations will commence from 1st February.

If the date of commencement of the examination falls on Saturday, Sunday or declared Public Holidays, the examination shall begin on the next working day.

9. CUT-OFF DATES FOR ADMISSION TO THE EXAMINATION:

The Candidates admitted upto 30th September shall be registered to take up their 1st year examination during August of the next year.

All kinds of admissions shall be completed on or before 30th September of the academic year. There shall not be any admissions after 30th September even if seats are vacant.

10. MEDIUM OF INSTRUCTION:

English shall be the medium of instruction for all subjects of study and examinations will be conducted only in English.

11. CURRICULUM:

The Curriculum and the Syllabi for the course shall be as prescribed by the University from time to time.

12. WORKING DAYS IN AN ACADEMIC YEAR:

Each academic year shall have a total of 200 working days.

13. ATTENDANCE REQUIRED FOR ADMISSION TO EXAMINATIONS:

- (a) No candidate shall be permitted to appear for the University examinations, unless he/she attends the course for the prescribed period and produces the necessary certificate of attendance and satisfactory conduct from the Head of the Institution.
- (b) Every candidate is required to put in a minimum of 75% of attendance both in theory and practical separately in each subject for admission to the examination.
- (c) A candidate lacking in the prescribed attendance in any subject in theory and /or practical shall not be admitted to the entire examination.

14. CONDONATION OF LACK OF ATTENDANCE;

There shall be not condonation of lack of attendance.

15. INTERNAL ASSESSMENT:

- (a) A minimum of two written internal assessment examinations shall be conducted in each subject during a semester and the average marks of two examinations shall be taken into consideration for the award of internal marks.
- (b) A minimum of two practical examinations shall be conducted in each subject (wherever practical have been included in the curriculum) and the average marks of these two examinations shall be taken into consideration for award of internal marks in practicals.
- (c) A candidate failed in any subject in the University examination shall be provided an opportunity to improve his/her internal assessment marks by conducting a minimum of two examinations in theory and two practicals separately.

16. SUBMISSION OF LABORATORY RECORD NOTE BOOKS:

At the time of practical examination, each candidate shall submit to the examiners his / her laboratory note books duly certified by the Head of the Department as a bonafide record of the work done by the candidate.

In practical record shall be evaluated by the concerned Head of the Department (Internal Evaluator) and the practical record marks shall be submitted to the University 15 days prior to the commencement of the theory Examinations.

In respect of failed candidates the marks awarded for record at previous examination will be carried over for the subsequent examination. The candidates shall have the option to improve his performance by submission of fresh records.

17. CARRY-OVER OF FAILED SUBJECTS:

- (a) Candidates shall be permitted to undergo study in the second year carrying not more than two University Examination subjects in the first year.
- (b) Candidates shall be permitted to undergo study in the third year only after passing all the prescribed subjects of the first year.

However, the candidates are permitted to carry not more than two University Examinations and two internal subjects of the second year.

- (c) Candidates shall be permitted to undergo internship only after passing all the subjects.

18. MARKS QUALIFYING FOR A PASS:

A candidate shall be declared to have passed the examination if he/she obtains the following minimum qualifying marks:-

50% of Marks in the University Theory Examination.

50% of Marks in the University Practical Examination.

50% of Marks in aggregate in Theory, Practical, I.A. & Oral.

19. CLASSIFICATION OF SUCCESSFUL CANDIDATES:

The candidate should have appeared for Theory Practical and Oral Examinations for securing a pass in a subject.

The names of first ten University Rank Holders will be published in the University Website.

20. REVALUATION / RETOTALLING OF ANSWER PAPERS:

There is no provision for revaluation of the answer papers of failed candidates in any examination. However, the failed candidates can apply for retotalling / revaluation.

21. MIGRATION / TRANSFER OF CANDIDATES:

Migration / Transfer of Candidates from one recognized institution to another recognized institution of this University shall be granted on the following conditions:-

- a) All migrations / transfers are subject to the approval of the Vice-Chancellor.
- b) Transfer shall be effected only at the beginning of the academic year.
- c) The transfer application should be sent through proper channel to the Academic Officer within three months of publications of the results or admission to the course.
- d) Transfers shall be effected during any year of study after fulfillment of the regulations of this University.

- e) The Vice-Chancellor has been empowered to decide and issue transfer from one college to another college, subject to verification of the vacancy position available in the college without contravention to the statutory rules of the Central Council and such transfers permitted by the University be placed in the Governing Council for information.
- f) The provision of combination of attendance shall be granted to the transfers for admission to the examination of the University on satisfactory fulfillment of the regulations of this University.

22. RE-ADMISSION AFTER BREAK OF STUDY:

As per the University common Regulations for Re-admission after break of study for all courses (As approved by the Standing Academic Board in its XXVI Meeting on 1612.2003).

23. VACATION:

Six Weeks in an academic year.

24. PATTERN OF QUESTION PAPER FOR UNIVERSITY EXAMINATION:

Theory:

| | | | |
|-------------------------------|--------|---|-----------|
| 2 Essays (20 Marks each) | 2 x 20 | = | 40 Marks |
| 10 Short Notes (6 Marks each) | 10 x 6 | = | 60 Marks |
| | | | ----- |
| | Total: | | 100 Marks |
| | | | ----- |

Bachelor of Optometry

25. SCHEME OF EXAMINATION

FIRST YEAR (200 Working days)*

| S. No. | Subject Title | I A | Univer sity Exam | Practica l/ Viva Voce | Total |
|--------|--|-----|------------------------|-----------------------------|-------|
| 1. | Mathematics I & II | 20 | 80 | - | 100 |
| 2. | Physical and Geometrical Optics (I & II) | 20 | 80 | 50 | 150 |
| 3. | General Anatomy and General Physiology | 20 | 80 | 50 | 150 |
| 4. | Ocular Anatomy and Ocular Physiology | 20 | 80 | 50 | 150 |
| 5. | Basic Biochemistry (I & II) | 20 | 80 | - | 100 |
| 6. | Computing and Computer Applications | 20 | 80 | 50 | 150 |
| 7. | Nutrition | 20 | 80 | 50 | 150 |
| 8. | Principles of Lighting | 20 | 80 | - | 100 |

Internal Papers:

9. Functional English and Communication
10. Management Principles and Basic Accountancy
11. Hospital Procedures

SECOND YEAR**(200 Working days)***

| S. No. | Subject Title | I A | Univer sity Exam | Practical / Viva Voce | Total |
|---------------|----------------------------|------------|---------------------------------|--------------------------------------|--------------|
| 1. | Optometric Optics (I & II) | 20 | 80 | - | 100 |
| 2. | Ocular Diseases (I & II) | 20 | 80 | - | 100 |
| 3. | Visual Optics (I & II) | 20 | 80 | 50 | 150 |
| 4. | Pharmacology | 20 | 80 | - | 100 |
| 5. | Pathology and Microbiology | 20 | 80 | - | 100 |

Internal Papers:

6. Marketing and Consumer Behaviour
7. Optometric Instruments
8. Clinical Examination of Visual System
9. Clinical Psychology
10. Clinics (I & II)

THIRD YEAR
(200 Working days)*

| S. No. | Subject Title | I A | Univer sity Exam | Practical/ Viva Voce | Total |
|---------------|--|------------|---------------------------------|-------------------------------------|--------------|
| 1. | Binocular vision | 20 | 80 | - | 100 |
| 2. | Glaucoma | 20 | 80 | - | 100 |
| 3. | Low Vision Aids | 20 | 80 | 50 | 150 |
| 4. | Dispensing Optics | 20 | 80 | 50 | 150 |
| 5. | Paediatric Optometry and Geriatric Optometry | 20 | 80 | - | 100 |
| 6. | Contact Lens | 20 | 80 | - | 100 |
| 7. | Law & Optometry and Occupational Optometry | 20 | 80 | - | 100 |

Internal Papers:

8. Systemic Diseases
9. Epidemiology and Bio Statistics
10. Public Health and Community Optometry
11. Clinics and Special Clinics (I & II)
12. Project

FOURTH YEAR – INTERNSHIP

Course objectives:

This programme will enable those passing out to become Optometrists who can undertake

1. Correction of refractive errors of the eye and prescription of glasses.
2. Detection of ocular and related systemic and neurological diseases.
3. Designing and fitting of contact lenses, aniseikonic lenses and low vision aids.
4. Diagnosis and orthoptic treatment of oculomotor malfunctions such as heterophoria and strabismus.
5. Public Health Optometry in Schools, Colleges, Urban slums, Rural areas and Occupational Optometry in Industries.
6. Optometric counseling of patients with partial sight, colour blindness and hereditary vision defects.
7. Evaluation of the health status of the eye and visual system and referral of patient to specialists at the appropriate stage.
8. Detection at an early stage of pathological conditions and immediate referral of the patients to specialists.
9. Vision rehabilitation and follow-up work of discharged patients.
10. Public education on ocular hygiene and related nutritional and environmental counseling.

They will however not be permitted to undertake any surgery or application of medicines other than those absolutely required for the discharge of their optometric functions.

The entire course to be conducted under the Senior Instructor or Lecturer with qualification of M.Sc., / M.Phil (Biometric) (4 years experience), Ph.D., as added qualification in Optometric. Junior Instructor should have B.Sc.(Optometric) (4-8 years experience).

These faculties should work directly under the supervision and guidance of Professor of Ophthalmology in the Department of Ophthalmology of the concerned University. These faculties are suggested with only an input of 20 students. For 20 students, one Senior Instructor with qualification of M.Sc., (Optometry) / M.Phil., (Optometry) with added qualification Ph.D., (Optional) with minimum of 4 years experience(Senior Instructor).

Junior Instructor – B.Sc.,(Optometry) – 8 years experience.

Senior Instructor – M.Sc.,(Optometry) / MPhil., - 3 years experience.

SYLLABUS**FIRST YEAR****MATHEMATICS I**

Theory: 60 hours

1. Algebra

Introduction to binomial theorem –Permutation and combination-Mathematical induction-Partial fractions-Types of partial fractions-Boolean Algebra- Boolean Algebraic structure-Principle of duality-Conditional and Biconditional statements-Arguments and their validity.

2. Trigonometry

Introduction to Trigonometrical ratios and identities –Signs of T-ratios-Compound angles $A+B$, $A-B$ –multiple angles $2A$, $3A$ –sub multiple angle $A/2$ – Transformation of product into sum or differences – Conditional identities – Trigonometrical equations – properties of triangles-Solution of triangles-Inverse trigonometric functions-Hyperbolic functions.

3. Differential calculus

Introduction-Concept of differentiation and derivation-Slope of a curve-Differentiability-Differentiation Techniques-Derivative of elementary functions from first principle-Product and Quotient rule-Derivative of trigonometric functions- Derivative of function of function-Logarithmic differentiation-method of substitution-Differentiation of implicit function-Higher order derivatives.

4. Application of Differential Calculus

Tangents and normal to curve-Angle of intersection of two curves-Rate of change-Increasing and decreasing functions-Maxima & Minima-Centre and radius of curvature-Partial differentiation.

5. Co-ordinate Geometry

Introduction to conic-Parabola, Ellipse, Hyperbola –Introduction to 3 dimensional geometry – Spheres.

Reference Books:

1. Algebra and Trigonometry Problem Solver by James R Ogden, Jerry R Shipman, 2003.
2. Linear Algebra and Geometry by Yu I Manin, Alexei I Kostrikin, Mathematics, 1989.
3. Trigonometry by Israel M Gelfrand, Mark E Saul, I M Gel' fand – Mathematics, 2001.
4. The Calculus problem solver by James R Ogden, The Staff of Rea, 2002.
5. Calculus and Analytical Geometry by Sherman K Stein, Anthony Barcellos,2003-Amazon Publications.

MATHEMATICS II

Theory: 60 hours

1. **Integral calculus**

Introduction to integration and formulas-Integrals of function with linear functions-Methods of Integration –Decomposition Method-Method of substitution-Integration by parts- definite integrals.

2. **Application of Integral calculus**

Area under plane curve-Area between two curves-Volume of solid revolution-length of arc-Surface of revolution.

3. **Differential Equation**

Introduction to first and second order differential equations-Solutions of first order but first degree equations-Homogeneous differential equations-Linear differential equations-Second order Linear equations with constant co-efficient.

4. **Application of Matrix and Vector Algebra**

Inverse of matrix-Determinants-properties of determinants-Solving simultaneous equations by matrix method-Solving equations by determinant method-Cramer's rule-application to solving on lens matrices- Dot product and cross products of two vectors-Scalar triple product - vectors-dot and cross product of four vectors.

5. **Mechanics**

Equivalent systems of Forces, moments, couples-Equilibrium of Rigid bodies in 2-D and 3-D – Centroids and Centers of Gravity – Forces in Beams-Friction-Kinematics of Particles-Plane Motion of Rigid Bodies: Energy and Momentum – Methods Navier stokes equation –Vector and Tensors symmetries and conservation-Linear and Nonlinear Oscillations Hamilton and Lagrangian Mechanics-Central Force Motion-Rigid Body dynamics-Coupled systems-Newtonian Mechanics-Laws of Thermodynamics.

Reference Books:

1. Differential and Integral Calculus by R.Courant (1998).
2. Theory of matrices with Applications by Peter Lancaster, Miron Tismenetsky (1985).
3. About vectors by Banesh Hoffmann (1975).
4. Vector methods applied to mechanics and Potential Theory by D E Ruther Ford (2004).
5. New foundation for Classical Mechanics by David Hestenes (1999).
6. Primer of Quantum Mechanics by Marvin Chester (2003).
7. Introduction to Differential Equation by John W Dettman (1976).
8. Introduction to Matrices and Vectors by Jacob T Schwartz (2001)-Pub-Amazon.

PHYSICAL OPTICS

Theory: 60 hours
Practical: 40 hours

1. **Light**

Nature of light-Newton's Corpuscular theory-Huygens's wave theory-Maxwell's electromagnetic theory-Einstein's quantum theory-Dual Nature theory
Properties of light - Spectrum of light
Visible light and the eye- Fechner's Law-Weber's law
Measurement of light-Radiometry-Photometry

2. **Interference**

Interference phenomena in optics-Constructive interference-Destructive interference
Coherence-Spatial coherence-Temporal coherence
Applications of interference
Thomas Young's experiment
Interference in thin films -Lloyd's single mirror-interference due to reflected and transmitted light
Wedge shaped thin films- testing of planeness of surface
Newton's rings experiment-refractive index of liquid
Non-reflecting films
Interferometer-Michelson interferometer-Fabry-Perot interferometer

3. **Diffraction**

Phenomenon of Rectilinear Propagation
Frenel's diffraction
Fraunhofer diffraction
Applied aspects of diffraction
Single slit, qualitative and quantitative
Zone plate
Circular aperture

4. **Polarisation**

Polarization of transverse waves-light as transverse waves
Double refraction
Nicol prism - Nicol prism as an analyser
Elliptically & Circularly polarized light
Optical activity- Frenal's experiment
Biquartz
Applications of polarized light

5. **Spectrum**

Sources of spectrum: Bunsen-carbon-mercury-sodium

Emission and absorption spectra

Classification of emission spectra

Solar spectrum

Ultraviolet Spectrum

Infra red spectrum

Electromagnetic spectrum

6. **Scattering**

Applied aspects-Glare effect-light reduction effect

Photo electric effect

Raman Effect

LASER

7. **Optical instruments**

Spectrometer

Simple and compound microscope

Telescope

Resolving power of optical instruments

Resolving power of the eye

Magnifying power of simple and compound microscope, telescope

Practicals:

1. Newton's Ring's-radius of curvature-refractive index of lens
2. Newton's Ring's-refractive index of a liquid
3. Air wedge-thickness of a wire (hair)
4. Grating-wavelength determination
5. Dispersive power of a grating
6. Grating – minimum deviation & Wavelength determination
7. Reflection grating
8. Diffraction at a straight wire
9. Resolving power of a telescope
10. Polarimeter
11. Fresnel's biprism experiment
12. Thickness of thin glass plate

Reference Books:

1. Optics-Hecht (International Edition 4).
2. The principles of Physical optics-Ernst mach.
3. Physical optics-S.A. Akhmanov & S.Yu.Nikitin.
4. Radiation & Optics – Stone Mc.Graw Hill.
5. The eye & visual optical Instruments-George Smith & David Atchison.
6. Fundamentals of Optics-Jenkins & White, Mc Graw Hill.
7. Principles of Optics-Born & wolf.

GEOMETRIC OPTICS I

Theory: 60 hours

1. **Stimulus of vision**

Laws of reflection and refraction
 Total internal reflection
 The Ray model
 Fermat's principle

2. **Refraction through spherical surfaces**

Introduction: Lenses-Spherical lens-Cylindrical lens-Contact lens -Divergence and convergence of wave fronts by spherical surfaces - Definition of dioptré –Vergence.

Working of spherical lenses – primary and secondary focal points.

Prism diopter: Prentice's law – deviations- Ophthalmic prisms – thin and thick.

Refraction at single Spherical or plane surfaces: convex – concave – Curvature & Sagitta- Vergence & dioptric power-Nodal points & nodal ray-lateral magnification and angular magnification-Snell's law of refraction.

Thin lenses: lenses in contact-lenses separated by a distance. Two lens systems- dioptric & vergence power-(Object-image) relationships.

Application: calculation of image points - dioptric powers in reduced systems using vergence techniques.

Thick lenses -- cardinal points - front and back vertex powers reduced system - dioptric power of equivalent lenses.

Application – to calculate to 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).

Cylindrical and spherocylindrical lenses: location of foci-image planes-principle meridians-refraction by a cylindrical lens -calculation of power in different meridians -spherocylindrical lenses- circle of least confusion- refraction through a sphero cylindrical lens- writing Rx in different forms (+cyl., -cyl., meridional)- additional sphero-cylinders-oblique-cylinders.

3. **Stops, Pupils and Ports:**

Entrance pupil & exit pupil (size & location)
 Field stop
 Entrance port & exit port, field of view, vignetting
 Depth of field and depth of focus

4. **Aberrations:**

Spherical
 Coma
 Oblique astigmatism
 Curvature of field

Distortion
Chromatic

5. Thin prisms and Mirrors

Unit of measurement (prism diopter)
Prism deviation in prism
Combination of thin prisms
Dispersive power of prism-achromatic prisms
Planar & spherical reflection in mirrors
Magnification in mirrors
Lens/mirror systems

Practicals:

1. Refraction through a slab
2. Caustic curve for a glass slab
3. Refraction at a curved surface
4. I-d curve for a prism – pin method
5. Spherometer and lens gauge
6. Single optic lever
7. Double optic lever
8. Spherical mirrors
9. Spherical lenses
10. Critical angle – glass and water
11. magnifying power of a simple and a compound microscope
12. Magnifying power of a telescope

Reference Books:

1. Mirrors, Prisms & Lenses-southall, Dover.
2. Geometric, Physical & Visual Optics-Michael P.Kealing.
3. Aberrations of Optical systems-W.T.Welford.
4. Introduction to Geometrical optics-Milton Katz.
5. N.Subramanyam & Brij Lal: A text book of Optics, S.Chand & Co.

GEOMETRIC OPTICS II

Theory: 60 hours
Practical: 40 hours

INTRODUCTION:

1. Vergence and vergence techniques revised. Lens power, prism power, cylindrical lenses.
2. Gull strand's schematic eyes, visual acuity, Stile Crawford experiment.

Errors of refraction:

3. Emmetropia and ammetropia
4. Correction of ammetropia with lenses
5. Myopia
6. Hypermetropia
7. Astigmatism-Causes of Astigmatism-Types of Astigmatism-Application-for eg., to calculate dioptric power - angular magnification of spectacles in aphakic-presbyopic patients.
8. Aphakia
9. Presbyopia
10. Thin lens model of the eye – angular magnification – magnification of microscope, telescope, Spectacle and relative spectacle magnification. Applications – To calculate the angular magnification, dioptric power of spectacles, spectacle magnification, entrance and exit pupils, vertex distances.

Laser Optics:

11. Laser optics – basic laser principles – spontaneous and stimulated emission. Coherence – spatial, temporal, laser pumping- population inversion optical feedback.
Gas lasers, solid lasers, helium-neon laser- Argon-ion laser-ruby laser.
Monocular laser-carbon dioxide, eximer laser - Semiconductor lasers. Lasers in medicine ophthalmic applications.

Practicals:

1. Spectrometer – minimum deviation
2. Spectrometer – I-d curve
3. Spectrometer – I-I' curve
4. Spectrometer – narrow angled prism
5. Refractive index by microscope
6. Focimeter
7. Dispersive power of a prism
8. Toric lens and meniscus lens
9. Nodal slide

10. Boy's method – radius of curvature
11. Liquid lens
12. Refractive index of lenses
13. Powers of concave and convex mirrors

Reference Books:

1. Lasers –Milonni & Eberly, John wiley & sons.
2. N.Subramanyam & Brij Lal: A text book of Optics, S.Chand & Co.

GENERAL ANATOMY

Theory: 40 hours
Practical: 40 hours

1. **Introduction:**

Subdivisions of Anatomy: Regional and Systemic Anatomy
Planes of the Body
Terminology

2. **Systemic Anatomy**

Skeletal System-Bones of the body
Joints – Classification, Joints of the body
Muscular system
Cardiovascular System- Heart, Arteries & Veins of the Body
Lymphatic system – Lymphoid organs, Lymphatics & Lymphatic drainage of the body
Respiratory system – Upper and lower Respiratory tract, Lungs, Pleura & Muscles of Respiration
Digestive system
Reproductive system
Endocrine system
Special senses – Ear, Tongue and Nose

3. **Histology**

Ephithelial Tissue
Connective Tissue
Cartilage
Bone
Muscular Tissue
Cardiovascular Tissue
Lymphoid organs
Nervous System
Skin & Appendages
Exocrine glands – Salivary, Lacrimal, Mammary & Pancreas
Endocrine glands – Thyroid, Parathyroid, Pituitary & Adrenal
Eye – Cornea & Retina

Practicals:

1. Skeletal System and Joints
2. Muscular system

3. Cardiovascular System
4. Lymphatic system
5. Respiratory system
6. Digestive system
7. Reproductive system
8. Endocrine system
9. Special senses
10. Epithelial Tissue
11. Connective Tissue
12. Cartilage
13. Bone
14. Muscular Tissue
15. Cardiovascular Tissue
16. Lymphoid organs
17. Nervous System
18. Exocrine glands
19. Endocrine glands
20. Eye

Reference Books:

1. Mariano S.H.Difiore: Atlas of Human Histology, 5th Edn., 1981, Lea & Feliger.
2. G.J.Tortora & N.P.Anagnostakos: Principles of Anatomy and Physiology.
3. Ross & Wilson, Text Book of Anatomy and Physiology.

GENERAL PHYSIOLOGY

Theory: 60 hours
Practical: 40 hours

1. **Introduction to Physiology**

Cell structure, Body fluid compartments, Transport across cell membrane, Homeostasis, Skeletal muscle structure and properties, neuromuscular junction and muscle contraction.

2. **Blood**

Composition and function of Blood, Red blood cells, erythropoiesis, anaemia, White blood cells structure and functions, Platelets and blood coagulation, plasma proteins, blood groups.

3. **Cardiovascular system**

Properties of cardiac muscle, origin and conduction of heart beat, cardiac cycle, ECG, cardiac output, arterial blood pressure measurement, factors affecting and factor regulating it, heart rate and its regulation.

4. **Respiration**

Mechanics of respiration, lung volume and capacities, transport of oxygen and carbondioxide, regulation of respiration, hypoxia and artificial respiration.

5. **Digestive system**

Movements of GI tract, Secretions and functions of salivary glands, gastric glands, pancreas, small intestine, function of liver, absorption in the intestine.

6. **Excretion**

Structure of Nephron, Renal circulation, formation of urine, micturition, diuretics, normal and abnormal constituents of urine, structure and function of skin.

7. **Endocrine system**

All major endocrine glands, their secretion, action and regualtaion with hyper and hypo secretion of the glands.

8. **Reproductive system**

Spermatogenesis, male sex harmones, menstrual cycle, pregnancy and lactation, principles of contraceptive methods.

9. **Nervous system**

Structure of neuron, properties of nerve, nerve impulse conduction, synapse, receptor, spinal cord, reflex action, ascending and descending tracts, structure and function of cerebral cortex,

basal ganglia, thalamus, hypothalamus, brain stem, sleep and reticular formation, autonomic nervous system.

10. **Special tissues**

Olfaction, gustation, Hearing and Vision-Structure, Physiology, pathways and applied aspect.

Practicals:

1. Enumeration of RBC and WBC count
2. Differential count
3. Estimation of Haemoglobin
4. Determination of blood group
5. Determination of bleeding time and clotting time
6. Determination of erythrocyte sedimentation rate
7. Measurement of blood pressure
8. Effect of posture and exercise on blood pressure
9. Radial pulse tracing
10. Clinical examination of cardiovascular and respiratory system
11. Examination of Motor and sensory system
12. Examination of cranial nerves

Reference Books:

1. G.J.Tortora & N.P.Anagnostakos: Principles of Anatomy and Physiology, 4th Edition., Harper & Row Publishers, NY.
2. Parthur C. Guyton: Text book of Medical physiology, 8th Ed., Saunder.

OCULAR ANATOMY

Theory: 40 hours

Practical: 40 hours

1. Surface anatomy of the orbit – Nerve supply & blood supply of Extra-ocular muscles- Neural basis of eye movements – 3rd, 4th, 5th and 6th Cranial nerves – Anatomy of papillary pathway.
2. Eye:
 - Sclera - Anatomy, Anterior & Posterior scleral foramen, Emisaria.
 - Cornea – Structure, transparency, nerves, Limbal transition zone.
 - Iris – Structure, Sphincter pupillae, Dilator Pupillae, blood vessels movement of fluid across iris
 - Ciliary body – Pars plana, pars plicata, blood supply & Nerve supply, Blood supply, accommodation, presbyopia, Aqueous secretion.
 - Retina – anatomy, photoreceptors, general architecture.
3. Refractive media: Anterior chamber relation, Anterior chamber outflow apparatus, Lens structure, Vitreous gross & microscopic anatomy.
4. Eyelids: Orbicularis oculi & levator palpebrae superioris, Anatomy blood supply, nerve supply.
5. Adnexa: Lacrimal apparatus, Embryology and development of eye.

Practicals:

Orbit : Orbital structure demonstration

Eye : Cadaveric enucleation of eye

Reference Books:

1. Inderbir Singh (I.B.S): A Text book of Human Neuro-Anatomy, Vikas Publishing House, 1985.
2. A.K.Dutta: Essentials of Human Anatomy, Current books International Calcutta, Bombay, Chennai, 1989.
3. Richard S Snell & M A Lemp, Ocular Anatomy of the eye, 1998.

OCULAR PHYSIOLOGY

Theory: 40 hours
Practical: 40 hours

| | | |
|-----------------------------------|---|---|
| Eye lid | : | Movements and pathways |
| Lacrimal Apparatus | : | Tear film & composition of tears Tests to assess lacrimal excretory function |
| Extra-ocular muscles | : | articulation of eyeball in socket Mechanics of movement Control of eye movements Diplopia-Diagnosis & assessment Qualification of extraocular muscle Limitation (measurement of torsion, measurement of deviation, measurement of field of BSV, measurement of field of muscle action) |
| Cornea | : | Biochemistry, Corneal Transparency, Innervation |
| Aqueous Humor & Vitreous: | | Aqueous secretion & dynamics Maintenance of IOP, Diurnal variations Measurement of IOP Molecular structure of vitreous & developmental anomalies |
| Crystalline lens & Accommodation: | | Biochemistry, glucose metabolism Changes in lens structure Depth of field & depth of focus Accommodation (Changes, Amplitude, accommodation & refraction, accommodation & convergence) Presbyopia |
| Iris & pupil | | Pupillary reaction to light Measurement of afferent papillary defect Pharmacology of pupil Horner's syndrome & evaluation Analyzing anisocoria |
| Retina | : | Photichemistry of Retina Wald's visual cycle Entopic phenomenon |
| Acuity of vision | : | Vernier acuity, minimum angle of resolution, Principle of measurement, factors affecting visual acuity |
| Visual pathway | : | Optic nerve, chiasm & optic tract Visual deprivation, lesions of pathway |
| Visual Perception | : | Binocular vision, development, theories of fusion, Stereoscopic acuity, |

| | | |
|-------------------|---|--|
| | | tests for stereopsis, anomalies of stereopsis, Dark adaptation |
| Colour Vision | : | Theories of colour vision, Defective colour vision Testing for congenital & acquired colour vision defects |
| Electrophysiology | : | Electro retinogram, Electro oculogram |

Practicals:**Eye and Vision**

1. Lid movements
2. Tests for lacrimal secretion
3. BUT
4. Extraocular movements, anterior segment examination – Slit lamp examination
5. Pupillary reflexes
6. Digital tonometry
7. Schiottz tonometry
8. Measurement of accommodation
9. Visual acuity measurement
10. Ophthalmoscopy and retinoscopy
11. Ophthalmoscopy and retinoscopy
12. Ophthalmoscopy and retinoscopy
13. Light and dark adaptation
14. Binocular vision
15. Colour vision

Reference Books:

1. Davson H: Physiology of the eye, 4th edition., 1980.
2. Sir Steward Duke Elders, System of Ophthalmology, Vol.4 .

BASIC BIOCHEMISTRY I

Theory: 60 hours

1. **Carbohydrates**

Properties of monosaccharide, disaccharides, polysaccharides and their biological importance.

2. **Proteins**

Classification and properties of Amino acids, physiological important peptides, Classification and properties of proteins, plasma proteins, structure of protein, immunoglobulins, chromatography and electrophoresis.

3. **Lipids**

Classification and properties of fatty acids, triglycerides, phospholipids, other compound lipids, cholesterol its derivatives and their biological significance.

4. **Enzymes**

Definition, classification, co-enzymes, factors affecting their action, enzyme inhibition, enzymes of clinical importance.

5. **Vitamins**

Classification, functions, source, deficiency manifestations and hypervitaminoses.

6. **Minerals**

Calcium, Phosphorus, Sodium, Potassium, iron, selenium, iodine, copper.

Reference Books:

1. Dr.S.Ramakrishnan: Essentials of Biochemistry & Ocular Biochemistry 1992, Publications Division, Annamalai University. (EBO).
2. G.Rajagopal & Dr.S.Ramakrishnan: Practical Biochemistry for Medical students, M/s. Orient Longman, Calcutta, 1985 (For Practical).

BASIC BIOCHEMISTRY II

Theory: 60 hours

Practical: 40 hours

1. Hormones basic concepts in metabolic regulation with examples, with respect to insulin.
2. **Metabolism:**
Metabolism of carbohydrates, proteins and lipids.
3. **Ocular Biochemistry:**
Various aspects of the eye, viz., tears, cornea, lens, aqueous, vitreous, retina and pigment rhodopsin.
Importance of the biochemical constituents in ocular tissues.
4. **Technique:**
Colloidal state, sol. Gel, emulsion, dialysis, electrophoresis, Ph buffers mode of buffer action, molar and percentage solutions, photometer, colorimetry and spectrophotometry
Radio isotopes: application in medicine and basic research.
5. **Clinical Biochemistry**
Blood sugar, urea, creatinine and bilirubin significance of their estimation.

Practicals:

Qualitative Experiment

1. Analysis of biochemical substance-Reactions of carbohydrates, proteins, non protein nitrogenous substance.
2. Analysis of abnormal urine.

Demonstration

Quantitative Experiment

Principle, working and use of

1. pH meter
2. Colorimeter-estimation of glucose, urea, cholesterol
3. Electrophoresis
4. Semi automated analyzer
5. Charts on serum protein electrophoretic pattern, cardiac, renal & liver profile

Reference Books:

1. Dr.S.Ramakrishnan: Essentials of Biochemistry & Ocular Biochemistry 1992, Publications Division, Annamalai University (EBO).
2. G.Rajagopal & Dr.S.Ramakrishnan: Practical Biochemistry for Medical students, M/s. Orient Longman, Calcutta, 1985 (For Practical).

COMPUTING AND COMPUTER APPLICATIONS

Theory: 60 hours

Practical: 80 hours

1. **Computers:** History of computers, Definition of computers, input devices, output devices, storage devices, types of memory, and units of measurement, range of computers, generations of computers, characteristics of computers.
 2. **System:** Hardware, Software, system definition, Fundamentals of Networking, Internet, performing searches and working with search engines, types of software and its applications.
 3. **Office application suite** – Word processor, spreadsheet, presentations, other utility tools, Fundamentals of Linux / Windows operating system, functions, interfaces, basic commands, working with the shell and other standard utilities.
-
1. **Language** - Comparison chart of conventional language, programming languages, generations of programming languages, Compilers and interpreters, Universal programming constructs based on SDLC, Variable, constant, identifiers, functions, procedures, if while, do – while, for and other Structures. Programming in C language, Data types, identifiers, functions and its types, arrays, union, structures and pointers.
 2. Introduction to object oriented programming with c++: classes, objects, inheritance polymorphism, and encapsulation. Introduction to databases, and query languages, Introduction to Bioinformatics.

Practicals:

1. Various browsers, search engines, email.
2. Text document with images with multiple formatting options using a specified office package.
3. Spreadsheet using a specified office package.
4. Presentation on a specified topic using the specified locations.
5. Shell programming-parameters.
6. Shell program- regular expressions.
7. C program- functions.
8. C program – file handling.
9. C program demonstrating the usage of user defined variables.
10. Databases.
11. Applications in Optometry.

Reference Books:

1. C Programming Tutorial (K & R version 4) Author(s): Mark Burgess.
2. An introduction to GCC by Brian J.Gough, foreword by Richard M.Stallman.
3. Red Hat Linux 9 bible by Christopher Negus May 2003.
4. Microsoft office 2003 by Jennifer Ackerman Kettell, Guy Hart-Davis.

NUTRITION

Theory: 40 hours
Practical: 40 hours

1. **Introduction**

History of nutrition, Nutrition as science.

2. **Foods**

Food groups, RDA, Food guides, Food Pyramid, Balanced diet, Limitations of daily food guide, Menu planning.

3. **Carbohydrates**

Function, sources, RDA, Dietary fiber.

4. **Proteins**

Sources and functions, Essential and non-essential amino acids, Incomplete and complete proteins, Supplementary food, PEM and the eye, Nitrogen balance, Changes in the protein requirement.

5. **Fats**

Functions and sources, Essential fatty acids, Excess and deficiency, Lipids and the eye.

6. **Energy**

Units of energy, Measurement and energy value of food, Energy expenditure, Total energy/calorie requirement for different age groups and diseases, Energy imbalance – obesity, starvation.

7. **Minerals**

General functions and sources, Macro and micro minerals associated with the eye, Deficiencies and excess – ophthalmic complications (e.g) Iron, calcium, Iodine, etc.

8. **Vitamins**

General functions, food sources, Vitamin deficiencies and associated eye disorders with particular emphasis on vitamin 'A'.

9. **Antioxidant**

Lutein, zeaxanthin, lycopene, Monosodium Glutamate, aspartame and their role in vision.

Practicals:**Test 1: Applied Nutrition**1. **Assessment of nutritional status**

A – anthropometry- height weight measurements, BMI calculation & interpretation, MAC, TSF measurements

B – Biochemical Interpretation

C – 24 hour recall

Bedside exposure

2. **Life cycle**

Nutrition in: pregnancy, lactation, low birth weight, infancy, childhood, adolescence

3. Nutrition in elderly

Test 2: Clinical Nutrition

4. Diabetes Mellitus – Glaucoma, retinopathy – role of diet

5. Hyperlipidemias, Atherosclerosis, Xanthomas

6. Measles and associated eye disorders

Test 3: Miscellaneous

7. Epidemiologic studies of nutrition and cataract

8. Recent advances of nutrition in vision

Reference Books:

1. Nutritional Ophthalmology (Nutrition, Basic and Applied Science) by Donald Stewart MC Lenon, 2nd Ed. (1980).
2. Nutritional and environmental influences on the Eye, Allen Taylor (1999).
3. Nutritional Aspects and Clinical Management of Chronic Disorders and Disease (2002).
4. Normal and Therapeutic Nutrition, Orinne H. Robinson & Narilyn R. Lawler, 1986.
5. Food & Nutrition, Dr. M.Swaminathan, Vol. I & II.

PRINCIPLES OF LIGHTING

Theory: 60 hours

1. Modern theory on light and colour: synthesis of light.
2. Colour theory: Additive and subtractive synthesis of colour- Goethe's theory 7 reasoning – colour temperature-colour rendering.
3. Visual task: factors affecting visual tasks.
4. Light and vision : Discomfort glare - Visual ability- relationship among lighting- visibility and task performance.
5. Light sources: Sunlight-Modern light sources – spectral energy distribution – luminous efficiency – colour temperature – colour rendering.
6. Illumination : Luminous flux, candela, solid angle, illumination, utilization factor, depreciation factor, Illumination laws.
7. Lighting System Design : Design approach, Design process, concept of lighting design, Physical consideration and psychological consideration and types of lighting.
8. Photometry : Photometric quantities - photometers and filters.
9. Fibre optics: Optical description-optical fiber communication -optical fibre cables.

Reference Books:

1. Colour: An introduction to practice and principles.
2. Applied Illumination Engineering-Lindsey.
3. Illuminating Engineering Society of North America Introductory Lighting, 1985.

FUNCTIONAL ENGLISH AND COMMUNICATION

Theory: 40 hours

FUNCTIONAL ENGLISH

1. Grammar

Components of a sentence
 Positive and Negative statements
 Interrogative Statement
 Parts of speech in brief
 Transformation and synthesis of sentences
 Verb and Tense forms
 Voice
 Reported Speech
 Common errors and how to avoid them

2. Vocabulary

Medical Terminology
 Words often confused or misused
 Words and expression in British and American English
 Idioms and Phrases

3. Oral communication

Importance of speaking efficiently
 Voice culture
 Preparation of Speech
 Secrets of good delivery
 Audience Psychology
 Presentation Skills
 Using non-verbal communication
 Interview technique
 Skill in arguing

4. Spoken English

The phonetic symbols
 Stress
 Intonation
 Rhythm
 Transcription
 Using dictionaries for learning to pronounce

5. Written communication

(a) Art of writing

Rules for effective writing
 Expansion of proverbs & Ideas
 Précis writing

(b) Letter writing

Private letters & Social letters
 Business letters
 Letter to a Bank
 Letter to a Newspaper
 Letter to Application

Curriculum Vitae (Different models)

Placing an order

(c) Report writing

Guidelines to prepare a good report

Usage of impersonal language

Preparing lab reports

(d) Note making and Note taking

Note making and note taking strategies

Organizing notes

Exercise and note making / taking

(e) Comprehension

Listening and reading comprehension

(Exercise of prescribed short answers)

6. Reading

(a) What is efficient and fast reading?

(b) Awareness of existing reading habits

(c) Tested techniques for improving speed

(d) Improving concentration and comprehension through systematic study

Reference Books:

1. English for Competitive Examinations by R.P.Bhatnagar, Rajiel Bhargava.
2. English for college and competitive exams by Dyvadatham.
3. Written Communication in English by Sarah Freeman.
4. Writing with a purpose by Tickoo & Sasikumar.
5. English phonetics for Beginners by P.Iyadurai.
6. English through reading by W.Bhaskar and N.S.Prabhu.
7. Empowerment through verbs & idioms by Padmini Devkumar.
8. High School English Grammer and Composition by Wren & Martin.
9. Communication techniques for your success everywhere by Muralidharan.

Method of Evaluation:

Oral presentations, Reading Comprehension exercise, Writing letters, summaries and essays, MCQ's in grammar and vocabulary.

MANAGEMENT PRINCIPLES AND BASIC ACCOUNTANCY

Theory: 40 hours

1. Definition of Management - Concepts of management - Role and importance of Management - Levels of management - Skills of management - Principles of management.
2. Planning – Meaning – Nature - Importance kinds of planning - Planning process - Strategic Planning vs. Operational planning - types of plans – Budgets – Meaning – Importance - Types of Budgets -Functional Budget - Master Budget - Fixed Budget - Flexible budget - Long term budget-Short term budget.
3. Organizing - Principles of organizing – Organizing process – staffing - Elements of staffing – Manpower planning – Process – Direction - Principles of Directing – Supervision – Motivation –Leadership - Leadership skills - Qualities of a good leader - Leadership styles.
4. Basic Accountancy - Need for accountancy - Principles of Accounting - Journal- Ledger-Trial Balance - Final accounts - Balance Sheet - Profit and loss account.

Reference Books:

1. Advanced accountancy, R L Gupta & M Radhasamy.
2. Advanced Accountancy, T.S. Grewell.
3. Management Principles for Health Professionals, 2nd edition (1992)- Joan Gratto Lieblev, Ruth Eller Louvine, Jeffrey Rothman, Aspex publication, Gaithersburg, Maryland.
4. Principles of Management- G.Venkatesan (1994), J.J.Publishers , Madurai.
5. Management in Health Care. A Theoretical and Experiential Approach, (1997)- Elaine Lynne la Monica and Philip Ian Morgan, Macmillan Publishers.
6. Essentials of Management – Harold Koontz and Heinz Wehrich – Tata McGraw Hill, 5th edition.
7. Financial Management I.M.Pandey,, Vikas Publishing House Pvt. Ltd.
8. Financial Management, Prasanna Chandra.
9. Financial Management, Eugene West.
10. Financial Management, S.N.Maheswari.

HOSPITAL PROCEDURES

Practical: 40 hours

Practicals:

1. Accounts Department
2. Laboratory
3. Bio-Medical Engineering department
4. Medical records Department
5. Correspondence
6. Stores
7. House Keeping
8. Reception
9. Computer Department
10. Fundus Fluorescein Angiography and Medical Photography
11. Human Resources Department
12. Medical Social Work Department
13. Message Centre
14. Patients Relation Department
15. Biometry Department

SECOND YEAR**OPTOMETRIC OPTICS I**

Theory: 60 hours

Part I**1. Spectacle lenses:**

- Introduction to spectacle lenses
- Forms of lenses
- Cylindrical and spherocylindrical lenses
- Properties of crossed cylinders
- Toric lenses
- Toric transportation
- Astigmatic lenses
- Axis direction of astigmatic lenses
- Obliquely crossed cylinders
- Sag formula
- Miscellaneous spectacle lenses
- Vertex distance and vertex power
- Tilt induced power
- Aberrations in ophthalmic lenses
- Fresnel prisms, lenses and magnifiers

Part II**2. Spectacle lenses:**

- Manufacture of glass
- Lens surfacing
- Principle of surface generation and glass cements
- Lens quality
- Faults in lens material
- Faults on lens surface
- Inspecting the quality of lenses
- Toughened lenses

3. Ophthalmic lenses

- Definition of prisms; units of prism power
- Thickness difference and base – apex notation
- Dividing, compounding and resolving prisms
- Rotary prisms and effective prism power in near vision
- Prismatic effect, decentration, Prentice's rule

Prismatic effect of spherocylinders and plano cylinders
Differential prismatic effects

4. **Spectacle frames**

Frame types and parts

Classification of spectacle frames – material, weight, temple position, coloration

Frame construction, frame measurements and markings

Reference Books:

1. M.Jalie: Principles of Ophthalmic Lenses, Edition 3, 1980.
2. T E Fannin & T Grosvenor: Clinical Optics,1996.

OPTOMETRIC OPTICS II

Theory: 80 hours

1. Tinted and protective lenses
2. Characteristics of tinted lenses
3. Absorptive glasses
4. Polarizing filters
5. Photochromic filters
6. Reflecting filters
7. Bifocal lenses
8. Trifocal lenses
9. Progressive addition lenses
10. Lenticular lenses
11. Reflections from spectacle lenses, ghost images, reflections in bifocals at the dividing line
12. Anti-reflection coating, Anti-scratch coating, Anti-fog coating, Mirror coating, Edge coating, hard multi coating (HMC)
13. Field of view of lenses
14. Size, shape and mounting of ophthalmic lenses
15. Aspherical lenses

Reference Books:

1. M.Jalie: Principles of Ophthalmic Lenses, Edition 3, 1980.
2. T E Fannin & T Grosvenor: Clinical Optics,1996.

OCULAR DISEASES I

Theory: 60 hours

1. **Eyelids:**
 - Eyelid anatomy
 - Congenital and developmental anomalies of the eyelids
 - Blepharospasm
 - Ectropion
 - Entropion
 - Trichiasis and symblepharon
 - Eyelid inflammations
 - Eyelid tumours
 - Ptosis
 - Eyelid retraction
 - Eyelid trauma
2. **Lacrimal system**
 - Lacrimal system
 - Lacrimal pump
 - Methods of lacrimal evaluation
 - Congenital and development anomalies of the lacrimal system
 - Lacrimal obstruction
 - Lacrimal sac tumors
 - Lacrimal trauma
3. **Sclera, Episclera**
 - Ectasia and staphyloma
 - Scleritis, episcleritis
4. **Orbit**
 - Orbital anatomy
 - Incidence of orbital abnormalities
 - Methods of orbital examination
 - Congenital and developmental anomalies of the orbit
 - Orbital tumours
 - Orbital inflammations
 - Sinus disorders affecting the orbit
 - Orbital trauma
5. **Conjunctiva and Cornea**
 - Inflammation
 - Therapeutic principles
 - Specific inflammatory diseases
 - Tumours

- Tumours of epithelial origina
- Glandular and adnexal tumours
- Tumours of neuroectodermal origin
- Vascular tumours
- Xanthomatuos lesions
- Inflammatory lesions
- Metastatic tumours
- Degenerations and dystrophies
 - Definitions
 - Degenerations
 - Dynstrophies
- Miscellaneous conditions
 - Keratoconjunctivitis Sicca (K Sicca)
 - Tear function tests
 - Stevens – Johnson syndrome
 - Ocular Rosacea
 - Atopic eye disorders
 - Benign mucosal pemphigoid (BMP) – ocular pemphigoid
 - Vitamin A deficiency
 - Metabolic diseases associated with corneal charges
- 6. **Iris, Ciliary body and Pupil**
 - Congenital anomalies
 - Primary and secondary disease of iris and ciliary body
 - Tumors
 - Anomalies of papillary reactions
- 7. **Choroid**
 - Congenital anomalies of the choroids
 - Diseases of the chorioid
 - Tumours

Reference Books:

1. Jack J. Kanski: Clinical Ophthalmology, Butterworths, 2nd Ed., 1989.

OCULAR DISEASES II

Theory: 80 hours

1. Vitreous

Developmental abnormalities
 Hereditary hyaloidoretinopathies
 Juvenile retinoschisis
 Asteroid hyalosis
 Cholesterolosis
 Vitreous haemorrhage
 Blunt trauma and the vitreous
 Inflammation and the vitreous
 Parasitic infestations
 Pigment granules in the vitreous
 Vitreous complications in cataract surgery

2. Retina

Retinal vascular diseases
 Diseases of the choroidal vasculature, Bruch's membrane and retinal pigment epithelium (RPE)
 Retinal tumors
 Retinoblastoma
 Phakomatoses
 Retinal vascular anomalies
 Retinal and optic nerve head astrocytomas
 Lymphoid tumors
 Tumors of the retinal pigment epithelium
 Other retinal disorders
 Retinal inflammations
 Metabolic diseases affecting the retina
 Miscellaneous disorders
 Electromagnetic radiation effects on the retina
 Retinal physiology and psychophysics
 Hereditary macular disorders (including albinism)
 Peripheral retinal degenerations
 Retinal holes and detachments
 Intraocular foreign bodies
 Photocoagulation

3. Neuro-ophthalmology

Neuro-ophthalmic examination
 History
 Visual function testing

Technique of papillary examination
 Ocular motility
 Checklist for testing
 Visual sensory system
 The retina
 The optic disc
 The optic nerve
 The optic chiasm
 The optic tracts
 The lateral geniculate body
 The optic radiations
 The visual cortex
 The visual field
 The blood supply of the anterior and posterior visual systems
 Disorders of visual integration
 Ocular motor system
 Supranuclear control of eye movements

- Saccadic system
- Clinical disorders of the saccadic system
- Gaze palsies
- Progressive supranuclear palsy
- Parkinson's disease
- Ocular motor apraxia
- Ocular oscillation

 Smooth pursuit system and disorders
 Vergence system
 Cerebella system
 Non-visual reflex system
 Position maintenance system
 Nystagmus
 Ocular motor nerves and medial longitudinal fascicules
 The facial nerve
 Pain and sensation from the eye
 Autonomic nervous system
 Selected systemic disorders with neuro-ophthalmologic signs

4. **Lens**

Anatomy and pathophysiology
 Normal anatomy and aging process
 Developmental defects

Acquired lenticular defects

5. **Trauma**

Anterior segment trauma

Posterior segment trauma

6. **Blindness**

Blindness – definitions

Causes 6.1.2 Social implications 6.1.3 Rationale in therapy

Drug induced ocular diseases

Reference Books:

1. Jack J. Kanski: Clinical Ophthalmology, Butterworths, 2nd Ed., 1989.

VISUAL OPTICS I

Theory: 60 hours
Practical: 40 hours

1. Review of Geometric Optics

Vergence and power
Conjugacy, object space and image space
Sign convention
Spherical refracting surface
Spherical mirror; catoptric power
Cardinal points
Magnification

Optics of Ocular Structures

Cornea and aqueous
Crystalline lens
Vitreous
Curvature of the lens and ophthalmometry
Axial and axis of the eye
Measurement of the optical constants of the eye
Corneal curvature and thickness
Keratometry
Curvature of the lens and ophthalmometry
Axial and axis of the eye

2. Refractive anomalies and their causes

Aetiology of refractive anomalies
Contributing variabilities and their ranges
Populating distributions of anomalies
Optical component measurements
Growth of the eye in relation to refractive errors

Practical:

1. Study of Purkinje images I and II
2. Study of Purkinje images III and IV
3. Measurement of corneal curvature
4. Measurement of Corneal thickness
5. Mathematical models of the eye –emmetropia
6. Mathematical models of Hypermetropia
7. Mathematical models of myopia
8. Conjugate points – demonstration – worked examples

9. Axial and refractive hyperopia – worked examples
10. Axial and refractive myopia – worked examples
11. visual acuity charts
12. Effect of lenses in front of the eye
13. Effect of prisms in front of the eye
14. Vision through pinhole, slit, filters, etc.

Reference Books:

1. Bennett & Rabbetts: Clinical visual Optics.
2. David O Michaels: Visual Optics & Refraction (DOM).

VISUAL OPTICS II

Theory: 60 hours
Practical: 80 hours

1. **Refractive conditions**
 - Emmetropia
 - Myopia
 - Hyperopia
 - Astigmatism
 - Anisometropia and Anisekonia
 - Presbyopia
 - Aphakia and Pseudo aphakia
 - Correction and Management of Ambliopia
2. Far and near points of accommodation
 - Correction of spherical ametropis
 - Axial versus refractive ametropia
 - Relationship between accommodation and convergence; A/c ratio
3. Retinoscopy – principles and methods
 - Retinoscopy – speed of reflex and optimum condition
 - Retinoscopy – dynamic/static
 - Review of objective refractive methods
 - Review of subjective refractive methods
 - Cross cylinder method for astigmatism, Astigmatic Fan test
 - Difficulties in objective tests and their avoidance
 - Transposition of lenses
 - Spherical equivalent
 - Prescribing prisms
 - Binocular refraction
4. Effective power of spectacles; vertex distance effects
 - Ocular refraction versus spectacle refraction
 - Ocular accommodation versus spectacle accommodation
 - Spectacle magnification and relative spectacle magnification
 - Retinal image blur; depth of focus and depth of field

Practicals:

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

6. Hypermetropic correction: subjective verification
7. Demonstration of astigmatism. Use of slit and Kertometry to find the principal meridians
8. Astigmatism: fan – subjective verification tests
9. Astigmatism: Cross-Cyl. – Subjective verification test
10. Measurement of accommodation: near and far points and range
11. Presbyopic correction and methods: accommodative reserve, balancing the relative accommodation and cross grid test
12. Methods of differentiating axial and refractive ametropia
13. Practice of Retinoscopy – Emmetropia
14. Practice of Retinoscopy – Spherical ametropia
15. Practice of Retinoscopy – Simple astigmatism
16. Practice of Retinoscopy – Compound hyperopia
17. Practice of Retinoscopy – Compound myopia
18. Practice of Retinoscopy – Oblique astigmatism
19. Practice of Retinoscopy – in media apacities
20. Practice of Retinoscopy – in irregular astigmatism
21. Practice of Retinoscopy – in strabismus and eccentric fixation
22. Interpretation of cycloplegic retinoscopic findings
23. Prescription writing
24. Binocular refraction
25. Photo refraction
26. Vision therapy
27. Exercises for vergence

Reference Books:

1. Abrams D: Duke elders Practice of Refraction, Edition 9, 1998.

PHARMACOLOGY

Theory: 60 hours

1. General Pharmacology

Introduction, sources of drugs, drug formulations in ophthalmic use

General routes of drug administrations, ocular routes

Pharmacokinetics - absorption, distribution, Bio-transformation, excretion of drugs

Pharmacokinetics - Factors modifying drug action

Adverse drug effects

2. Autonomic Nervous system

Cholinergic drugs

Anticholinergic drugs

Sympathomimetics

Anti adrenergic drugs

Anti glaucoma drugs

3. Peripheral Nervous system

Local anaesthetics

Different techniques of giving LA in eye

4. Autocoids

Antihistamines mast cell stabilizers, Mucolytics

Non steroidal anti-inflammatory drugs

5. Hormones

Insulin and oral hypoglycaemic drugs

Corticosteroids

6. Central Nervous system

General Anaesthesia

Ethyl and Methyl alcohol

Sedatives and hypnotics

Antidepressants

7. Cardiovascular system

Anti hypertensives

Diuretics

Coagulants and anticoagulants

8. Chemotherapy

Antibiotics – Sulfonamides, Quinolones, Bactam antibiotics, Tetra cyclones, Chloram phenicol, amino glycosides, macrolides

Anti tubercular drugs

Anti leprotic drugs

Anti fungal drugs

Anti viral drugs

9. Miscellaneous

- Anticancer drugs for ophthalmic use
- Immunosuppressants
- Drugs acting on skin and mucous membranes
- Antiseptics and disinfectants
- Vitamins
- Drugs causing ocular toxicity
- Drugs and Biological agents used in Ophthalmic surgery
- Agents used to assist in ocular diagnosis
- Wetting agents/ Tear substitutes/ Osmotic drugs in ocular use

Reference Books:

1. S P Rang, M M Dale, Ritter- Pharmacology Edition 3, Churchill 1995.
2. K D Tripathi: Essentials of Medical Pharmacology, 4th Ed., 1999.
3. Goodman & Gilman's the pharmacological basis of therapeutics, 11th edition.

Books suggested for reading

1. Text book of pharmacology by Seth 2nd edition.
2. Basic and clinical pharmacology by Katzung 9th edition.

PATHOLOGY AND MICROBIOLOGY

Theory: 60 hours

PATHOLOGY

1. General Introduction
2. Inflammation and repair
3. Ophthalmic wound healing
4. Infections (tuberculosis, leprosy, syphilis, fungus, virus, Chlamydia)
5. Intraocular tumours (retinoblastoma, choroidal melanoma)
6. Optic nerve (normal and tumors)
7. Hematology (anemia, Leukemia and bleeding disorders)
8. Clinical pathology (examination of urine and blood smears)
9. Eyelid (normal and pathology including inflammations and tumors)
10. Cornea (normal and pathology in degeneration and dystrophies)
11. Lens (normal and pathology of cataract)
12. Retina (normal and pathology in inflammatory disease, infections)
13. Orbit (inflammation and neoplasia)

MICROBIOLOGY

1. Morphology of the bacterial cell
2. Growth and nutrition of bacteria; cultivation methods
3. Identification of Bacteria
4. Sterilization
5. Disinfection
6. Antibacterial agents and antibiotic sensitivity testing
7. Basic Immunology
8. Bacterial infections of the eye
9. Viral infections of the eye
10. Parasitic infections of the eye
11. Fungal infections of the eye

Reference Books:

1. Corton Kumar and Robins: Pathological Basis of the Disease, 4th edition, 1994.
2. Harsh Mohan: Text Book of Pathology.
3. Burton G R W: Microbiology for the Health Sciences, St.Louis, J P Lippincott Co., 3rd ., 1988.
4. Essentials of Medical Microbiology by Rajesh Bhatia, Rattan Lal Ichhpujani- Jaypee (latest edition).

MARKETING AND CONSUMER BEHAVIOUR

Theory: 40 hours

1. Market-Classification of markets- Marketing –Features of marketing-Scope of marketing-Importance of marketing- Marketing and Selling-Role of marketing in Economic Development.
2. Marketing mix-Product-Features-Classification-Product mix-Product Differentiation-Branding and packaging-Price-Importance of pricing-Pricing objectives-Factors affecting pricing decisions-Procedure for price determination-Kinds of pricing-Sales promotion-Purpose-Kinds of sales promotion-Consumer promotion-Dealer promotion-Advertising.
3. Marketing Finance-Finance-Business Finance-Fixed and working capital-Factors determining working capital-Types and sources working capital –Trade credit-Consumer credit.
4. Consumer Behaviour-Introduction-Buying motives-Buying decision Process-factors influencing buying behaviour-Customer retention-Need-Importance-Advantages-Customer Relationship Management (CRM).

Reference Books:

1. Marketing Management-analysis, planning and control – Philip Kotler, (1987), 11th edition, Prentice hall of India, New Delhi.
2. Principles of Marketing-Philip Kotler & Gary Armstrong (1996), Prentice Hall of India, New Delhi 14th Indian reprint.
3. The essence of Marketing- Simon Majoro, (1996), 3rd Indian Reprint, Prentice Hall of India, New Delhi.
4. Fundamentals of Marketing – William J.Stanton and Charles Futrell.
5. Marketing Management – Rajan Saxena.
6. Consumer Behaviour, Leon G.Schiffman, Leslie Lazar Kanuk, 6th Edition Prentice Hall of India, New Delhi.

OPTOMETRIC INSTRUMENTS

Theory: 40 hours
Practical: 40 hours

1. Binocular vision
2. Simple and compound microscope – oil immersion eyepiece
3. **Refractive instruments:**
 - Test chart standards
 - Choice of test charts
 - Trial case lenses – best forms
 - Refractor (phoropter) head units –Auto refractors
 - Optical considerations of refractor units
 - Trial frame design
 - Near vision difficulties with units and trial frame
 - Retinoscope – types available
 - Adjustment of retinoscopes – special features
 - Cylinder retinoscopy
 - The interpretation of objective findings
 - Special subjective test – polarizing and displacement – etc., simultan test
 - Projection charts
 - Illumination of the consulting room
 - Special Instruments:
 - Brightness acuity test
 - Vision analyzer
 - Pupilometer
 - Video acuity test
 - Nerve fiber analyzer
4. **Ophthalmoscopes and related devices**
 - Design of ophthalmoscopes – illumination/viewing
 - Ophthalmoscope disc
 - Filters for ophthalmoscopy
 - Indirect ophthalmoscopes
 - The use of the ophthalmoscope in special cases
5. Lensometer, lens gauge or clock
6. Slit lamp
 - Slit lamp systems
 - Viewing microscope systems
 - Scanning laser devices
 - Slit lamp accessories
 - Mechanical design in instruments

7. **Tonometer**
 Tonometer principles
 Types of tonometers and standardization
 Use and interpretation of tonometers
8. **Fundus camera**
 The fundus camera - principles
 The fundus camera – techniques
 External eye photography – apparatus
9. Keratometer and corneal topography
10. Refractionometer
11. **Orthoptic Instruments**
 Orthoptic Instruments - haploscopes
 Orthoptic Instruments – home devices
 Orthoptic Instruments – pleoptics
 Historical instruments
12. **Colour vision testing devices**
 Colour confusion/Hue discrimination/Colour matching
 FM-100 hue test
13. **Fields of vision and screening devices**
 Perimeter and the visual field
 Illumination of field testing instruments
 Projection perimeters
 Screening devices for field defects
 Results of field examination
 Vision screeners – principles
 Vision screeners – details
 Analysis of screener results
 Bowl perimeters
 Goldmann and Humphery Vision Analyzer
14. Optical devices and electronic (Low vision) aids
15. **Ophthalmic Ultrasonography**
 Biometry/Ultrasound/'A' Scan/'B' Scan/UBM
16. **Electrodiagnostics**
 ERG/VEP//EOG
17. NFA

Practicals:

1. Simple and compound microscope – oil immersion eyepiece
2. Refractive instruments:
 - Test chart standards
 - Trial case lenses – best forms
 - Refractor (phoropter) head units –Auto refractors
 - Retinoscope – types available
 - Nerve fiber analyzer
3. Ophthalmoscopes and related devices
 - Design of ophthalmoscopes – illumination/viewing
 - Ophthalmoscope disc
 - Filters for ophthalmoscopy
 - Indirect ophthalmoscopes
 - The use of the ophthalmoscope in special cases
4. Lensometer, lens gauge or clock
5. Slit lamp
 - Slit lamp systems
 - Viewing microscope systems
 - Scanning laser devices
 - Slit lamp accessories
6. Tonometer
 - Tonometer principles
7. Fundus camera
8. Keratometer and corneal topography
9. Orthoptic Instruments
10. Colour vision testing devices
11. Fields of vision and screening devices
12. Ophthalmic Ultrasonography
13. Electrodiagnostics

Reference Books:

1. David B Henson: Optometric Instrumentation. (DBH).

CLINICAL EXAMINATION OF VISUAL SYSTEM

Theory: 40 hours

1. History of the Ophthalmic subject
 - Ocular symptoms
 - The past prescription – its influence
2. Visual acuity testing – distance and near and colour vision
3. Examination of muscle balance
4. Slit lamp examination
 - Examination of eye lids, conjunctiva and sclera
 - Examination of cornea
 - Examination of iris, ciliary body and pupil
 - Examination of lens
5. Examination of intraocular pressure and examination of angle of anterior chamber
6. Ophthalmoscopy – Direct and Indirect
7. Examination of fundus (vitreous and disc), (choroids and retina)
8. Examination of lacrimal system
9. Examination of the orbit
10. Macular function test
11. Visual field charting (central), (peripheral).
12. Neuro – ophthalmological examination

Reference Books:

1. Jack J. Kanski: Clinical Ophthalmology, Butterworths, 2nd Ed, 1989.

CLINICAL PSYCHOLOGY

Theory: 40 hours

1. Introduction to Psychology
 - A – Definition, History, Branches, Scope and Current Status
 - B – Methods, Concepts of Normality and abnormality
2. Sensation, Attention and Perception
 - Primary senses
 - Types of attention and determinants
 - Principles of perception and determinants
3. A – Intelligence, B - Learning, C - Memory, D - Personality, E – Motivation and F – Body image and personality integration.
4. Helper – Helpee relationship and Ophthalmic counseling
 - Characteristics of therapist, Relationship between the therapist and client
 - Counseling patient with partial sight, colour blindness and hereditary vision defects
5. Psychological Reaction
 - A – Illness, loss and Grief
 - B - Adapting changes in Vision (age, diseases, etc....)
6. Tests for people with disability
 - WAIS – R, WISC –R (for visually handicapped)
 - Blind learning aptitude tests
7. Disability and Rehabilitation

Reference Books:

1. Introduction to Psychology, Morgon C.T., King R.A., Robinson N.M., Tata Mc Graw Hill Publishing Co.
2. Introduction to Psychology, Hilgard and Atkinson, Tata Mc Graw Hill Publishing Co.
3. Psychology 5th Ed. Dworetsky J.P.
4. Child Development Hurlock, EB, VIED, Mc Graw Hill International Book Co. (1981).

CLINICS I

Practical: 180 hours

CLINICS II

Practical : 180 hours

THIRD YEAR**BINOCULAR VISION**

Theory: 60 hours

1. Spatial sense
2. Evolution of Binocular vision
3. Binocular fusion, suppression, revalry and summation
4. Visual direction, local sign and corresponding points
5. Visual distance, empirical cues
6. Panum's space
7. Stereopsis
8. Development of Binocular vision
9. The longitudinal horopter
10. Neural aspects of Binocular vision
11. Visually guided behaviour and aniselkonia
12. ARC
13. Qualitative and quantitative diagnosis of strabismus
14. Esodeviations
15. Exodeviations
16. A-V phenomena
17. Cyclovertical squint
18. Pseudo strabismus
19. Amblyopia and eccentric fixation
20. Treatment of amblyopia
21. Special forms of strabismus
22. Nystagmus
23. Non-surgical management of strabismus
24. Review of orthoptic procedures

Reference Books:

1. R W Reading: Binocular Vision- Foundations and Applications.
2. Basic Science, A.A.O (section-6) Pediatric Ophthalmology and Strabismus 1992-1993.

GLAUCOMA

Theory: 60 hours

1. Introduction to glaucoma
 - a. Epidemiology
 - b. Heridity
 - c. Definition & classification of Glaucoma
2. Intra Ocular pressure and Aqueous humor dynamics
3. Clinical Evaluation
 - a. History and General examination
 - b. Gonioscopy
 - c. Optic nerve head analysis
 - d. Visual fields
4. Childhood Glaucoma
5. Open angle glaucoma
 - a. The glaucoma suspect
 - b. Open angle glaucoma without elevated IOP
 - c. primary open angle glaucoma
 - d. Secondary open angle glaucoma
6. Angle closure glaucoma
 - a. Primary angle closure glaucoma
 - b. Secondary angle closure glaucoma
7. Medical management of glaucoma
8. Surgery therapy f or glaucoma
9. Newer advances in the management of glaucoma

Reference Books:

1. M Bruce Shields (MBS): Text Book of Glaucoma, Williams & Wilkins, London.
2. Marc Leiberman: Simplified Guide to Computerized Perimetry.

LOW VISION AIDS

Theory: 60 hours
Practical: 40 hours

1. Identifying the low vision patient
2. History
3. Diagnostic procedures in low vision case management
4. Optics of low vision aids
5. Refraction, special charts. | Radical retinoscopy
6. Evaluating near vision: Amsler grid and field defects, prismatic scanning
7. Demonstrating aids – optical, Non-optical, Electronic
8. Teaching the patient to use aids including eccentric viewing training when necessary
9. Guidelines to determining magnification and selecting low vision aids for distance, intermediate and near
10. Spectacle mounted telescopes and microscopes
11. Children with low vision
12. Choice of tests, aids in different pathological conditions
13. Light, glare and contrast in low vision care and rehabilitation
14. Bioptic telescopes
15. Optical devices to help people with field defects
16. Contact lens combined system
17. Rehabilitation of the Visually handicapped

Practicals:

1. Refraction, special charts. | Radical retinoscopy
2. Evaluating near vision: Amsler grid and field defects, prismatic scanning
3. Demonstrating aids – optical, Non-optical, Electronic
4. Guidelines to determining magnification and selecting low vision aids for distance, intermediate and near
5. Spectacle mounted telescopes and microscopes
6. Choice of tests, aids in different pathological conditions
7. Contact lens combined system
8. Rehabilitation of the Visually handicapped

Reference Books:

1. C. Dickinson : Principles and Practice of Low Vision, Butterworth- Heinemann Publication, 1998.

DISPENSING OPTICS

Theory: 60 hours
Practical: 40 hours

1. Clinical experiences in verification and dispensing of ophthalmic materials outlined in Ophthalmic Optics.(Optometric Optics)Course and Dispensing Optics
2. Special practical instructions in centering, marking and mounting the lenses of all designs, types, shapes and sizes in accordance with frame and facial measurements
3. Visit to lens manufacturing workshops
4. Video session on fitting of progressive lenses
5. ANSI standards
6. Dispensing Instrumentation
Pupillometer
Pliers
PCD
Air blower
Distometer
7. Abbe's value, specific gravity, optical density, Pantoscopic flit
8. Patients selection, fitting Ms of PALs, Selection of designs
9. case study : problems, orientated dispensing optics
10. Recent developments
11. Special purpose frames
12. Safety wear

Practicals:

1. Optic center marking
2. PD Measurement – for far and near
3. Pupillometer
4. Tints and filters to be shown – indications
5. Different types of Bifocals to be shown
6. PALs fitting

Reference Books:

1. Clifford W Brooks & Irvin M Borish: System of Ophthalmic Dispensing, Professional press, 1979.

PAEDIATRIC OPTOMETRY AND GERIATRIC OPTOMETRY

Theory: 100 hours

PAEDIATRIC OPTOMETRY

PART I – Examination and Diagnosis

1. **History**
Genetic factors - Perinatal factors- Prenatal factors - Postnatal factors
Measurement of visual acuity
2. **Normal appearance, Pathology and structural anomalies of :**
Orbit
Eyelids
Lacrimal system
Conjunctiva
Cornea
Sclera
Anterior chamber, uveal tract, pupils
Lens, vitreous, fundus
Oculomotor system
3. Measurement of refractive status
4. Determining binocular status
5. Determining sensory motor adaptability

PART II – Post-Examination process

6. Compensatory treatment and remedial therapy for:
Myopia
Pseudo myopia
Hyperopia
Astigmatism
Anisometropia
Amblyopia
7. Remedial and compensatory treatment for strabismus and nystagmus
8. Vergence and accommodation

GERIATRIC OPTOMETRY

1. Structural changes in eye
2. Physiological changes in eye
3. Optical and refractive changes in eye
4. Aphakia, Pseudo aphakia – its correction

5. Ocular diseases common in old eye, with special reference to cataract, glaucoma, macular disorders, vascular diseases of the eye.
6. Special considerations in ophthalmic dispensing to the elderly.
7. Management of visual problems of aging.
8. How to carry on one's visual task overcoming the problems of aging?

Reference Books:

1. Jerome Rosner: Pediatric Optometry, Butterworths, London, 1982.
2. Hirsch M J & Wick R E: Vision of the Aging Patient, An Optometric Symposium, 1960.

CONTACT LENS

Theory: 100 hours

1. History of contact lens
2. Corneal Anatomy and Physiology
3. Corneal Physiology and Contact Lens
4. Preliminary Measurements and Investigations
5. Slit lamp Biomicroscopy
6. Contact lens materials
7. Optics of Contact lenses
8. Glossary of Terms: Contact Lenses
9. Indications and Contra Indications of CL
10. Rigid gas permeable contact lens design
11. Soft contact lens design
12. Keratometry, Placido's disc, Topography
13. Fitting philosophies (Introduction to Contact lens fitting)
14. Handling of contact lenses
15. Fitting of spherical Soft CL and effects of parameter changes
16. Astigmatism; Correction options
17. Fitting spherical RGP CL. Low DK High DK
18. Effects of RGP CL parameter changes on lens fitting
19. Fitting in Astigmatism
20. Fitting in Keratoconus
21. Fitting in Aphakia, Pseudophakia
22. Lens care & Hygiene Instructions Compliance
23. Follow up post fitting examination
24. Follow up slit lamp examinations
25. Cosmetic Contact lenses
26. Fitting contact lens in children
27. Toric Contact lenses
28. Bifocal contact lenses
29. Continuous wear and extended wear lenses
30. Therapeutic lenses / bandage lenses
31. Contact lens following ocular surgeries
32. Disposable contact lenses, Frequent replacement and lenses
33. Use of Specular Microscopy and Tachymetry in CL
34. Care of contact lenses, Contact lens solutions
35. Complications of Contact lenses
36. Contact lens modification of finished lenses
37. Instrumentation in contact lens practice

38. Checking finished lens parameters
39. Contact lens – Special purposes – Swimming, Sports, Occupational etc.,
40. recent developments in Contact lenses
41. Review of lenses available in India
42. Current contact lens research

Reference Books:

1. Robber B Mandell: Contact lens Practice, hard and flexible lenses, Charles C. Thomas, 3rd Edition, 1981, Illinois, USA.
2. Ruben M Guillon: Contact lens practice, 994, 1st Edition.

LAW & OPTOMETRY AND OCCUPATIONAL OPTOMETRY

Theory: 80 hours

LAW & OPTOMETRY

1. Legal environment and techniques – history – law and equity
2. History and theory of licensure
3. Licensure as a means of internal and external discipline – unprofessional conduct – incompetence – gross immorality
4. International Optometry – important foreign optometry law
5. The Optometrist in court
6. Malpractice – Theory of Liability – damages – minimizing malpractice claims
7. Insurance
8. Negligence
9. Ethics – professional ethics
10. Laws governing practice of medical profession and para-medical profession In India
11. Registered medical practitioner – laws against practice of medicine of those unregistered – Medical Council of India – Dental Council – Nursing council
12. Present rules and regulations – Laws regarding optical product manufacturers – dispensing in India
13. Opticians – Are they registered? Dispensing Opticians – rules in U.K

OCCUPATIONAL OPTOMETRY

1. Introduction to occupational health, hygiene and safety International Bodies like ILO, WHO, National bodies like labour Institutes, National Institutes of Occupational Health, National Safety Council, etc.
2. Acts and Rules: Factories Act and Rules- Workmen's Compensation Act – ESI Act, etc
3. Occupational diseases/ occupation related diseases caused by – physical agents, chemical agents and biological agents
4. Occupational hygiene, environmental monitoring
Recognition, evaluation and control of hazards
Illumination – definition, measurements and standards
5. Occupational safety
Causes of accidents
Vision, lighting, colour and their role
Accident analysis
Accident prevention
6. Ocular and visual problems of occupation
Electromagnetic radiation
Ionizing

- Non-ionizing – Infra red
 - 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
- 13. Role of Optometrists – promotion of general and visual health and safety of people at work

Reference Books:

1. Seymour L Coblenz: ptometry and the Law, American Optometric Association, St.Louis,1976.
2. R.A.F. Cox (ed.) fitness for work – the medical aspects. Oxford University Press 2000, reprinted 2003.
3. Indian Association of Occupation Health, Guidelines on Pre-Employment Medical Examination, Pune 1998.
4. Barbara A.Plog, Patrica J. Quinlan. Fundamentals of Industrial Hygiene. 5th Edition, 2002.
5. John Ridley & John Channing. Safety at work. 5th Edition 1999, reprinted 2000,2001.
6. Stephen Konz, Steven Johnson. Work Design-Industrial Ergonomics 2000.
7. Salvatore R. Dinardi. The Occupational Environment – Its Evaluation and Control 1997.
8. Linda Rosenstock & Mark R.Cullen. Textbook of Clinical Occupational and Environmental Medicine, 1994.
9. William N. Rom. Environmental and Occupational Medicine. 3rd edition, 1998.
10. Stephen L.Demeter, Gunnar B. J.Andersson. Disability Evaluation. 2nd edition, 2003.

SYSTEMIC DISEASES

Theory: 40 hours

Practical: 40 hours

1. **Arterial Hypertension**
Pathophysiology, classification, clinical examination, diagnosis, complications, management
Hypertension and the eye
2. **Diabetes Mellitus**
Pathology, classification, clinical features, diagnosis, complications and management
Diabetes mellitus and the eye
3. **Acquired Heart Disease – Embolism**
Rheumatic fever- Pathophysiology, classifications, diagnosis, complications, management
Embolism
Subacute bacterial endocarditis
4. **Cancer – Introduction**
Definitions, nomenclature, characteristics of Benign and malignant neoplasms
Grading of staging of cancer, diagnosis, principles of treatment
Neoplasia and the eye
5. **Connective Tissue disease**
Anatomy and Pathophysiology : Arthritis
Eye and connective tissue disease
6. **Thyroid Disease**
Anatomy and physiology of the thyroid gland
Classification of thyroid disease
Diagnosis, complications, clinical features, management, thyroid disease and the eye
7. **Tuberculosis**
Aetiology, pathology, clinical features, pulmonary tuberculosis, diagnosis, complications, treatment, tuberculosis and the eye
8. **Helminthiasis**
Classification of helminthic diseases, Schistosomiasis, principles of diagnosis and management
9. **Common tropical medical ailments (Malaria, Leprosy, etc.)**
Introduction to tropical diseases; Malaria
Tropical diseases and the eye – leprosy, toxoplasmosis, syphilis trachoma
10. **Malnutrition**
Aetiology, protein energy malnutrition, water electrolytes, minerals, vitamins, nutritional disorders and the eye
11. **Introduction to Immunology**
Introduction, components of the Immune system, principle of Immunity in health, Immunology in disease, Immunology and the eye

12. **Neurological disorders – Stroke/CVA**

Disseminated sclerosis and subacute combined degeneration

Anatomy eith pathophysiology Disseminated sclerosis and subacute combined degeneration

Eye and connective tissue disease

13. **General Medical Emergencies – first aid**

Ocular/general

14. **Genetics**

Introduction to genetics

Organization of the cell

Chromosome structure and cell division

Gene structure and basic principle of genetics

Genetic disorders and their diagnosis

Genes and the eye

Genetic counseling and genetic engineering

Practical:

Ward visits

Reference Books:

1. Davidson's principles and Practice of Medicine, Ed. John Macleod, 14th Ed., ELBS/Churchill Livingstone (PPM).

EPIDEMIOLOGY AND BIO-STATISTICS

Theory: 60 hours

EPIDEMIOLOGY

1. Introduction to Epidemiology
2. Measures of Disease Frequency
3. Descriptive Epidemiology
4. Cross sectional studies
5. Case control studies
6. Cohort studies
7. Randomized controlled trial
8. Association and Causation
9. Bias and Confounding
10. Screening for disease
11. History of Public Health
12. Organization of Health services
13. Health Care Delivery system
14. Health Economics
15. Health Planning

BIO-STATISTICS

1. Introduction to Statistics
2. Scales of Measurement
3. Collection and Presentation of data
4. Measures of Central tendency
5. Measures of Variation
6. Probability
7. Binomial and Normal distribution
8. Sampling Methods
9. Sample size determination
10. Correlation and Regression
11. Statistical Significance
12. Non-Parametric tests
13. Health Statistics including hospital statistics

Reference Books:

1. Mausne & Bahn: Epidemiology- An Introductory text, 2nd Ed.
2. Community Health Nursing by K.Park, Latest Edition, Banarsidas.
3. Basic Epidemiology by R.Beaglehole R.Bonita and T.Kjellstrom. Orient Longman WHO Geneva.
4. Biostatistics, 2nd edition University park Press, Baltimore.
5. Methods in Biostatistics by Mahajan, B.K.Jaypee publishers.
6. An introduction to Biostatistics III Edition by P.S.S.Sundar Rao & J.Richard, Prentice-Hall of India, New Delhi.

PUBLIC HEALTH AND COMMUNITY OPTOMETRY

Theory: 80 hours

1. Philosophy of Public Health

History of public health medicine

History of public health optometry (including epidemiology, man power, projections, community reimbursement mechanisms)

2. Health care systems

Organization of health services (principles of primary, secondary and tertiary care)

Determinants of health care delivery system

Planning of health services (including relevant legislation and implications to optometric practice)

Health economics

Health manpower protection and in the practice of ophthalmology

Third party involvement in financing health care services (including both governmental and non-governmental programmes)

Quality assurance in patient care services

3. Modes of health and vision care delivery

Solo and group practice modes

Multidisciplinary, interdisciplinary and institutional practice modes

Optometry's role as a primary care profession

Reference Books:

1. Oxford Text Book of Public Health & Preventive Medicine, (Vol I to I).

CLINICS AND SPECIAL CLINICS I

Practical: 240 hours

1. Case sheet
 2. History taking
 3. Lensometry
 4. Visual acuity
 5. Tests for phorias and tropias
 6. External examination
 7. Slit lamp examination
 8. Drugs and method of application
 9. Do's and don'ts – papillary dilatation
 10. Direct Ophthalmoscopy
 11. Indirect Ophthalmoscopy
 12. Instrumentation
 13. Patients selection
 14. Keratometry reading
 15. Refraction
 16. Fluorescent pattern
 17. Overrefraction
 18. Fitting of hard lenses
 19. Rigid gas permeable lenses and soft lenses in refractive errors and in specialized condition
- The students are made to observe the interneers initially, then gradually they are encouraged to work up a patient, and perform various examination techniques.

NOTE: The portion for clinics I and II are the same.

CLINICS AND SPECIAL CLINICS II

Practical: 240 hours

1. Case sheet
2. History taking
3. Lensometry
4. Visual acuity
5. Tests for phorias and tropias
6. External examination
7. Slit lamp examination
8. Drugs and method of application
9. Do's and don'ts – papillary dilatation
10. Direct Ophthalmoscopy
11. Indirect Ophthalmoscopy
12. Instrumentation
13. Patients selection
14. Keratometry reading
15. Refraction
16. Flourescein pattern
17. Overrefraction
18. Fitting of hard lenses
19. Rigid gas permeable lenses and soft lenses in refractive errors and in specialized condition

The students are made to observe the interneers initially, then gradually they are encouraged to work up a patient, and perform various examination techniques

NOTE: The portion for clinics I and II are the same

PROJECT