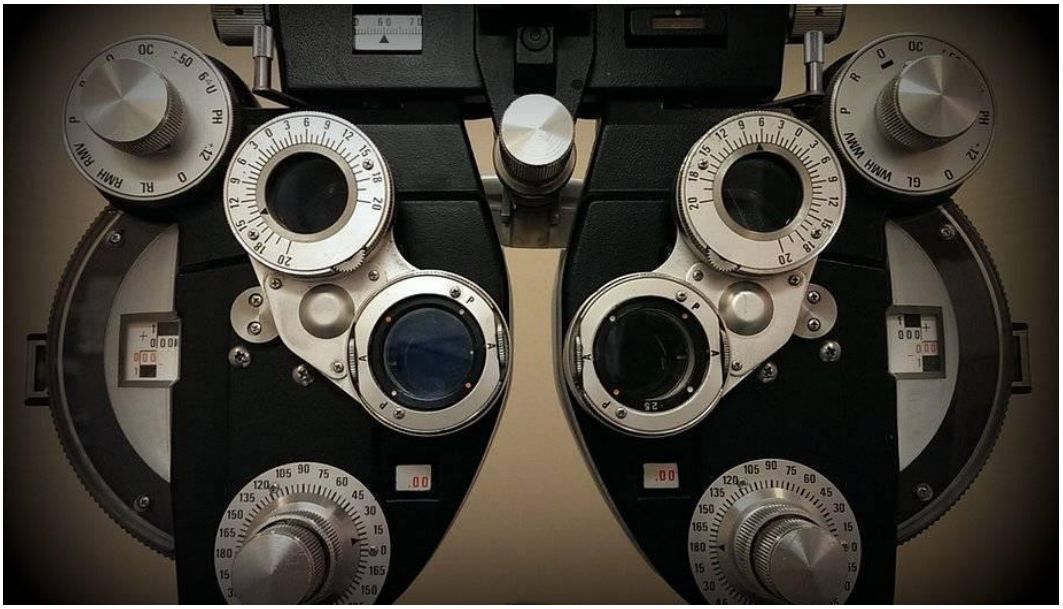
**MAHARASHTRA UNIVERSITY OF HEALTH SCIENCES**



# B. Sc. Optometry

# SYLLABUS

- Background of the profession :

Optometry is a science which deals with diagnosis and management of vision-related disorders, mainly refractive errors and rehabilitation services, that is, dispensing spectacles, contact lenses and low vision aids.

Refractive error (RE) is a very common eye disorder. It occurs when the eye cannot clearly focus the images on the (retina) or from the outside world which results in blurred vision, which sometimes can be so severe that it can causes visual impairment. RE can be easily measured, diagnosed and corrected with spectacles. However, if improperly corrected, they can become a major cause of low vision and blindness.

Optometry is a health care profession that is concerned especially with examining the eye for defects and faults of refraction, with prescribing correctional lenses, eye exercises and/or visual rehabilitation care for visually impaired, with diagnosing diseases of the eye, and with treating such diseases or referring them for treatment.

Optometry as a profession has the primary public health responsibility for eliminating uncorrected refractive error. As primary eye care practitioners, optometrists have a vital role in detecting potentially serious eye diseases such as cataract, glaucoma and Diabetic retinopathy, age-related maculopathy, as well as general health conditions such as hypertension and diabetes, which means optometrists can also help alleviate the burden of other causes of blindness through diagnosis, referral and in some cases co-management.

Optometry can and should play a leading role in eye care provision at the primary level, and can also assist at secondary and tertiary levels where possible, working with ophthalmologists and other eye care providers towards the unified goal of combating blindness.

- **Goal of the Optometry programme:**

Learning Objectives: At the completion of this course, the student should –

1. Be able to develop skills to provide comprehensive eye examination.

a. To acquire knowledge on ocular structures, its functions and pathological change.

b. To carryout ophthalmic investigations

c. To impart knowledge with regard to common eye diseases

d. To impart knowledge on treatment modalities from the perspective of counseling.

e. To acquire knowledge about the referral guidelines for ocular and systemic conditions

2. Be able to correct refractive error and provide spectacle prescription

3. Be able to fit, evaluate, prescribe and dispense contact lenses for refractive correction and other ocular conditions

4. Be able to assess the low vision and provide comprehensive low vision care

5. Be able to have adequate knowledge to develop skill in manufacturing of spectacle lenses, contact lenses and low vision devices.

6. Be able to do complete binocular vision assessment, manage non-strabismic binocular vision anomalies and refer condition which warrants surgery

7. Be able to assess the visual demands for various occupations and match it to the visual capabilities. Also be able to advice on eye safety wear for various occupations.

8. Have knowledge and skill for early detection of various ocular conditions and pathologies –Refractive error, Strabismus, Cataract, Diabetic retinopathy, Glaucoma etc.

9. Have knowledge regarding organizations of eye banks and preservation of ocular tissues.

10. Have knowledge on sensory substitution and other rehabilitation measures for totally visually challenged.

11. Have knowledge of counseling on visual/ocular hygiene, nutritional and environmental modifications.

- **Skills and Competencies to be imparted :**

1. Communication Skills
2. Professional Conduct
3. Patient Examination and management.
4. Optical Dispensing
5. Documentation

- **Job Opportunities:**

The job sectors for optometrist can be divided into the following areas:

1. Corporate sector
2. Private practice
3. Work for an optical chain or under an optical store
4. Public health
5. Industries/companies
6. Eye care hospitals & institutions
7. Education sector
8. Scientific research

## ➢ Eligibility Criteria :

- The students entering the Optometry programme should have completed the recognized secondary school studies is 10+2 with Sciences Physics, chemistry, biology from a recognized Board.

- Candidates who have completed diploma in ophthalmic science / diploma in optometry form GMC/MUHS can also join the undergraduate course. They would be eligible to join in 2nd year of optometry.

- Ophthalmic Officers in service will be considered who are granted permission through proper channel.

## ➢ <u>Course duration</u>

- Under graduate 4 year programme (including 1 year of clinical training /internship) - Bachelor's degree level.

## ➢ Curriculum Outline:-

| First Year | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sr. No** | **Paper Name** | **University Exam (Marks)** | | | | **Examiner** | **Remarks** |
| | | **Theory** | | **Practical** | | | |
| | | **IA** | **UE** | **IA** | **UE** | | |
| 01 | General Anatomy, Physiology, Biochemistry. | NA | 100 | NA | 200 | MS Ophthalmology (University Approved Teacher) | **1)** 01 Optometrist should be Passed B.Sc Optometry with 05 years Experience As a Internal Examiner. **2)** Other Internal Examiner should be M.S. Ophthalmology. **3)** External Examiner should be Ophthalmologist. |
| 02 | Ocular Anatomy Physiology & Biochemistry. | NA | 100 | | | MS Ophthalmology (University Approved Teacher) | |
| 03 | Geometrical Optics I & II | NA | 100 | | | MS Ophthalmology (University Approved Teacher) | |
| 04 | Basic Computer, English, Nutrition & Psychology | NA | 100 | | | MS Ophthalmology (University Approved Teacher) | |
| 05 | Physical Optics. | NA | 100 | | | MS Ophthalmology (University Approved Teacher) | |

| Second Year | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Sr. No** | **Paper Name** | **University Exam (Marks)** | | | | **Examiner** | **Remarks** |
| | | **Theory** | | **Practical** | | | |
| | | **IA** | **UE** | **IA** | **UE** | | |
| 01 | Visual Optics I & II | NA | 100 | NA | 200 | MS Ophthalmology (University Approved Teacher) | **1)** 01 Optometrist should be Passed B.Sc Optometry with 05 years Experience As a Internal Examiner. **2)** Other Internal Examiner should be M.S. Ophthalmology **3)** External Examiner should be Ophthalmologist. |
| 02 | Ocular Diseases I,II & Glaucoma. | NA | 100 | | | MS Ophthalmology (University Approved Teacher) | |
| 03 | Optometric Optics & Dispensing Optics. | NA | 100 | | | MS Ophthalmology (University Approved Teacher) | |
| 04 | Ocular Microbiology, Pathology, & Pharmacology. | NA | 100 | | | MS Ophthalmology (University Approved Teacher) | |
| 05 | Clinical Examination of Visual System & Optometric Instrumentation. | NA | 100 | | | MS Ophthalmology (University Approved Teacher) | |
| **Third Year** | | | | | | | |
| **Sr. No** | **Paper Name** | **University Exam (Marks)** | | | | **Examiner** | **Remarks** |
| | | **Theory** | | **Practical** | | | |
| | | **IA** | **UE** | **IA** | **UE** | | |
| 01 | Contact Lenses. | NA | 100 | NA | 200 | MS Ophthalmology (University Approved Teacher) | **1)** 01 Optometrist should be Passed B.Sc Optometry with 05 years Experience As a Internal Examiner. **2)** Other Internal Examiner should be M.S. Ophthalmology **3)** External Examiner should be Ophthalmologist. |
| 02 | Binocular Vision. | NA | 100 | | | MS Ophthalmology (University Approved Teacher) | |
| 03 | Occupational Optometry & Low Visual Aids. | NA | 100 | | | MS Ophthalmology (University Approved Teacher) | |
| 04 | Paediatric Optometric, Geriatric Optometry, Systemic Diseases.. | NA | 100 | | | MS Ophthalmology (University Approved Teacher) | |
| 05 | Public Health Community Optometry, Research Methodology & Biostatistics & Medical Law. | NA | 100 | | | MS Ophthalmology (University Approved Teacher) | |

- **Fourth Year:-**

- Internship is for 12 months (July – December; January – June) or 1 year. Total number of days (after deducting for national holidays & Sundays + Examination).
- Students are encouraged to involve in community outreach activities as part of their clinical postings without absenting himself /herself for the other regular classes.
- Project report needs to be submitted at the end of internship

## First Year

### GENERAL ANATOMY:-

- **COURSE DESCRIPTION:** General anatomy deals with the entire human anatomy with emphasis on different tissues, blood vessels, glands, nerves and the entire central nervous system in particular.

- **OBJECTIVES:** At the end of the semester, the student should be able to:

1. Comprehend the normal disposition, inter-relationships, gross, functional and applied anatomy of various structures in the human body.
2. Identify the microscopic structures of various tissues, and organs in the human body and correlate the structure with the functions.
3. Comprehend the basic structure and connections between the various parts of the central nervous system so as to analyze the integrative and regulative functions on the organs and systems.

- **COURSE PLAN:-**

| Sl. No. | Topics | No. of hrs. |
|---|---|---|
| 1 | Introduction to Human Anatomy:<br>Anatomy: Definition and its relevance in medicine and optometry<br>Planes of the body, relationship of structures, organ system | 1 |
| 2 | Skeleton System | 3 |
| 3 | Tissues of the Body:<br>Epithelium, connective tissue, bone and cartilage, Embryology, histology, different types of each of them, types of cells, cellular differentiation and arrangements in different tissues | 3 |
| 4 | Muscles:<br>Different types of muscles, their functional differentiation, their relationship with different structures, their neural supply | 3 |
| 5 | Blood vessels:<br>Differentiation between arteries and veins, embryology, histology of both arteries and veins, Functional differences between the two, anatomical differences at different locations | 3 |
| 6 | Skin and appendages:<br>Embryology, anatomical differences in different areas, functional and protective variations, innervations, relationship with muscles and nerves | 3 |
| 7 | Lymphatic system:<br>Embryology, functions, relationship with blood vessels and organs | 1 |
| 8 | Glands:<br>Embryology, different types of glands (exocrine and endocrine), functional differences, neural control of glands | 2 |
| 9 | Nervous system:<br>Parts of Nervous system, cell types of nervous system, Blood-brain barrier, Reflex arc, Peripheral Nerves, Spinal nerves, Nerve fibers, Autonomic Nervous system | 5 |
| 10 | Brain and Cranial nerves:<br>Major parts of Brain, Protective coverings of the Brain, Cerebrospinal Fluid, Brain stem, Cerebellum, Diencephalon, Cerebrum, Cranial nerves | 6 |
| | **Total Number of Hours** | **30** |

**PRACTICAL (15 Hours):** Practical demonstration of each organ using specimen. If specimen for certain organs are not available, then videos can be shown to make the student understand the anatomic structures.

**TEXT BOOKS: -**

1. MARIANO S.H. DIFIORE: Atlas of Human Histology, 5th Ed. 1981, Lea and Feliger.

2. G.J. TORTORA & N.P ANAGNOSTAKOS: Principles of Anatomy and Physiology. (recent edition)

3. B.D. CHAURASIA: Handbook of General Anatomy, 2nd Ed., CBS Publishers and Distributors, New Delhi - 110032.

**REFERENCE BOOKS: -**

1. PETER L. WILLIAMS AND ROGER WARWICK: - Gray's Anatomy - Descriptive and Applied, 36th Ed., 1980, Churchill Livingstone.

2. T.S. RANGANATHAN: Text book of Human Anatomy, 1982, S. Chand & Co., New Delhi 110 055.

3. INDERBIR SINGH: Human Embryology, 3rd Ed., Macmillan India, 1981.

4. R. KANAGASUNTHARAM, P. SIVANANDA -SINGHAM & A. KRISHNAMURTI: Anatomy - Regional, Functional, & Clinical, P.G. Publisher, Singapore 1987.

- **GENERAL PHYSIOLOGY:-**

**COURSE DESCRIPTION:** General physiology deals with the entire human anatomy with emphasis on different organ systems, their physiological functions with special emphasis on blood and neuro physiology.

**OBJECTIVES:** At the end of the course the student will be able to: • Explain the normal functioning of various organ systems of the body and their interactions. • Elucidate the physiological aspects of normal growth and development. • Describe the physiological response and adaptations to environmental stresses. • Know the physiological principles underlying pathogenesis of disease.

| Sl. No. | Topics | No. of hrs. |
|---|---|---|
| 1 | CELL STRUCTURE & ORGANIZATION<br>Tissue organization<br>Epithelium<br>Connective tissue –Collagen fibers –Elastic fibers –Areolar fibers<br>Cartilage –Bone<br>Contractile tissue –striated –skeletal –cardiac –non striated – plain –myoepithelial<br>General principles of cell physiology<br>Physiology of skeletal muscle | 4 |
| 2 | BLOOD:<br>Composition<br>Volume measurement & variations<br>Plasma proteins –classification & functions<br>Red blood cells –development, morphology & measurements – functions & dysfunctions.<br>White blood cells –development –classification, morphology – functions & dysfunctions<br>Platelets –morphology –development, functions & dysfunctions<br>Clotting –factors –mechanism –anti- coagulants dysfunctions<br>Blood grouping –classification –importance in transfusion, Rh factor & incompatibility<br>Suspension stability<br>Osmotic stability<br>Reticulo endothelial system<br>o Spleen<br>o lymphatic tissue<br>o Thymus<br>o bone marrow<br>o immune system<br>o cellular<br>o Humoral<br>o Autoimmune | 4 |
| 3 | DIGESTION:<br>General arrangement<br>Salivary digestion –functions & regulations<br>Gastric digestion –functions & regulations<br>Pancreatic digestion –functions & regulations<br>Intestinal digestion –functions & regulations | 2 |

| | | |
|---|---|---|
| | Liver & bile<br>Absorption<br>Motility<br>Deglutition<br>Vomiting<br>Defecation<br>Functions of large intestine<br>Neurohumoral regulations of alimentary functions, summary | |
| 4 | EXCRETION:<br>Body fluids –distribution, measurement & exchange, Kidney – structure of nephron –mechanism of urine formation – composition of the urine and abnormal constituents –urinary bladder & micturition | 2 |
| 5 | ENDOCRINES:<br>Hormone mechanism –negative feed backs –tropic action – permissive action –cellular action, hypothalamic regulation<br>Thyroid - hormones, actions, regulations<br>Adrenal cortex - hormones, actions, regulations<br>Adrenal medulla –hormones, actions, regulations<br>Parathyroid - hormones, actions, regulations<br>Islets of pancreas –hormones, actions, regulations<br>Miscellaneous _ hormones, actions, regulations<br>Common clinical disorders | 3 |
| 6 | REPRODUCTION:<br>Male reproductive system –control & regulation<br>Female reproductive system –uterus –ovaries –menstrual cycle – regulation –pregnancy & delivery –breast –family planning | 1 |
| 7 | RESPIRATION:<br>Mechanics of respiration –pulmonary function tests –transport of respiratory gases- neural and chemical regulation of respiration – hypoxia, cyanosis, dyspnoea–asphyxia. | 1 |
| 8 | CIRCULATION:<br>General principles<br>Heart: myocardium –innervation –transmission of cardiac impulse- Events during cardiac cycle –cardiac output. Peripheral circulation: peripheral resistances –arterial blood pressure – measurements –factors regulation variations –capillary circulation –venous circulation. Special circulation: coronary cerebral –miscellaneous | 4 |
| 9 | ENVIRONMENTAL PHYSIOLOGY<br>Body temperature regulation (including skin Physiology). | 2 |

| | | |
|---|---|---|
| | Exposure to low and high atmospheric pressure | |
| 10 | NERVOUS SYSTEM:<br>Neuron –Conduction of impulse –synapse –receptor.<br>Sensory organization –pathways and perception<br>Reflexes –cerebral cortex –functions. Thalamus –Basal ganglia<br>Cerebellum.<br>Hypothalamus.<br>Autonomic nervous system –motor control of movements, posture and equilibrium –<br>conditioned reflex, eye hand co-ordination | 5 |
| 11 | SPECIAL SENSES –(Elementary) Olfaction –Taste –Hearing | 2 |
| | **Total Number of Hours** | **30** |

**PRACTICAL** (Total: 15 hours)

1. Blood test: Microscope, Haemocytometer, Blood, RBC count, Hb, WBC count, Differential Count, Haematocrit demonstration, ESR, Blood group & Rh. type, Bleeding time and clotting time
2. Digestion: Test salivary digestions
3. Excretion: Examination of Urine, Specific gravity, Albumin, Sugar, Microscopic examination for cells and cysts
4. Endocrinology and Reproduction: Dry experiments in the form of cases showing different endocrine disorders.
5. Respiratory System: Clinical examination of respiratory system, Spirometry, Breath holding test
6. Cardio Vascular System: Clinical examination of circulatory system, Measurement of blood pressure and pulse rate, Effect of exercise on blood pressure and pulse rate
7. Central Nervous System: Sensory system, Motor system, Cranial system, Superficial and deep reflexes

**TEXT BOOKS:-**

1. L Prakasamreddy, Fundamentals of Medical Physiology, 4th Edition, Paras medical Publisher, Hyderabad, 2008
2. Sujit K. Chaudhuri, Concise Medical Physiology, 6th edition, New Central Book Agency, Kolkata, 2008.

**REFERENCE BOOKS:-**

1. AK Khurana, InduKhurana: Anatomy and Physiology of Eye, Second edition,CBS Publishers, New Delhi, 2006
2. A C Guyton: Text book of Medical Physiology, 8th edition, saunders company, Japan,

3. G J Tortora, B Derrickson: Principles of anatomy & physiology,11th edition, Harper & Row Publishers, New York
4. John Wiley & Sons Inc, New Jer.sey, 2007.

## ➢ GENERAL BIOCHEMISTRY:-

**COURSE DESCRIPTION:** This course will be taught in two consecutive semesters. General Biochemistry deals with the biochemical nature of carbohydrates, proteins, minerals, vitamins, lipids etc. A detailed study of these, emphasizing on their chemical composition and their role in metabolism.

**OBJECTIVES:** At the end of the course, the student should be able to:
demonstrate his knowledge and understanding on:
1. Structure, function and interrelationship of biomolecules and consequences of deviation from normal.
2. Integration of the various aspects of metabolism, and their regulatory pathways.
3. Principles of various conventional and specialized laboratory investigations and instrumentation, analysis and interpretation of a given data.

**COURSE PLAN:**

| Sl.No. | Topics | No of hrs |
|---|---|---|
| **1** | Carbohydrates:<br>Glucose; fructose; galactose; lactose; sucrose; starch and glycogen (properties and tests, Structure and function) | 6 |
| **2** | Proteins:<br>Amino acids, peptides, and proteins (general properties & tests with a few examples like glycine, trytophan, glutathione, albumin, hemoglobin, collagen) | 6 |
| **3** | Lipids:<br>Fatty acids, saturated and unsaturated, cholesterol and triacyglycerol, phospholipids and plasma membrane | 6 |
| **4** | Vitamins:<br>General with emphasis on A,B2, C, E and inositol (requirements, assimilation and properties) | 6 |
| **5** | Minerals:<br>Na, K, Ca, P, Fe, Cu and Se.(requirements, availability and properties) | 6 |
| | **Total Number of Hours** | **30** |

**PRACTICAL (Total: 15 hours)**

1. Reactions of monosaccharide, disaccharides and starch:
Glucose Fructose
Galactose Maltose, lactose
Sucrose Starch
2. Analysis of Unknown Sugars
Estimation:
Photometry Biofluid of choice – blood, plasma, serum
Standard graphs Glucose
Proteins Urea
Creatinine Bilirubin

**TEXT BOOK:**

S. Ramakrishnan: Essentials of biochemistry and ocular biochemistry, Annamalai University Publications, Chidambaram, India, 1992

**REFERENCE BOOKS:**

1. S. Ramakrishnan, K G Prasannan and R Rajan: Text book of Medical Biochemistry, Orient Longman, Madras, 1990
2. D.R. Whikehart: Biochemistry of the Eye, 2ndedition, Butterworth Heinemann, Pennsylvania, 2003.

## ➢ GEOMETRICAL OPTICS-I:-

**COURSE DESCRIPTION**: This course will be taught in two consecutive semesters. Geometric Optics is the study of light and its behaviour as it propagates in a variety of media. Specifically, the phenomena of reflection and refraction of light at boundaries between media and subsequent image formation will be dealt with in detail. Reflections at plane and spherical surfaces and refractions at plane, spherical, cylindrical and toric surfaces will be studied in this course. Attention will be given to the system of surfaces and/or lenses and their imaging properties. The effect of aperture stops on the quality of images, such as blur and aberrations, depth of field and depth of focus, will also be studied .

**OBJECTIVES**: The objective of this course is to equip the students with a thorough knowledge of mirrors and lenses. At the end of this course, students will be able to predict the basic properties of the images formed on the retina by the optics of the eye.

**COURSE PLAN :**

| No. | Topics | No of hrs. |
|---|---|---|
| 1. | Nature of light –light as electromagnetic oscillation; ideas of sinusoidal oscillations; amplitude and phase; speed of light in vacuum and other media; refractive index. | 2 |
| 2. | Wavefronts–spherical, elliptical and plane; Curvature and vergence; rays; convergence and divergence in terms of rays and vergence; vergence at a distance | 2 |
| 3. | Refractive index; its dependence on wavelength | 1 |
| 4. | Fermat's and Huygen's Principle –Derivation of laws of reflection and refraction (Snell's law) from these principles | 3 |
| 5. | Plane mirrors –height of the mirror; rotation of the mirror | 1 |
| 6. | Reflection by a spherical mirror –paraxial approximation; sign convention; derivation of vergence equation | 1 |
| 7. | Imaging by concave mirror, convex mirror | 2 |
| 8. | Reflectivity; transmissivity; Snell's Law, Refraction at a plane surface | 2 |
| 9. | Glass slab; displacement without deviation; displacement without dispersion | 2 |
| 10. | Thick prisms; angle of prism; deviation produced by a prism; refractive index of the prism | 2 |
| 11. | Prisms; angular dispersion; dispersive power; Abbe's number. | 1 |
| 12. | Definition of crown and flint glasses; materials of high refractive index | 1 |
| 13. | Thin prism –definition; definition of Prism diopter; deviation produced by a thin prism; it dependence on refractive index | 2 |
| 14. | Refraction by a spherical surface; sign convention; introduction to spherical aberration using image formed by a spherical surface of a distance object; sag formula | 3 |
| 15. | Paraxial approximation; derivation of vergence equation | 1 |
| 16. | Imaging by a positive powered surface and negative powered surface | 1 |
| 17. | Vergence at a distance formula; effectivity of a refracting surface | 1 |

| | | |
|---|---|---|
| 18. | Definition of a lens as a combination of two surfaces; different types of lens shapes. | 1 |
| 19. | Image formation by a lens by application of vergence at a distance formula; definitions of front and back vertex powers; equivalent power; first and second principal planes/points; primary and secondary focal planes/points; primary and secondary focal lengths | 3 |
| 20. | Newton's formula; linear magnification; angular magnification | 2 |
| 21. | Nodal Planes | 1 |
| 22. | Thin lens as a special case of thick lens; review of sign convention | 1 |
| 23. | Imaging by a thin convex lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions | 2 |
| 24. | Imaging by a thin concave lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions | 2 |
| 25. | Prentice's Rule | 1 |
| 26. | System of two thin lenses; review of front and back vertex powers and equivalent power, review of six cardinal points. | 2 |
| 27. | System of more than two thin lenses; calculation of equivalent power using magnification formula | 2 |
| | **Total number of Lectures** | **45** |

**PRACTICAL (Total: 15 hours)**

1. Thick Prism – determination of prism angle and dispersive power; calculation of the refractive index
2. Thin Prism – measurement of deviation; calculation of the prism diopter
3. Image formation by spherical mirrors
4. Convex lens - power determination using lens gauge, power determination using distant object method; power determination using the vergence formula
5. Concave lens – in combination with a convex lens – power determination.

**TEXT BOOK:**

1. Tunnacliffe A. H, Hirst J. G, Optics, The association of British Dispensing Opticians, London, U.K., 1990.

2. Pedrotti L. S, Pedrotti Sr. F. L, Optics and Vision, Prentice Hall, New Jersey, USA, 1998.

**REFERENCE BOOKS:**

1. Loshin D. S.The Geometric Optics Workbook, Butterworth-Heinemann, Boston, USA, 1991.

2. Schwartz S. H. Geometrical and Visual Optics: A Clinical Introduction, McGraw-Hill, New York, USA, 2002.

## ➢ NUTRITION:-

**COURSE DESCRIPTION**: This course covers the basic aspects of Nutrition for good health. It also includes nutrients and nutrient derivatives relevant to ocular health, nutrition deficiency and ocular disease, Nutrition and ocular aging, and contraindications, adverse reactions and ocular nutritional supplements.

**OBJECTIVES**: At the end of the course student would have gained the knowledge of the following: • Balanced diet. • Protein, carbohydrates, vitamins, Minerals, carotenoids and eye. • Nutrition and Ocular aging • Adverse effects of ocular nutritional supplements.

- **COURSE PLAN (Total: 15 hours)**

1. Introduction.

1.1 History of Nutrition

1.2 Nutrition as a science

1.3 Food groups, RDA

1.4 Balanced diet, diet planning.

1.5 Assessment of nutritional status

2. Energy

2.1 Units of energy.

2.2 Measurements of energy and value of food

2.3 Energy expenditure.

2.4 Total energy/calorie requirement for different age groups and diseases.

2.5 Satiety value

2.6 Energy imbalance- obesity, starvation.

2.7 Limitations of the daily food guide.

3. Proteins

3.1 Sources and functions

3.2 Essential and non- essential amino- acids.

3.3 Incomplete and complete proteins

3.4 Supplementary foods.

3.5 PEM and the eye

3.6 Nitrogen balance

3.7 Changes in protein requirement.

4. Fats

4.1 Sources and functions

4.2 Essential fatty acids

4.3 Excess and deficiency

4.4 Lipids and the eye.

4.5 Hyperlipidemia, heart diseases, atherosclerosis.

5. Minerals

5.1 General functions and sources

5.2 Macro and micro minerals associated with the eye.

5.3 Deficiencies and excess –ophthalmic complications (e.g. iron, calcium, iodine etc.)

6. Vitamins

6.1 General functions, and food sources

6.2 Vitamin deficiencies and associated eye disorders with particular emphasis to Vitamin A

6.3 Promoting sound habits in pregnancy, lactation and infancy.

6.4 Nutrient with antioxidant.

6.5 Properties

6.6 Digestion of Proteins, carbohydrates & lipids

7. Essential amino acids.

8. Miscellaneous

8.1 Measles and associated eye disorders, low birth weight

**TEXT BOOK:**

1. M Swaminathan: Hand book of Food and Nutrition, fifth edition, Bangalore printing & publishing Co.Ltd, Bangalore, 2004

2. C Gopalan, BV Rama Sastri, SC Balasubramanian: Nutritive Value of Indian Foods, National Institute of Nutrition, ICMR, Hyderabad,2004

3. Frank Eperjesi& Stephen Beatty: Nutrition and the Eye A practical Approach, Elsevier Butterworth- Heinemann, USA, 2006

## ➢ ENGLISH AND COMMUNICATION:-

**COURSE DESCRIPTION**: This course deals with essential functional English aspects and nuances of the communication skills essential for the health care professionals.

**OBJECTIVES**:

1. This course trains the students in oral presentations, expository writing, logical organization and structural support.
2. By acquiring skills in the use of communication techniques the students will be able to express better, grow personally and professionally, develop poise and confidence and achieve success.

| **Functional English** | **Topics** | **Hours** |
|---|---|---|
| Unit 1<br>Basics of Grammar | Vocabulary<br>Synonyms, Antonyms, Prefix and Suffix, Homonyms, Analogies and Portmanteau words | 2 |
| Unit II<br>Basics of Grammar – Part II | Active, Passive, Direct and Indirect speech, Prepositions, Conjunctions and Euphemisms | 1 |
| Unit III<br>Writing Skills | Letter Writing, Email, Essay, Articles, Memos, one word substitutes, note making and Comprehension | 2 |
| Unit IV<br>Writing and Reading | Summary writing, Creative writing, newspaper reading | 1 |
| Unit V<br>Practical Exercise | Formal speech, Phonetics, semantics and pronunciation | 1 |
| Communication Introduction | □ Communication process.<br>□ Elements of communication<br>□ Barriers of communication and how to overcome them.<br>□ Nuances for communicating with patients and their attenders in hospitals | 1 |

| | | |
|---|---|---|
| Speaking | □ Importance of speaking efficiently<br>□ Voice culture.<br>□ Preparation of speech. Secrets of good delivery<br>□ Audience psychology, handling<br>□ Presentation skills.<br>□ Individual feedback for each student<br>□ Conference/Interview technique | 2 |
| Listening | □ Importance of listening<br>□ Self-assessment<br>□ Action plan execution.<br>□ Barriers in listening.<br>□ Good and persuasive listening | 2 |
| Reading | □ What is efficient and fast reading<br>□ Awareness of existing reading habits<br>□ Tested techniques for improving speed<br>□ Improving concentration and comprehension through systematic study. | 1 |
| Non Verbal Communication | □ Basics of non-verbal communication<br>□ Rapport building skills using neuro- linguistic programming (NLP) | 1 |
| Communication in Optometry practice | | 1 |
| Total | | 15 |

**TEXT BOOK**:

1. Graham Lock, Functional English Grammar: Introduction to second Language Teachers. Cambridge University Press, New York, 1996.

2. Gwen Van Servellen. Communication for Health care professionals: Concepts, practice and evidence, Jones & Bartlett Publications , USA, 2009

- **OCULAR ANATOMY :-**

**COURSE DESCRIPTION**: This course deals with detailed anatomy of the orbit, eyeball and cranial nerves associated with ocular functions.

**OBJECTIVES**: the student should be able to:

1. Comprehend the normal disposition, inter-relationships, gross, functional and applied anatomy of various structures in the eye and adnexa.
2. Identify the microscopic structures of various tissues in the eye and correlate the structure with the functions.
3. Comprehend the basic structure and connections between the various parts of the central nervous system and the eye so as to understand the neural connections and distribution.
4. To understand the basic principles of ocular embryology.

**COURSE PLAN (Total: 45 hours)**

1. Central nervous system:
1.1 Spinal cord and brain stem
1.2 Cerebellum
1.3 Cerebrum.
2. Orbit
2.1 Eye
2.2 Sclera
2.3 Cornea
2.4 Choroid
2.5 Ciliary body
2.6 Iris
2.7 Retina
3. Refractory media-
3.1 Aqueous humor
3.2 Anterior chamber
3.3 Posterior chamber
3.4 Lens
3.5 Vitreous body
4. Eyelids
5. Conjunctiva
6. Embryology

**PRACTICAL (Total: 15 hours)**

1. Eye: Practical dissection of bull's eye

2. Orbit: Practical demonstration of orbital structures.

**TEXT BOOK**: L A Remington: Clinical Anatomy of the Visual System, Second edition, Elsevier Butterworth Heinemann, Missouri, USA, 2005.

**REFERENCE BOOKS**: AK Khurana, InduKhurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006

## ➢ OCULAR PHYSIOLOGY :-

**COURSE DESCRIPTION**: Ocular physiology deals with the physiological functions of each part of the eye.

**OBJECTIVES**: At the end of the course, the student should be able to:

1. Explain the normal functioning of all structures of the eye and their interactions
2. Elucidate the physiological aspects of normal growth and development of the eye
3. Understand the phenomenon of vision
4. List the physiological principles underlying pathogenesis and treatment of diseases of the eye

**COURSE PLAN: (Total: 45 hours)**

1. Protective mechanisms in the eye: Eye lids and lacrimation, description of the globe
2. Extrinsic eye muscles, their actions and control of their movements
3. Coats of the eye ball
4. Cornea
5. Aqueous humor and vitreous: Intra ocular pressure
6. Iris and pupil
7. Crystalline lens and accommodation – presbyopia
8. Retina – structure and functions
9. Vision – general aspects of sensation
10. Pigments of the eye and photochemistry
11. The visual stimulus, refractive errors

12. Visual acuity, Vernier acuity and principle of measurement
13. Visual perception – Binocular vision, stereoscopic vision, optical illusions
14. Visual pathway, central and cerebral connections
15. Colour vision and colour defects. Theories and diagnostic tests
16. Introduction to electro physiology
17. Scotopic and Photopic vision
18. Color vision, Color mixing
19. Mechanism of accommodation
20. Retinal sensitivity and Visibility
21. Receptive stimulation and flicker

22. Ocular, movements and saccades
23. Visual perception and adaptation
24. Introduction to visual psychology (Psychophysics)

**PRACTICAL: Total: 15 hours.**

1. Lid movements
2. Tests for lacrimation tests
3. Extra ocular movements
4. Break up time
5. Pupillary reflexes
6. Applanation tonometry
7. Schiotz tonometry.
8. Measurement of accommodation and convergence
9. Visual acuity measurement.
10. Direct ophthalmoscopy
11. Indirect ophthalmoscopy
12. Retinoscopy
13. Light and dark adaptation.
14. Binocular vision( Stereopsis)

- **TEXT BOOK**: AK Khurana, InduKhurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006

- **REFERENCE BOOKS:**

- RD Ravindran: Physiology of the eye, Arvind eye hospitals, Pondicherry, 2001
- PL Kaufman, A Alm: Adler's Physiology of the eye clinical application, 10th edition, Mosby, 2002

## ➢ OCULAR BIOCHEMISTRY:-

**COURSE DESCRIPTION**: This course is being taught in two consecutive semesters. Ocular Biochemistry deals with the metabolism that takes place in the human body. It also deals with ocular biochemistry in detail. Clinical estimation as well as the clinical significance of biochemical values is also taught.

**OBJECTIVES**: At the end of the course, the student should be able to demonstrate his knowledge and understanding on

1. Structure ,function and interrelationship of biomolecules and consequences of deviation from the normal
2. Integration of various aspects of metabolism and their regulatory pathways
3. Principles of various conventional and specialized laboratory investigations and instrumentation, analysis and interpretation of a given data
4. Understand metabolic processes taking place in different ocular structures.

**COURSE PLAN: (Total: 15 hours)**

1. Hormones basic concepts in metabolic regulation with examples say insulin.
2. Metabolism: General whole body metabolism (carbohydrates, proteins, lipids)
3. Ocular Biochemistry: Various aspects of the eye, viz., cornea, lens aqueous, vitreous, retina and pigment rhodopsin. (The important chemicals in each and their roles.)

Immunology of anterior segment

4. Technique: Colloidal state, sol. Gel. Emulsion, dialysis, electrophoresis.pH buffers mode of action, molar and percentage solutions, photometer, colorimeter and spectrometry. Radio isotopes: application in medicine and basic research.
5. Clinical Biochemistry: Blood sugar, urea, creatinine and bilirubin significance of their estimation.

**PRACTICAL (Total: 15 hours)**

1. Quantitative analysis
2. Abnormal constituents in urine, sugar proteins, ketones, blood and bile salts.
3. Techniques of detection of abnormal constituents of urine:
4. Electrophoresis
4.1 Chromatography
4.2 Preparation of normal, molar and percentage solutions.
4.3 Preparation of buffers, pH determination
5. Demonstration
5.1 Estimation of blood cholesterol
5.2 Estimation of alkaline phosphatase.
5.3 Salivary amylase (effect of ph, etc)
5.4 Milk analysis.

- **TEXT BOOK**: S. Ramakrishnan: Essentials of biochemistry and ocular biochemistry, Annamalai University Publications, Chidambaram, India, 1992
- **REFERENCE BOOKS**:
- S. Ramakrishnan, K G Prasannan and R Rajan: Text book of Medical Biochemistry, Orient Longman, Madras, 1990
- D R Whikehart: Biochemistry of the Eye, 2nd edition, Butterworth Heinemann, Pennsylvania, 2003

## ➢ PHYSICAL OPTICS :-

**COURSE DESCRIPTION**: This course will be taught in one semester. Physical Optics is the study of light, its properties and its interaction with matter. Specifically, the phenomena of interference, diffraction, polarization and scattering will be dealt with in detail.

**OBJECTIVES**: The objective of this course is to equip the students with a thorough knowledge of properties of light. At the end of this course, students will be able to predict the distribution of light under various conditions.

**COURSE PLAN**

**No. Topics No of**

| | | hrs. |
|---|---|---|
| 1. | Nature of light –light as electromagnetic oscillation –wave equation; ideas of sinusoidal oscillations –simple harmonic oscillation; transverse nature of oscillation; concepts of frequency, wavelength, amplitude and phase. | 7 |
| 2. | Sources of light; Electromagnetic Spectrum. | 3 |
| 3. | Polarized light; linearly polarized light; and circularly polarized light. | 3 |
| 4. | Intensity of polarized light; Malus'Law; polarizers and analyzers; Methods of producing polarized light; Brewster's angle. | 2 |
| 5. | Birefringence; ordinary and extraordinary rays. | 2 |
| 6. | Relationship between amplitude and intensity. | 1 |
| 7. | Coherence; interference; constructive interference, destructive interference; fringes; fringe width. | 2 |
| 8. | Double slits, multiple slits, gratings. | 2 |
| 9. | Diffraction; diffraction by a circular aperture; Airy's disc | 2 |
| 10. | Resolution of an instrument (telescope, for example); Raleigh's criterion | 2 |
| 11. | Scattering; Raleigh's scattering; Tyndall effect. | 2 |
| 12. | Fluorescence and Phosphorescence | 2 |
| 13. | Basics of Lasers –coherence; population inversion; spontaneous emission; Einstein's theory of lasers. | 5 |
| 14. | Radiometry; solid angle; radiometric units; photopic and scotopic luminous efficiency and efficacy curves; photometric units | 4 |
| 15. | Inverse square law of photometry; Lambert's law. | 3 |
| 16. | Other units of light measurement; retinal illumination; Trolands | 3 |
| **Total number of Lectures** | | **45** |

**PRACTICAL: (Total : 15 hours )**

Each practical session could be evaluated for 10 marks and the total could be added to the final evaluations. These practical could be customized as per the university requirements and spaced apart conveniently. The practical to be done include the following:

1. Gratings – determination of grating constant using Sodium vapour lamp; determination of wavelengths of light from Mercury vapour lamp
2. Circular Apertures – measurements of Airy's disc for apertures of various sizes
3. Verification of Malus' Law using a polarizer – analyzer combination
4. Demonstration of birefringence using Calcite crystals
5. Measurement of the resolving power of telescopes.
6. Newton's rings
7. Demonstration of fluorescence and phosphorescence using crystals and paints .

- **TEXT BOOK**: Subrahmanyan N, BrijLal, A text book of Optics, S. Chand Co Ltd, New Delhi, India, 2003.
- **REFERENCE BOOKS**:
- Pedrotti L. S, Pedrotti Sr. F. L, Optics and Vision, Prentice Hall, New Jersey, USA, 1998.
- Keating NM. P, Geometric, Physical and Visual Optics, Butterworth-Heinemann, Massachusetts, USA, 2002.

## ➢ GEOMETRICAL OPTICS II:-

**COURSE DESCRIPTION**: This course will be taught in two consecutive semesters. Geometric Optics is the study of light and its behaviour as it propagates in a variety of media. Specifically, the phenomena of reflection and refraction of light at boundaries between media and subsequent image formation will be dealt with in detail. Reflections at plane and spherical surfaces and refractions at plane, spherical, cylindrical and toric surfaces will be studied in this course. Attention will be given to the system of surfaces and/or lenses and their imaging properties.

**OBJECTIVES**: The objective of this course is to equip the students with a thorough knowledge of mirrors and lenses. At the end of this course, students will be able to predict the basic properties of the images formed on the retina by the optics of the eye.

**COURSE PLAN: Total: 45 hours**

1. Vergence and vergence techniques revised.
2. Gullstrand's schematic eyes, visual acuity, Stile Crawford
3. Emmetropia and ametropia
4. Blur retinal Imaginary
5. Correction of spherical ammetropia, vertex distance and effective power, dioptric power of the spectacle, to calculate the dioptoric power, angular magnification of spectacles in aphakic
6. Thin lens model of the eye –angular magnification –spectacle and relative spectacle magnification.
7. Aperture stops- entrance and exit pupils.
8. Astigmatism. - To calculate the position of the line image in a sphero-cylindrical lens.
9. Accommodation –Accommodation formulae and calculations.
10. Presbyopia- Spectacle magnification, angular magnification of spectacle lens, near point, calculation of add, depth of field.
11. Spatial distribution of optical information- modulation transfer functions- Spatial filtering- applications.
12. Visual optics of aphakia and pseudophakia.

**PRACTICAL: Total: 15 hours**

1. Construction of a tabletop telescope – all three types of telescopes.
2. Construction of a tabletop microscope
3. Imaging by a cylindrical lens – relationship between cylinder axis and image orientation
4. Imaging by two cylinders in contact – determination of the position of CLC; verification of CLC using a spherical lens with power equal to the spherical equivalent; orientations and position of the line images and their relation to the cylinders' powers and orientations
5. Imaging by a spherocylindrical lens – sphere and cylinder in contact – determination of the position of CLC; verification of CLC using a spherical lens with power equal to the spherical equivalent; orientations and position of the line images and their relation to the cylinder's power and orientation .

- **TEXT BOOK:**

- Tunnacliffe A. H, Hirst J. G, Optics, The association of British Dispensing Opticians, London, U.K., 1990.
- Pedrotti L. S, Pedrotti Sr. F. L, Optics and Vision, Prentice Hall, New Jersey, USA, 1998.

- **REFERENCE BOOKS:**
- Loshin D. S. The Geometric Optics Workbook, Butterworth-Heinemann, Boston, USA, 1991.
- Schwartz S. H. Geometrical and Visual Optics: A Clinical Introduction, McGraw-Hill, New York, USA, 2002

## ➢ BASIC COMPUTERS AND INFORMATION SCIENCE

**COURSE DESCRIPTION**: The course has focus on computer organization, computer operating system and software, and MS windows, Word processing, Excel data worksheet and PowerPoint presentation.

**OBJECTIVES**: The students will be able to appreciate the role of computer technology and some extent able to gain hand-on experience in using computers.

**COURSE PLAN**: (Total: 15 hours) – students will be given hand-on practical sessions and reading materials (softcopy). Some of the topics will be demonstration.

1. Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.

2. Input output devices: Input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems).

3. Processor and memory: The Central Processing Unit (CPU), main memory.

4. Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

5. Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).

6. Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and

formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.

7. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.

8. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.

9. Introduction of Operating System: introduction, operating system concepts, types of operating system.

10. Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.

11. Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.

12. Application of Computers in clinical settings.

- **CLINICAL OPTOMETRY I (STUDENTSHIP):**

**Total: 15 hours**

Students will observe the basic operations of the optometry clinic while interacting with the multidisciplinary team members involved in providing optimal care to patients. The student will be introduced to optical terminology, equipment, and techniques used for treatment.

## Second Year :-

- **OCULAR MICROBIOLOGY:-**

**COURSE DESCRIPTION** This course covers the basic biological, biochemical and pathogenic characteristics of pathogenic organisms.

**OBJECTIVES** The objectives of the course are:

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

**COURSE PLAN: (Total: 15 hours)**

1. Morphology and principles of cultivating bacteria
2. Sterilization and disinfections used in laboratory and hospital practice
3. Common bacterial infections of the eye.
4. Common fungal infections of the eye
5. Common viral infections of the eye.
6. Common parasitic infections of the eye.

- **TEXT BOOK:**
- BURTON G.R.W: Microbiology for the Health Sciences, third edition, J.P. Lippincott Co., St. Louis, 1988.
- M J Pelczar (Jr),ECS Chan, NR Krieg : Microbiology ,fifth edition, TATA McGRAW-HILL Publisher, New Delhi,1993

- **REFERENCE BOOKS:**
- KJ Ryan, CG Ray: Sherris Medical Microbiology- An Introduction to infectious Diseases, fourth edition, McGRAW HILL Publisher, New Delhi, 1994 MACKIE & McCartney Practical Medical Microbiology
- SYDNEY M. FINEGOLD & ELLEN JO BARON: Diagnostic Microbiology .

## ➢ VISUAL OPTICS I:-

**COURSE DESCRIPTION:** This course deals with the concept of eye as an optical instrument and thereby covers various optical components of eye, types

of refractive errors, clinical approach in diagnosis and management of various types of refractive errors.

**OBJECTIVES**: Upon completion of the course, the student should be able:
1. To understand the fundamentals of optical components of the eye
2. To gain theoretical knowledge and practical skill on visual acuity measurement, objective and subjective clinical refraction.

**COURSE PLAN (Total: 15 hours)**

1. Review of Geometrical Optics: Vergence and power
1.1 Conjugacy, object space and image space
1.2 Sign convention
1.3 Spherical refracting surface
1.4 Spherical mirror; catoptric power
1.5 Cardinal points

1.6 Magnification
1.7 Light and visual function
1.8 Clinical Relevance of: Fluorescence, Interference, Diffraction, Polarization, Bi-refringence, Dichroism
1.9 Aberration and application Spherical and Chromatic
2. Optics of Ocular Structure
2.1 Cornea and aqueous
2.2 Crystalline lens
2.3 Vitreous
2.4 Schematic and reduced eye
3. Measurements of Optical Constants of the Eye
3.1 Corneal curvature and thickness
3.2 Keratometry
3.3 Curvature of the lens and ophthalmophakometry
3.4 Axial and axis of the eye
3.5 Basic Aspects of Vision.
3.5.1 Visual Acuity
3.5.2 Light and Dark Adaptation
3.5.3 Color Vision
3.5.4 Spatial and Temporal Resolution

3.5.5 Science of Measuring visual performance and application to Clinical Optometry

4. Refractive anomalies and their causes

4.1 Etiology of refractive anomalies

4.2 Contributing variability and their ranges

4.3 Populating distributions of anomalies.

4.4 Optical component measurements

4.5 Growth of the eye in relation to refractive errors

- **TEXT BOOK:**
- A H Tunnacliffe: Visual optics, The Association of British Optician, 1987
- AG Bennett & RB Rabbets: Clinical Visual optics, 3rd edition, Butterworth Heinemann, 1998

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

## ➢ OPTOMETRIC OPTICS I:-

**COURSE DESCRIPTION:** This course deals with understanding the theory behind spectacle lenses and frames, their materials, types, advantages and disadvantages, calculations involved, when and how to prescribe. It will impart construction, design application and development of lenses, particularly of the methods of calculating their power and effect.

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

1. Measurement of lens power , lens centration using conventional techniques

2. Transposition of various types of lenses •Knowledge to identify different forms of lenses .

3. Knowledge to select the tool power for grinding process.

4. Measurement of surface powers using lens measure.

5. Method of laying off the lens for glazing process.

6. Ophthalmic prism knowledge –effects, units, base-apex notation, compounding and resolving prisms.

7. Knowledge of prism and decentration in ophthalmic lenses

8. Knowledge of different types of materials used to make lenses and its characteristics

9. Knowledge lens designs –single vision, bifocals, progressive lens

10. Knowledge on tinted and protective lenses

11. Knowledge on special lenses like iseikonic, spectacle magnifiers.

12. Knowledge on spectacle frames –manufacture, materials

**COURSE PLAN (Total: 45 hours)**

1. Introduction –Light, Mirror, Reflection, Refraction and Absorption

2. Prisms –Definition, properties, Refraction through prisms, Thickness difference, Base-apex notation, uses, nomenclature and units, Sign Conventions, Fresnel's prisms, rotary prisms

3. Lenses –Definition, units, terminology used to describe, form of lenses

4. Vertex distance and vertex power, Effectivity calculations

5. Lens shape, size and types i.e. Spherical, cylindrical and Sphero-cylindrical

6. Transpositions –Simple, Toric and Spherical equivalent

7. Prismatic effect, centration, decentration and Prentice rule, Prismatic effect of Plano-cylinder and Spherocylinderlenses

8. Spherometer& Sag formula, Edge thickness calculations

9. Magnification in high plus lenses, Minification in high minus lenses

10. Tilt induced power in spectacles

11. Aberration in Ophthalmic Lenses

- **TEXT BOOK**:
- Jalie M: The principles of Ophthalmic Lenses, The Association of Dispensing Opticians, London, 1994.

- **REFERENCE BOOKS:**

- David Wilson: Practical Optical Dispensing, OTEN- DE, NSW TAFE Commission,1999
- C V Brooks, IM Borish: System for Ophthalmic Dispensing, Second edition, Butterworth-Heinemann, USA, 1996 .

## ➢ OPTOMETRIC INSTRUMENTS:-

**COURSE DESCRIPTION:** This course covers commonly used optometric instruments, its basic principle, description and usage in clinical practice.
**OBJECTIVES**: Upon completion of the course, the student should be able to gain theoretical knowledge and basic practical skill in handling the following instruments

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

**COURSE PLAN (Total: 30 hours)**

1. Refractive instruments

1.1 Optotypes and MTF, Spatial Frequency

1.2 Test charts standards.

1.3 Choice of test charts

1.4 Trial case lenses

1.5 Refractor (phoropter) head units

1.6 Optical considerations of refractor units

1.7 Trial frame design

1.8 Near vision difficulties with units and trial frames

1.9 Retinoscope – types available

1.10 Adjustment of Retinoscopes- special features
1.11 Objective optometers.
1.12 Infrared optometer devices.
1.13 Projection charts
1.14 Illumination of the consulting room.
1.15 Brightness acuity test
1.16 Vision analyzer
1.17 Pupilometer
1.18 Potential Acuity Meter
1.19 Abberometer
2. Ophthalmoscopes and related devices
2.1 Design of ophthalmoscopes – illumination
2.2 Design of ophthalmoscopes- viewing
2.3 Ophthalmoscope disc

2.4 Filters for ophthalmoscopy
2.5 Indirect ophthalmoscope
3. Lensometer, Lens gauges or clock
4. Slit lamp
5. Tonometers
6. Keratometer and corneal topography
7. Refractometer
8. Orthoptic Instruments (Synaptophore Only)
9. Color Vision Testing Devices
10. Fields of Vision And Screening Devices
11. Scans
12. ERG
13. New Instruments

- **TEXT BOOK:** David Henson: Optometric Instrumentations, Butterworth- Heinnemann, UK, 1991

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

## ➢ OCULAR DISEASES- I:-

**COURSE DESCRIPTION:** This course deals with various ocular diseases affecting various parts of the eyes. It covers clinical signs and symptoms, cause, pathophysiological mechanism, diagnostic approach, differential diagnosis and management aspects of the ocular diseases.

**OBJECTIVES**: At the end of the course the students will be knowledgeable in the following aspects of ocular diseases:

1. Etiology
2. Epidemiology
3. Symptoms
4. Signs
5. Course sequelae of ocular disease
6. Diagnostic approach and
7. Management of the ocular diseases.

**COURSE PLAN (Total: 45 hours)**

1. Orbit

1.1 Applied Anatomy

1.2 Proptosis (Classification, Causes, Investigations)

1.3 Enophthalmos

1.4 Developmental Anomalies (craniosynostosis, Craniofacial Dysostosis, Hypertelorism, Median facial cleft syndrome)

1.5 Orbital Inflammations (Preseptal cellulites, Orbital cellulitis Orbital Periostitis, cavernous sinus Thrombosis)

1.6 Grave's Ophthalmopathy

1.7 Orbital tumors(Dermoids, capillary haemangioma, Optic nerve glioma)

1.8 Orbital blowout fractures

1.9 Orbital surgery (Orbitotomy)

1.10 Orbital tumors

1.11 Orbital trauma

1.12 Approach to a patient with proptosis

2. Lids

2.1 Applied Anatomy

2.2 Congenital anomalies (Ptosis, Coloboma, Epicanthus, Distichiasis, Cryptophthalmos)

2.3 Oedema of the eyelids(Inflammatory, Solid, Passive edema)

2.4 Inflammatory disorders (Blepharitis, External Hordeolum, Chalazion ,Internalhordeolum, MolluscumContagiosum)

2.5 Anomalies in the position of the lashes and Lid Margin (Trichiasis, Ectropion, Entropion, Symblepharon, Blepharophimosis, Lagophthalmos, Blepharospasm, Ptosis).

2.6 Tumors (Papillomas, Xanthelasma, Haemangioma, Basal carcinoma, Squamous cell carcinoma, sebaceous gland melanoma)

3. Lacrimal System

3.1 Applied Anatomy

3.2 Tear Film

3.3 The Dry Eye ( Sjogren's Syndrome)

3.4 The watering eye ( Etiology, clinical evaluation)

3.5 Dacryocystitis

3.6 Swelling of the Lacrimal gland(Dacryoadenitis)

4. Conjunctiva

4.1 Applied Anatomy

4.2 Inflammations of conjunctiva ( Infective conjunctivitis – bacterial, chlamydial, viral , Allergic conjunctivitis, Granulomatous conjunctivitis)

4.3 Degenerative conditions(Pinguecula, Pterygium, Concretions)

4.4 Symptomatic conditions(Hyperaemia, Chemosis, Ecchymosis, Xerosis, Discoloration)

4.5 Cysts and Tumors

5. Cornea

5.1 Applied Anatomy and Physiology

5.2 Congenital Anomalies (Megalocornea, Microcornea, Cornea plana, Congenital cloudy cornea)

5.3 Inflammations of the cornea (Topographical classifications: Ulcerative keratitis and Non ulcerative

5.4 Etiological classifications: Infective, Allergic, Trophic, Traumatic, Idiopathic)

5.5 Degenerations ( classifications, Arcussenilis, Vogt's white limbal girdle, Hassal-henle bodies, Lipoid Keratopathy, Band shaped keratopathy, Salzmann's nodular degeneration, Droplet keratopathy, Pellucid Marginal degeneration)

5.6 Dystrophies ( Reis Buckler dystrophy,Recurrent corneal erosion syndrome, Granular dystrophy, Lattice dystrophy, Macular dystrophy, cornea guttata, Fuch's epithelial endothelial dystrophy, Congenital hereditary endothelial dystrophy)

5.7 Keratoconus, Keratoglobus

5.8 Corneal oedema, Corneal opacity, Corneal vascularisation

5.9 Penetrating Keratoplasty

6. Uveal Tract and Sclera

6.1 Applied Anatomy,

6.2 Classification of uveitis

6.3 Etiology

6.4 Pathology

6.5 Anterior Uveitis

6.6 Posterior Uveitis

6.7 Purulent Uveitis

6.8 Endophthalmitis

6.9 Panophthalmitis

6.10 Pars Planitis

6.11 Tumors of uvealtract( Melanoma)

6.12 Episcleritis and scleritis

6.13 Clinical examination of Uveitis and Scleritis

- **TEXT BOOK:**
- A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international (p) Ltd. Publishers, New Delhi, 2007

- **REFERENCE BOOKS:**
- Stephen J. Miller : Parsons Diseases of the Eye, 18th edition, Churchill Livingstone, 1990
- Jack J. Kanski Clinical Ophthalmology: A Systematic Approach, 6th edition, Butterworth - Heinemann, 2007 .

## ➢ CLINICAL EXAMINATION OF THE VISUAL SYSTEM:-

**COURSE DESCRIPTION:** This course covers various clinical optometry procedures involving external examination, anterior segment and posterior

segment examination, neuroophthalmic examination, paediatric optometry examination, and Glaucoma evaluation

.

**OBJECTIVES:** At the end of the course the students will be skilled in knowing the purpose, set-up and devices required for the test, indications and contraindications of the test, step-by-step procedures, documentation of the findings, and interpretation of the findings of the various clinical optometry procedures.

**COURSE PLAN (Total: 30 hours)**

1. History taking
2. Visual acuity estimation
3. Extraocular motility, Cover teat, Alternating cover test
4. Hirschberg test, Modified Krimsky
5. Pupils Examination
6. Maddox Rod
7. Van Herrick
8. External examination of the eye, Lid Eversion
9. Schirmer's, TBUT, tear meniscus level, NITBUT (keratometer),
10. Color Vision
11. Stereopsis
12. Confrontation test
13. Photostress test
14. Slit lamp biomicroscopy
15. Ophthalmoscopy
16. Tonometry
17. ROPLAS
18. Amsler test
19. Contrast sensitivity function test
20. Saccades and pursuit test

- **TEXT BOOK**: T Grosvenor: Primary Care Optometry, 5th edition, Butterworth –Heinneman, USA, 2007.
- **REFERENCE BOOKS:**
- A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international(p) Ltd. Publishers, New Delhi, 2007

- D B. Elliott :Clinical Procedures in Primary Eye Care,3rd edition, Butterworth-Heinemann, 2007
- Jack J. Kanski Clinical Ophthalmology: A Systematic Approach,6th edition, Butterworth-Heinemann, 2007
- 4. J.B Eskridge, J F. Amos, J D. Bartlett: Clinical Procedures in Optometry, Lippincott Williams and Wilkins,1991
- 5. N B. Carlson , Dl Kurtz: Clinical Procedures for Ocular Examination ,3rd edition, McGraw-Hill Medical, 2003


## ➢ INDIAN MEDICINE AND TELEMEDICINE :-

**COURSE DESCRIPTION**: This course insight into existing healthcare system in India.

**OBJECTIVES:** At the end of the course student will be aware of the traditional and the latest healthcare system. The student also will get basic knowledge about the telemedicine practices in India especially in eye care.

**COURSE PLAN**: (Total: 15 hours)
Topics to be covered under the subject are as follows:
1. Introduction to healthcare delivery system
1.1 Healthcare delivery system in India at primary, secondary and tertiary care
1.2 Community participation in healthcare delivery system
1.3 Health system in developed countries.
1.4 Private Sector
1.5 National Health Mission
1.6 National Health Policy
1.7 Issues in Health Care Delivery System in India
2. National Health Programme-Background objectives, action plan, targets, operations, achievements and constraints in various National Heath Programme.
3. Introduction to AYUSH system of medicine
3.1 Introduction to Ayurveda.
3.2 Yoga and Naturopathy
3.3 Unani
3.4 Siddha
3.5 Homeopathy
3.6 Need for integration of various system of medicine

4. Health scenario of India- past, present and future

5. Demography & Vital Statistics-

5.1 Demography – its concept

5.2 Vital events of life & its impact on demography

5.3 Significance and recording of vital statistics

5.4 Census & its impact on health policy

6. Epidemiology

6.1 Principles of Epidemiology

6.2 Natural History of disease

6.3 Methods of Epidemiological studies

6.4 Epidemiology of communicable & non-communicable diseases, disease transmission, host defense immunizing agents, cold chain, immunization, disease monitoring and surveillance.

- **CLINICAL OPTOMETRY II (STUDENTSHIP)**

**Total: 45 hours**

Students will gain additional skills in clinical procedures, interaction with patients and professional personnel. Students apply knowledge from previous clinical learning experience under the supervision of a registered optometrist. Students are tested on intermediate clinical optometry skills. The practical aspects of the dispensing optics( hand-on in optical), optometric instruments, clinical examination of visual system( Hands-on under supervision) and ocular diseases ( Slides and case discussion) will be given to the students during their clinical training.

- **OPTOMETRIC OPTICS II & Dispensing Optics:-**

**COURSE DESCRIPTION:** This course deals with understanding the theory behind spectacle lenses and frames, their materials, types, advantages and disadvantages, calculations involved, when and how to prescribe. It will impart

construction, design application and development of lenses, particularly of the methods of calculating their power and effect. In addition deals with role of optometrists in optical set-up.

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

1. To select the tool power for grinding process
2. Different types of materials used to make lenses and its characteristics
3. Lens designs–Bifocals, progressive lens
4. Tinted, Protective & Special lenses
5. Spectacle frames –manufacture process & materials
6. Art and science of dispensing spectacle lens and frames based on the glass prescription.
7. Reading of spectacle prescription. Counselling the patient
8. Lens edge thickness calculation
9. Frame & lens measurements and selection
10. Writing spectacle lens order
11. Facial measurements - Interpupillary distance measurement and measuring heights (single vision, multifocal, progressives)
12. Lens verification and axis marking and fitting of all lens types
13. Final checking of finished spectacle with frame adjustments
14. Delivery and follow-up
15. Troubleshooting complaints and handling patient's questions

**COURSE PLAN :**

| **Sl. No** | **Topics** | **No. of Hrs** |
|---|---|---|
| 1. | Spectacle Lenses - II:<br>□ Manufacture of glass<br>□ Lens materials<br>□ Lens surfacing<br>□ Principle of surface generation and glass cements<br>□ Terminology used in Lens workshop<br>□ Lens properties<br>□ Lens quality | **5** |

□ Faults in lens material
□ Faults on lens surface

□ Methods of Inspecting the quality of lenses
□ Safety standards for ophthalmic lenses (FDA, ANSI, ISI, Others)

| | | |
|---|---|---|
| 2. | Spectacle Frames:<br>□ Types and parts<br>□ Classification of spectacle frames-material, weight, temple position, Coloration<br>□ Frame construction<br>□ Frame selection<br>□ Size, shape, mounting and field of view of ophthalmic lenses | **5** |
| 3. | Tinted & Protective Lenses<br>□ Characteristics of tinted lenses Absorptive Glasses<br>□ Polarizing Filters, Photochromic & Reflecting filters<br>□ Safety lenses-Toughened lenses, Laminated Lenses, CR 39, Polycarbonate lenses | **5** |
| 4. | Multifocal Lenses:<br>□ Introduction, history and development, types<br>□ Bifocal lenses, Trifocal & Progressive addition lenses | **3** |
| 5. | Reflection from spectacle lens surface & lens coatings:<br>□ Reflection from spectacle lenses - ghost images -Reflections in bifocals at the dividing line<br>□ Antireflection coating, Mirror coating, Hard Multi Coating [HMC], Hydrophobic coating | **2** |
| 6. | Miscellaneous Spectacle:<br>□ Iseikonic lenses<br>□ Spectacle magnifiers<br>□ Recumbent prisms<br>□ Fresnel prism and lenses<br>□ Lenticular &Aspherical lenses<br>□ High Refractive index glasses | **5** |

**Total number of hours** **25**

## DISPENSING OPTICS:

| Sl. No. | Topic | No. of Lectures |
|---|---|---|
| 1 | Components of spectacle prescription & interpretation, transposition, Add and near power relation | 1 |
| 2 | Frame selection –based on spectacle prescription, professional requirements, age group, face shape | 4 |
| 3 | Measuring Inter-pupillary distance (IPD) for distance & near, bifocal height | 1 |
| 4 | Lens & Frame markings, Pupillary centers, bifocal heights, Progressive markings & adjustments –facial wrap, pantoscopic tilt | 1 |
| 5 | Recording and ordering of lenses (power, add, diameter, base, material, type, lens enhancements) | 1 |
| 6 | Neutralization –Hand &lensometer, axis marking, prism marking | 3 |
| 7 | Faults in spectacles (lens fitting, frame fitting, patients complaints, description, detection and correction) | 2 |
| 8 | Final checking & dispensing of spectacles to customers, counseling on wearing & maintaining of spectacles, Accessories –Bands, chains, boxes, slevets, cleaners, screwdriver kit | 2 |
| 9 | Spectacle repairs –tools, methods, soldering, riveting, frame adjustments | 1 |
| 10 | Special types of spectacle frames<br>□ Monocles<br>□Ptosis crutches<br>□Industrial safety glasses<br>□Welding glasses | 1 |
| 12 | Frame availability in Indian market | 1 |
| 13 | FAQ's by customers and their ideal answers | 2 |
| **Total number of Hours** | | **20** |

- **TEXT BOOK/REFERENCE BOOKS:**

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


## ➢ VISUAL OPTICS II :-

**COURSE DESCRIPTION:** This course deals with the concept of eye as an optical instrument and thereby covers different optical components of eye, types of refractive errors, clinical approach in diagnosis and management of various types of refractive errors.

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

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

**COURSE PLAN:**

| Sl. No | Topics | No. of Hrs |
|---|---|---|
| 1. | Accommodation & Presbyopia<br>□ Far and near point of accommodation<br>□ Range and amplitude of accommodation<br>□ Mechanism of accommodation<br>□ Variation of accommodation with age<br>• Anomalies of accommodation ,Presbyopia ,Hypermetropia and accommodation | **6** |
| 2. | Convergence:<br>□ Type, Measurement and Anomalies<br>□ Relationship between accommodation and convergence-AC/A ratio | **3** |
| 3. | Objective Refraction (Static & Dynamic)<br>□ Streak retinoscopy<br>□ Principle, Procedure, Difficulties and interpretation of | **8** |

findings
□ Transposition and spherical equivalent
□ Dynamic retinoscopy various methods
□ Radical retinoscopy and near retinoscopy
□ Cycloplegic refraction

| | | |
|---|---|---|
| 4. | Subjective Refraction:<br>□ Principle and fogging<br>□ Fixed astigmatic dial(Clock dial),Combination of fixed and rotator dial(Fan and block test),J.C.C<br>□ Duochrome test<br>o Binocular balancing- alternate occlusion, prism dissociation, dissociate Duochrome balance, Borish dissociated fogging<br>o Binocular refraction-Various techniques | **8** |
| 5. | Effective Power &Magnification :<br>□ Ocular refraction vs. Spectacle refraction<br>□ Spectacle magnification vs. Relative spectacle magnification<br>□ Axial vs. Refractive ammetropia, Knapp's law<br>□ Ocular accommodation vs. Spectacle accommodation<br>□ Retinal image blur-Depth of focus and depth of field | **5** |
| **Total number of hours** | | 30 |

- **TEXT BOOK/REFERENCE BOOKS:**
- Theodore Grosvenor: Primary Care Optometry, 5th edition, Butterworth –Heinemann, 2007
- Duke –Elder's practice of Refraction
- AI Lens: Optics, Retinoscopy, and Refractometry: 2nd edition, SLACK Incorporated (p) Ltd, 2006
- George K. Hans, Kenneth Cuiffreda: Models of the visual system, Kluwer Academic, NY, 2002
- Leonard Werner, Leonard J. Press: Clinical Pearls in Refractive Care, Butterworth –Heinemann, 2002
- David B. Elliot: Clinical Procedures in Primary Eye care, 3rd edition, Butterworth –Heinemann, 2007
- WJ Benjamin: Borish's clinical refraction,2nd edition, Butterworth Heinemann, Missouri, USA,2006

➢ **OCULAR DISEASE II :-**

**COURSE DESCRIPTION:** This course deals with various ocular diseases affecting various parts of the eyes. It covers clinical signs and symptoms, cause, pathophysiological mechanism, diagnostic approach, differential diagnosis and management aspects of the ocular diseases.

**OBJECTIVES:** At the end of the course the students will be knowledgeable in the following aspects of ocular diseases: knowledge on

1. Etiology
2. Epidemiology
3. Symptoms
4. Signs
5. Course sequelae of ocular disease
6. Diagnostic approach, and
7. Management of the ocular diseases.

**COURSE PLAN:**

| **Sl. No** | **Topics** | **No. of Hrs** |
|---|---|---|
| | Retina and Vitreous: | **12** |
| 1. | □ Applied Anatomy<br>□ Congenital and Developmental Disorders ( Optic Disc: Coloboma, Drusen, Hypoplasia, Medullated nerve fibers; Persistent Hyaloid Artery)<br>□ Inflammatory disorders ( Retinitis : Acute purulent , Bacterial, Virus, mycotic)<br>□ Retinal Vasculitis ( Eales's)<br>□ Retinal Artery Occlusion ( Central retinal Artery occlusion)<br>□ Retinal Vein occlusion ( Ischaemic, Non Ischaemic , Branch retinal vein occlusion)<br>□ Retinal degenerations : Retinitis Pigmentosa, Lattice degenerations<br>□ Macular disorders: Solar retinopathy, central serous retinopathy, cystoid macular edema, Age related macular degeneration.<br>□ Retinal Detachement: Rhegmatogenous, Tractional, Exudative)<br>□ Retinablastoma<br>□ Diabetic retinopathy | |

| | | |
|---|---|---|
| 2. | Ocular Injuries: Terminology : Closed globe injury ( contusion, lamellar laceration) Open globe injury ( rupture, laceration, penetrating injury, perforating injury)<br>□ Mechanical injuries ( Extraocular foreign body, blunt trauma, perforating injury, sympathetic ophthalmitis)<br>□ Non Mechanical Injuries ( Chemical injuries, Thermal, Electrical, Radiational)<br>□ Clinical approach towards ocular injury patients | **3** |
| 3. | Lens<br>□ Applied Anatomy and Physiology<br>□ Clinical examination<br>□ Classification of cataract<br>□ Congenital and Developmental cataract<br>□ Acquired ( Senile, Traumatic, Complicated, Metabolic, Electric, Radiational, Toxic)<br>□ Morphological: Capsular, Subcapsular, Cortical, Supranuclear, Nuclear, Polar.<br>□ Management of cataract ( Non-surgical and surgical measures; preoperative evaluation, Types of surgeries,)<br>□ Complications of cataract surgery<br>□ Displacement of lens: Subluxation, Displacement<br>□ Lens coloboma, Lenticonus, Microsperophakia. | **10** |
| **4.** | Clinical Neuro-ophthalmology | **12** |

□ Anatomy of visual pathway
□ Lesions of the visual pathway
□ Pupillary reflexes and abnormalities (Amaurotic light reflex, Efferent pathway defect, Wernicke's hemianopic pupil, Marcus gunn pupil. Argyll Robetson pupil, Adie's tonic pupil)
□ Optic neuritis, Anterior Ischemic optic neuropathy, Pappilloedema, optic atrophy
□ Cortical blindness
□ Malingering
□ Nystagmus
□ Clinical examination

| | | |
|---|---|---|
| | Glaucoma | **8** |
| 5. | □ Applied anatomy and physiology of anterior segment<br>□ Clinical Examination<br>□ Definitions and classification of glaucoma<br>□ Pathogenesis of glaucomatous ocular damage<br>□ Congenital glaucoma's<br>□ Primary open angle glaucoma<br>□ Ocular hypertension<br>□ Normal Tension Glaucoma<br>□ Primary angle closure glaucoma ( Primary angle closure suspect, Intermittent glaucoma, acute congestive, chronic angle closure)<br>□ Secondary Glaucoma's<br>□ Management : common medications, laser intervention and surgical techniques | |
| **Total number of hours** | | **45** |

## ➢ PATHOLOGY :-

**COURSE DESCRIPTION**: This course describes basic aspects of disease processes with reference to specific entities relevant in optometry/ophthalmology.

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

1. Inflammation and repair aspects.
2. Pathology of various eye parts and adnexa.

**COURSE PLAN (Total: 15 hours)**

1. Inflammation and repair
2. Infection in general
3. Specific infections

3.1 Tuberculosis

3.2 Leprosy

3.3 Syphilis

3.4 Fungal infection

3.5 Viral chlamydial infection

4. Neoplasia

5. Haematology
5.1 Anemia

5.2 Leukemia

5.3 Bleeding disorders
6. Circulatory disturbances
6.1 Thrombosis

6.2 Infarction

6.3 Embolism
7. Clinical pathology
7.1 Interpretation of urine report

7.2 Interpretation of blood smears.
8. Immune system

9. Shock, Anaphylaxis.

10. Allergy

- **TEXT BOOK** K S Ratnagar: Pathology of the eye & orbit, Jaypee brothers Medical Publishers, 1997
- **REFERENCE BOOKS:**
- CORTON KUMAR AND ROBINS: Pathological Basis of the Disease, 7th Edition, Elsevier, New Delhi, 2004.
- S R Lakhani Susan AD & Caroline JF: Basic Pathology: An introduction to the mechanism of disease, 1993.

## ➢ BASIC AND OCULAR PHARMACOLOGY :-

**COURSE DESCRIPTION:** This course covers the actions, uses, adverse effects and mode of administration of drugs, especially related to eyes.

**OBJECTIVES:** At the end of the course the students will acquire knowledge in the following aspects-
1. Basic principle of pharmacokinetics & Pharmacodynamics

2. Commonly used ocular drugs, mechanism, indications, contraindications, drug dosage and adverse effects.

**COURSE PLAN**

| Sl. No | Topics | No. of Hrs |
|---|---|---|
| 1. | General Pharmacology: Introduction & sources of drugs, Routes of drug administration, Pharmacokinetics (emphasis on ocular pharmacokinetics), Pharmacodynamics & factors modifying drug actions | **10** |
| 2. | Systemic Pharmacology: Autonomic nervous system: Drugs affecting papillary size and light reflex, Intraocular tension, Accommodation; Cardiovascular system: Anti-hypertensive sand drugs useful in Angina; Diuretics: Drugs used in ocular disorders; Central Nervous System: Alcohol, sedative hypnotics, General & local anaesthetics, Opioids & non-opioids; Chemotherapy : Introduction on general chemotherapy, Specific chemotherapy –Antiviral, antifungal, antibiotics; Hormones : Corticosteroids, Antidiabetics; Blood Coagulants | **10** |
| 3. | Ocular Pharmacology: Ocular preparations, formulations and requirements of an ideal agent; Ocular Pharmacokinetics, methods of drug administration & Special drug delivery system; Ocular Toxicology | **10** |
| 4. | Diagnostic & Therapeutic applications of drugs used in Ophthalmology: Diagnostic Drugs & biological agents used in ocular surgery, Anaesthetics used in ophthalmic procedures, Anti-glaucoma drugs; Pharmacotherapy of ocular infections – Bacterial, viral, fungal & chlamydial; Drugs used in allergic, inflammatory& degenerative conditions of the eye; Immune modulators in Ophthalmic practice, Wetting agents & tear substitutes ,Antioxidants | **15** |
| **Total number of hours** | | **45** |

- TEXT BOOK/REFERENCE BOOKS:
- K D Tripathi: Essentials of Medical Pharmacology. 5th edition, Jaypee, New Delhi, 2004
- Ashok Garg: Manual of Ocular Therapeutics, Jaypee, New Delhi, 1996
- T J Zimmerman, K S Kooner : Text Book of Ocular Pharmacology, Lippincott-Raven, 1997.

## ➢ MEDICAL PSYCHOLOGY:-

**COURSE DESCRIPTION:** This course covers various aspects of medical psychology essential for the optometrist.

**OBJECTIVES:** At the end of the course, the student would have gathered knowledge various aspects of medical psychology essential for him to apply in the clinical scenario during his clinical postings.

**PLAN Total : 15 hours**

1. Introduction to Psychology
2. Intelligence Learning, Memory, Personality, Motiviation
3. Body Integrity – one's body image
4. The patient in his Milen
5. The self-concept of the therapist, Therapist-patient relationship – some guidelines
6. Illness, its impact on the patient
7. Maladies of the age and their impact on the patient's own and others concept of his body image
8. Adapting changes in Vision
9. Why Medical Psychology demands commitment.

- **TEXT BOOK**: Patricia Barkway. Psychology for health professionals, 2nd edition, Elsevier, 2013

## ➢ INTRODUCTION TO QUALITY AND PATIENT SAFETY:-

**COURSE DESCRIPTION:** This course deals with various aspects of quality and safety issues in health care services.

**OBJECTIVES:** At the end of the course, students have gained introductory knowledge about quality and patient safety aspects from Indian perspectives

**COURSE PLAN: (Total: 30 hours)**

1. Quality assurance and management
2. Basics of emergency care and life support skills
3. Biomedical waste management and environment safety
4. Infection and prevention control
5. Antibiotic resistance
6. Disaster preparedness and management

- **CLINICAL OPTOMETRY III (STUDENTSHIP)**

**Total Hours: 45 hours**

Students will improve their skills in clinical procedures, and then progressive interactions with patients and professional personal are monitored as students practice optometry in supervised setting. Additional area includes problem solving and complications of various managements will be inculcated. Students should have exposure to eye bank facilities and must be made aware of eye donation, collection of eyes, preservation, pre and post-operative instructions and latest techniques for preservation of donor cornea. The students will get clinical training on the practical aspects .

## Third Year :-

- **CONTACT LENSES I**

**COURSE DESCRIPTION:** The subject provides the student with suitable knowledge both in theoretical and practical aspects of Contact Lenses.

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

1. Understand the basics of contact lenses
2. List the important properties of contact lenses
3. Finalise the CL design for various kinds patients
4. Recognize various types of fitting .
5. Explain all the procedures to patient
6. Identify and manage the adverse effects of contact lens

**COURSE PLAN (Total: 30 hours)**

1. Introduction to Contact lenses
1.1 Definition
1.2 Classification / Types
2. History of Contact Lenses
3. Optics of Contact Lenses
3.1 Magnification & Visual field
3.2 Accommodation & Convergence
3.3 Back & Front Vertex Power / Vertex distance calculation
4. Review of Anatomy & Physiology of
4.1 Tear film
4.2 Cornea

4.3 Lids & Conjunctiva
5. Introduction to CL materials
5.1 Monomers, Polymers
6. Properties of CL materials
6.1 Physiological (Dk, Ionicity, Water content)
6.2 Physical (Elasticity, Tensile strength, Rigidity)
6.3 Optical (Transmission, Refractive index)
7. Indications and contraindications
8. Parameters / Designs of Contact Lenses & Terminology
9. RGP Contact Lens materials
10. Manufacturing Rigid and Soft Contact Lenses – various methods
11. Pre-Fitting examination – steps, significance, recording of results
12. Correction of Astigmatism with RGP lens
13. Types of fit – Steep, Flat, Optimum – on spherical cornea with spherical lenses
14. Types of fit – Steep, Flat, Optimum – on Toric cornea with spherical lenses
15. Calculation and finalising Contact lens parameters
16. Ordering Rigid Contact Lenses – writing a prescription to the Laboratory
17. Checking and verifying Contact lenses from Laboratory
18. Modifications possible with Rigid lenses
19. Common Handling Instructions
19.1 Insertion & Removal Techniques
19.2 Do's and Dont's
20. Care and Maintenance of Rigid lenses
20.1 Cleaning agents & Importance
20.2 Rinsing agents & Importance
20.3 Disinfecting agents & importance
20.4 Lubricating & Enzymatic cleaners
21. Follow up visit examination
22. Complications of RGP lenses

**PRACTICAL (Total: 30 hours)**
1. Measurement of Ocular dimensions
2. Pupillary diameter and lid characteristics
3. Blink rate and TBUT
4. Schrimers test, Slit lamp examination of tear layer
5. Keratometry

6. Placido's disc
7. Soft Contact Lens fitting – Aspherical
8. Soft Contact Lens fitting – Lathecut lenses
9. Soft Contact Lens over refraction
10. Lens insertion and removal
11. Lens handling and cleaning
12. Examination of old soft Lens
13. RGP Lens fitting
14. RGP Lens Fit Assessment and fluorescein pattern
15. Special RGP fitting (Aphakia, pseudo phakia&Keratoconus)
16. RGP over refraction and Lens flexure
17. Examination of old RGP Lens
18. RGP Lens parameters
19. Slit lamp examination of Contact Lens wearers

- **TEXT BOOKS:**
- IACLE modules 1 - 10
- CLAO Volumes 1, 2, 3
- Anthony J. Phillips : Contact Lenses, 5thedition, Butterworth-Heinemann, 2006
- Elisabeth A. W. Millis: Medical Contact Lens Practice, Butterworth-Heinemann, 2004
- E S. Bennett ,V A Henry :Clinical manual of Contact Lenses, 3rd edition, Lippincott Williams and Wilkins, 2008

## ➢ LOW VISION CARE:-

**COURSE DESCRIPTION:** This course deal with the definition of low vision, epidemiology aspect of visual impairment, types of low vision devices and its optical principles, clinical approach of the low vision patients, assistive devices for totally visually challenged, art of prescribing low vision devices and training the low vision patients and other rehabilitation measures.
**COURSE OBJECTIVES:** At the end of the course, the student will be knowledgeable in the following:
1. Definition and epidemiology of Low Vision
2. Clinical examination of Low vision subjects

3. Optical, Non-Optical, Electronic, and Assistive devices.

4. Training for Low Vision subjects with Low vision devices

5. Referrals and follow-up

**COURSE PLAN: (Total: 15 hours)**

1. Definitions & classification of Low vision

2. Epidemiology of low vision

3. Model of low vision service

4. Pre-clinical evaluation of low vision patients – prognostic & psychological factors; psycho-social impact of low vision

5. Types of low vision aids – optical aids, non-optical aids & electronic devices

6. Optics of low vision aids

7. Clinical evaluation – assessment of visual acuity, visual field, selection of low vision aids, instruction & training

8. Pediatric Low Vision care

9. Low vision aids – dispensing & prescribing aspects

10. Visual rehabilitation &counseling

11. Legal aspects of Low vision in India

12. Case Analysis

**PRACTICALS (Total: 15 hours)**

1. Practical 1: Attending in low vision care clinic and history taking.

2. Practical 2:

2.1 Determining the type of telescope and its magnification (Direct comparison method & calculated method)

2.2 Determining the change in field of view with different magnification and different eye to lens distances with telescopes and magnifiers.

3. Practical 3:

3.1 Inducing visual impairment and prescribing magnification.

3.2 Determining reading speed with different types of low vision aids with same magnification.

3.3 Determining reading speed with a low vision aid of different magnifications.

- **TEXT BOOKS:**
- Christine Dickinson: Low Vision: Principles and Practice Low vision care, 4th edition, Butterworth-Heinemann, 1998

- Sarika G, Sailaja MVSE Vaithilingam: practice of Low vision –A guide book, Medical Research Foundation, 2015.

- **REFERENCE BOOKS:**
- Richard L. Brilliant: Essentials of Low Vision Practice, Butterworth-Heinemann, 1999
- Helen Farral: optometric Management of Visual Handicap, Blackwell Scientific publications, 1991
- A J Jackson, J S Wolffsohn: Low Vision Manual, Butterworth Heinnemann, 2007

## ➢ GERIATRIC OPTOMETRY & PAEDIATRIC OPTOMETRY:-

## ➢ GERIATRIC OPTOMETRY:-

**COURSE DESCRIPTION:** This course deals with general and ocular physiological changes of ageing, common geriatric systemic and ocular diseases, clinical approach of geriatric patients, pharmacological aspects of ageing ,and spectacle dispensing aspects in ageing patients.

**COURSE OBJECTIVES:** The student on taking this course should

1. Be able to identify, investigate the age related changes in the eyes.
2. Be able to counsel the elderly
3. Be able to dispense spectacles with proper instructions.
4. Adequately gained knowledge on common ocular diseases.

**COURSE PLAN (Total: 20 hours)**

1. Structural , and morphological changes of eye in elderly
2. Physiological changes in eye in the course of aging.
3. Introduction to geriatric medicine – epidemiology , need for optometry care, systemic diseases (Hypertension, Atherosclerosis, coronary heart disease, congestive Heart failure, Cerebrovascular disease, Diabetes, COPD)
4. Optometric Examination of the Older Adult
5. Ocular diseases common in old eye, with special reference to cataract, glaucoma, macular disorders, vascular diseases of the eye
6. Contact lenses in elderly
7. Pharmacological aspects of aging
8. Low vision causes, management and rehabilitation in geriatrics.

9. Spectacle dispensing in elderly – Considerations of spectacle lenses and frames

- **TEXT BOOKS:** A.J. ROSSENBLOOM Jr& M.W.MORGAN: Vision and Aging, Butterworth-Heinemann, Missouri, 2007.
- **REFERENCE BOOKS:**
- OP Sharma: Geriatric Care –A textbook of geriatrics and Gerontology, viva books, New Delhi, 2005
- VS Natarajan: An update on Geriatrics, SakthiPathipagam, Chennai, 1998
- DE Rosenblatt, VS Natarajan: Primer on geriatric Care A clinical approach to the older patient, Printers Castle, Cochin, 2002

## ➢ PEDIATRIC OPTOMETRY:-

**COURSE DESCRIPTION:** This course is designed to provide the students adequate knowledge in theoretical and practical aspects of diagnosis, and management of eye conditions related to paediatric population. Also it will inculcate the skill of transferring / communicating the medicalinformation to the attender / patient by the students. The scope of this subject is to train the optometrists to develop a systematic way of dealing with children below 12, so as to implement primary eye care and have better, specialized management of anomalies.

**COURSE OBJECTIVES:**

1. Have a knowledge of the principal theories of childhood development, and visual development

2. Have the ability to take a thorough paediatric history which encompasses the relevant developmental, visual, medical and educational issues

3. Be familiar with the accommodative-vergence system, the genesis of ametropia, the disorders of refraction, accommodation and vergence, and the assessment and management of these disorders

4. Be familiar with the aetiology, clinical presentation and treatment of amblyopia, comitant strabismus and commonly presenting incomitant strabismus

5. Have a knowledge of the epidemiology of eye disease in children, the assessment techniques available for examining visual function of children of

all ages and an understanding varied management concepts of paediatric vision disorders

6. Have knowledge of the art of dispensing contact lens, low vision aids and referral to the surgeon or other specialists at the appropriate timing.

7. Have a capacity for highly evolved communication and co-management with other professionals involved in paediatric assessment and care

**COURSE PLAN (Total: 25 hours)**

1. The Development of Eye and Vision

2. History taking Paediatric subjects

3. Assessment of visual acuity

4. Normal appearance, pathology and structural anomalies of
4.1 Orbit, Eye lids, Lacrimal system,

4.2 Conjunctiva, Cornea, Sclera Anterior chamber, Uveal tract, Pupil

4.3 Lens, vitreous, Fundus Oculomotor system
5. Refractive Examination

6. Determining binocular status
7. Determining sensory motor adaptability

8. Compensatory treatment and remedial therapy for : Myopia, Pseudomyopia, Hyperopia, Astigmatism, Anisometropia, Amblyopia

9. Remedial and Compensatory treatment of Strabismus and Nystagmus

10. Paediatric eye disorders : Cataract, Retinopathy of Prematurity, Retinoblastoma, Neuromuscular conditions (myotonic dystrophy, mitochondrial cytopathy), and Genetics

11. Anterior segment dysgenesis, Aniridia, Microphthalmos, Coloboma, Albinism

12. Spectacle dispensing for children

13. Paediatric contact lenses

14. Low vision assessment in children

- **TEXT BOOKS:**
- Pediatric Optometry - JEROME ROSNER, Butterworth, London 1982
- Paediatric Optometry –William Harvey/ Bernard Gilmartin, Butterworth –Heinemann, 2004

- **REFERENCE BOOKS:**
- Binocular Vision and Ocular Motility - VON NOORDEN G K Burian Von Noorden’s, 2nd Ed., C.V. Mosby Co. St. Louis, 1980.

- Assessing Children's Vision. By Susan J Leat, Rosalyn H Shute, Carol A Westall.45 Oxford: Butterworth-Heinemann, 1999.
- Clinical pediatric optometry. LJ Press, BD Moore, Butterworth-Heinemann, 1993

## ➢ BINOCULAR VISION -I:-

**COURSE DESCRIPTION:** This course provides theoretical aspects of Binocular Vision and its clinical application. It deals with basis of normal binocular vision and space perception, Gross anatomy and physiology of extraocular muscles, various binocular vision anomalies, its diagnostic approaches and management.

**COURSE OBJECTIVES:** On successful completion of this module, a student will be expected to be able to:-

1. Demonstrate an in-depth knowledge of the gross anatomy and physiology relating to the extraocular muscles.

2. Provide a detailed explanation of, and differentiate between the etiology, investigation and management of binocular vision anomalies.

3. Adapt skills and interpret clinical results following investigation of binocular vision anomalies appropriately and safely.

**COURSE PLAN (Total: 30 hours)**

1. Binocular Vision and Space perception.

1.1 Relative subjective visual direction.

1.2 Retino motor value

1.3 Grades of BSV

1.4 SMP and Cyclopean Eye

1.5 Correspondence,

1.6 Fusion, Diplopia, Retinal rivalry

1.7 Horopter

1.8 Physiological Diplopia and Suppression

1.9 Stereopsis, Panum's area, BSV.

1.10 Stereopsis and monocular clues - significance.

1.11 Egocentric location, clinical applications.

1.12 Theories of Binocular vision.

2. Anatomy of Extra Ocular Muscles.

2.1 Rectii and Obliques, LPS.

2.2 Innervation & Blood Supply.
3. Physiology of Ocular movements.
3.1 Center of rotation, Axes of Fick.
3.2 Action of individual muscle.
4. Laws of ocular motility
4.1 Donder's and Listing's law
4.2 Sherrington's law
4.3 Hering's law
5. Uniocular& Binocular movements - fixation, saccadic & pursuits.
5.1 Version &Vergence.
5.2 Fixation & field of fixation
6. Near Vision Complex Accommodation
6.1 Definition and mechanism (process).
6.2 Methods of measurement.
6.3 Stimulus and innervation.
6.4 Types of accommodation.
6.5 Anomalies of accommodation – aetiology and management.
7. Convergence
7.1 Definition and mechanism.
7.2 Methods of measurement.
7.3 Types and components of convergence - Tonic, accommodative, fusional, proximal.
7.4 Anomalies of Convergence – aetiology and management.
8. Sensory adaptations
8.1 Confusion
9. Suppression
9.1 Investigations
9.2 Management
9.3 Blind spot syndrome
10. Abnormal Retinal Correspondence
10.1 Investigation and management
10.2 Blind spot syndrome
11. Eccentric Fixation
11.1 Investigation and management
12. Amblyopia
12.1 Classsification
12.2 Aeitiology
12.3 Investigation

12.4 Management

- **TEXT BOOKS:**
- Pradeep Sharma: Strabismus simplified, New Delhi, First edition, 1999, Modern publishers.
- Fiona J. Rowe: Clinical Orthoptics, second edition, 2004, Blackwell Science Ltd
- Gunter K. V. Mosby Company
- Mitchell Scheiman; Bruce Wick: Clinical Management of Binocular VisionHeterophoric, Accommodative, and Eye Movement Disorders, 2008, Lippincot Williams & Wilkins publishers

## ➢ SYSTEMIC DISEASES :

**COURSE DESCRIPTION:** This course deals with definition, classification, clinical diagnosis, complications and management of various systemic diseases. In indicated cases ocular manifestations also will be discussed.

**COURSE OBJECTIVES:** At the end of the course, students should get acquainted with the following:

1. Common Systemic conditions: Definition, diagnostic approach, complications and management options
2. Ocular findings of the systemic conditions
3. First Aid knowledge .

**COURSE PLAN (Total:45 hours)**

1. Hypertension

1.1 Definition, classification, Epidemiology, clinical examination, complications, and management.

1.2 Hypertensive retinopathy

2. Diabetes Mellitus

2.1 Classification, pathophysiology, clinical presentations, diagnosis, and management, Complications

2.2 Diabetic Retinopathy

3. Thyroid Disease

3.1 Physiology, testing for thyroid disease, Hyperthyroidism, Hypothroidism, Thyroiditis, Thyroid tumors

3.2 Grave's Ophthalmopathy

4. Acquired Heart Disease

4.1 Ischemic Heart Disease, Congestive heart failure, Disorders of cardiac rhythm

4.2 Ophthalmic considerations

5. Cancer :

5.1 Incidence

5.2 Etiology

5.3 Therapy

5.4 Ophthalmologic considerations

6. Connective Tissue Disease

6.1 Rheumatic arthritis

6.2 Systemic lupus erythematosus

6.3 Scleroderma

6.4 Polymyositis and dermatomyositis

6.5 Sjogren syndrome

6.6 Behcet's syndrome

6.7 Eye and connective tissue disease

7. Tuberculosis

7.1 Aetiology, pathology, clinical features, pulmonary tuberculosis, diagnosis, complications, treatment tuberculosis and the eye.

8. Herpes virus ( Herepes simplex, Varicella Zoster, Cytomegalovirus, Epstein Barr Virus)

8.1 Herpes and the eye

9. Hepatitis ( Hepatitis A, B, C)

10. Acquired Immunodeficiency Syndrome

11. Anemia ( Diagnosis, clinical evaluation, consequences, Sickle cell disease, treatment, Ophthalmologic considerations)

12. Common Tropical Medical Ailments

12.1 Malaria

12.2 Typhoid

12.3 Dengue

12.4 Filariases

12.5 Onchocerciasis

12.6 Cysticercosis

12.7 Leprosy

13. Nutritional and Metabolic disorders:

13.1 Obesity

13.2 Hyperlipidaemias

13.3 Kwashiorkor
13.4 Vitamin A Deficiency
13.5 Vitamin D Deficiency
13.6 Vitamin E Deficiency
13.7 Vitamin K Deficiency
13.8 Vitamin B1,B2, Deficiency
13.9 Vitamin C Deficiency
14. Myasthenia Gravis
15. First Aid
General Medical Emergencies
Preoperative precautions in ocular surgeries
16. Psychiatry
16.1 Basic knowledge of psychiatric condition and Patient Management
17. Genetics
17.1 Introduction to genetics
17.2 Organisation of the cell
17.3 Chromosome structure and cell division
17.4 Gene structure and basic principles of Genetics.
17.5 Genetic disorders and their diagnosis.
17.6 Genes and the eye
17.7 Genetic counseling and genetic engineering.

- **TEXT BOOKS:**
- C Haslett, E R Chilvers, N A boon, N R Coledge, J A A Hunter: Davidson's Principles and Practice of Medicine, Ed. John Macleod, 19th Ed., ELBS/Churchill Livingstone. (PPM), 2002 .
- Basic and clinical Science course: Update on General Medicine, American Academy of Ophthalmology, Section 1, 1999.

## ➢ RESEARCH METHODOLOGY AND BIOSTATISTICS

**COURSE OBJECTIVES:** The objective of this module is to help the students understand the basic principles of research and methods applied to draw inferences from the research findings.

**COURSE PLAN (Total: 30 hours)**
**Research Methodology**
1. Introduction to research methods

2. Identifying research problem
3. Ethical issues in research
4. Research design
5. Types of Data
6. Research tools and Data collection methods
7. Sampling methods
8. Developing a research proposal

**Biostatistics**

1. Basics of Biostatistics
1.1 Introduction of Biostatistics
1.2 Measures of Morality
1.3 Sampling
1.4 Statistical significance
1.5 Correlation
1.6 Sample size determination.
1.7 Statistics –Collection of Data - presentation including classification and diagrammatic representation –frequency distribution. Measures of central tendency; measures of dispersion.
1.8 Theoretical distributions.
1.8.1 Binomial
1.8.2 Normal
1.8.3 Sampling –necessity of methods and techniques.
1.8.4 Chi. Square test (2 x 2)
2. Hospital Statistics
3. Use of computerized software for statistics

- **TEXT BOOKS:**
- Mausner&Bahn: Epidemiology-An Introductory text, 2nd Ed., W. B. Saunders Co.
- Richard F. Morton & J. Richard Hebd: A study guide to Epidemiology and Biostatistics, 2nd Ed., University Park Press, Baltimore.
- Sylvia W Smoller, J Smoller, Biostatistics & Epidemiology A Primer for health and Biomedical professionals, 4th edition, Springs, 2015 .

- **CLINICAL OPTOMETRY IV (STUDENTSHIP)**

**Total: 45 hours**

The course provides students the opportunity to continue to develop confidence and increased skill in diagnosis and treatment delivery. Students will demonstrate competence in basic, intermediate and advance procedure in those areas. Students will participate in advance and specialized diagnostic and management procedure. Students will get practical experience of the knowledge acquired from geriatric and paediatric optometry courses. Hands-on experience under supervision will be provided in various outreach programmes namely, school vision screening, glaucoma and diabetic retinopathy screening etc., Students also get hand-on practical sessions on the following courses namely, contact lens, low vision care, geriatric optometry and paediatric optometry.

- **CONTACT LENSES II :**

**COURSE DESCRIPTION:** The subject provides the student with suitable knowledge both in theoretical and practical aspects of Contact Lenses.
**COURSE OBJECTIVES:** Upon completion of the course, the student should be able to:
1. Understand the basics of contact lenses
2. List the important properties of contact lenses
3. Finalise the CL design for various kinds patients
4. Recognize various types of fitting
5. Explain all the procedures to patient
6. Identify and manage the adverse effects of contact lenses.

**COURSE PLAN: Total : 30 hours**
1. SCL Materials & Review of manufacturing techniques
2. Comparison of RGP vs. SCL
3. Pre-fitting considerations for SCL
4. Fitting philosophies for SCL
5. Fit assessment in Soft Contact Lenses: Types of fit – Steep, Flat, Optimum

6. Calculation and finalising SCL parameters
6.1 Disposable lenses
6.2 Advantages and availability
7. Soft Toric CL
7.1 Stabilization techniques
7.2 Parameter selection
7.3 Fitting assessment
8. Common Handling Instructions
8.1 Insertion & Removal Techniques
8.2 Do's and Dont's
9. Care and Maintenance of Soft lenses
9.1 Cleaning agents & Importance
9.2 Rinsing agents & Importance
9.3 Disinfecting agents & importance
9.4 Lubricating & Enzymatic cleaners
10. Follow up visit examination
11. Complications of Soft lenses
12. Therapeutic contact lenses
12.1 Indications
12.2 Fitting consideration
13. Specialty fitting
13.1 Aphakia
13.2 Pediatric
13.3 Post refractive surgery
14. Management of Presbyopia with Contact lenses

**PRACTICAL (Total: 30 hours)**

1. Examination of old soft Lens
2. RGP Lens fitting
3. RGP Lens Fit Assessment and fluroscein pattern
4. Special RGP fitting (Aphakia, pseudo phakia&Keratoconus)
5. RGP over refraction and Lens flexure
6. Examination of old RGP Lens
7. RGP Lens parameters
8. Fitting Cosmetic Contact Lens
9. Slit lamp examination of Contact Lens wearers
10. Fitting Toric Contact Lens
11. Bandage Contact Lens

12. SPM &Pachymetry at SN During Clinics
13. Specialty Contact Lens fitting .

- **TEXT BOOKS:**
- IACLE modules 1 - 10
- CLAO Volumes 1, 2, 3
- Anthony J. Phillips : Contact Lenses, 5thedition, Butterworth-Heinemann, 2006
- Elisabeth A. W. Millis: Medical Contact Lens Practice, Butterworth-Heinemann, 2004
- E S. Bennett ,V A Henry :Clinical manual of Contact Lenses, 3rd edition, Lippincott Williams and Wilkins, 2008

## ➢ BINOCULAR VISION II

**COURSE DESCRIPTION:** This course deals with understanding of strabismus, its classification, necessary orthoptic investigations, diagnosis and non-surgical management. Along with theoretical knowledge it teaches the clinical aspects and application.

**COURSE OBJECTIVES:** The objective of this course is to inculcate the student with the knowledge of different types of strabismus its etiology signs and symptoms, necessary investigations and also management.

**COURSE PLAN: (Total: 30 hours)**

1. Neuro-muscular anomalies
1.1 Classification and etiological factors
2. History – recording and significance.
3. Convergent strabismus
3.1 Accommodative convergent squint
3.1.1 Classification
3.1.2 Investigation and Management
3.2 Non accommodative Convergent squint
3.1.3 Classification
3.1.4 Investigation and Management
4. Divergent Strabismus
4.1 Classification
4.2 A& V phenomenon
4.3 Investigation and Management
5. Vertical strabismus
5.1 Classification

5.2 Investigation and Management
6. Paralytic Strabismus
6.1 Acquired and Congenital
6.2 Clinical Characteristics
7. Distinction from comitant and restrictive Squint
8. Investigations
8.1 History and symptoms
8.2 Head Posture
8.3 Diplopia Charting
8.4 Hess chart
8.5 PBCT
8.6 Nine directions
8.7 Binocular field of vision
9. Amblyopia and Treatment of Amblyopia
10. Nystagmus
11. Non-surgical Management of Squint
12. Restrictive Strabismus
12.1 Features
12.2 Musculo-fascical anomalies
12.3 Duane's Retraction syndrome
12.4 Clinical features and management
12.5 Brown's Superior oblique sheath syndrome
12.6 Strabismus fixus
12.7 Congenital muscle fibrosis
13. Surgical management

**PRACTICAL (Total: 15 hours):** Deals with hand-on session the basic binocular vision evaluation techniques.

- **TEXT BOOKS:**
- Pradeep Sharma: Strabismus simplified, New Delhi, First edition, 1999, Modern publishers.
- Fiona J. Rowe: Clinical Orthoptics, second edition, 2004, Blackwell Science Ltd

- Gunter K. Von Noorden: BURIAN- VON NOORDEN'S Binocular vision and ocular motility theory and management of strabismus, Missouri, Second edition, 1980, C. V. Mosby Company
- Mitchell Scheiman; Bruce Wick: Clinical Management of Binocular Vision Heterophoric, Accommodative, and Eye Movement Disorders, 2008, Lippincot Williams & Wilkins publishers .

## ➢ PUBLIC HEALTH AND COMMUNITY OPTOMETRY

**COURSE DESCRIPTION:** Introduction to the foundation and basic sciences of public health optometry with an emphasis on the epidemiology of vision problems especially focused on Indian scenario.

**COURSE OBJECTIVES:** At the end of the course students will be be knowledgeable in the following areas:

1. Community based eye care in India.
2. Prevalence of various eye diseases
3. Developing Information Education Communication materials on eye and vision care for the benefit of the public
4. Organize health education programmes in the community
5. Vision screening for various eye diseases in the community and for different age groups.

**COURSE PLAN (Total: 30 hours)**

1. Public Health Optometry: Concepts and implementation, Stages of diseases
2. Dimensions, determinants and indicators of health
3. Levels of disease prevention and levels of health care patterns
4. Epidemiology of blindness – Defining blindness and visual impairment
5. Eye in primary health care
6. Contrasting between Clinical and community health programs
7. Community Eye Care Programs
8. Community based rehabilitation programs
9. Nutritional Blindness with reference to Vitamin A deficiency
10. Vision 2020: The Right to Sight
11. Screening for eye diseases
12. National and International health agencies, NPCB

13. Role of an optometrist in Public Health

14. Organization and Management of Eye Care Programs – Service Delivery models

15. Health manpower and planning & Health Economics

16. Evaluation and assessment of health programmes

17. Optometrists role in school eye health programmes

18. Basics of Tele Optometry and its application in Public Health

19. Information, Education and Communication for Eye Care programs

**TEXT BOOKS:**

1. GVS Murthy, S K Gupta, D Bachani: The principles and practice of community Ophthalmology, National programme for control of blindness, New Delhi, 2002

2. Newcomb RD, JolleyJL : Public Health and Community Optometry, Charles C Thomas Publisher, Illinois, 1980

3. K Park: Park's Text Book of Preventive and Social Medicine, 19th edition,

4. BanarsidasBhanot publishers, Jabalpur, 2007

- **PRACTICE MANAGEMENT**

**COURSE DESCRIPTION**: This course deal with all aspects of optometry practice management – business, accounting, taxation, professional values, and quality & safety aspects.

**COURSE OBJECTIVES**: At the end of the course, student would have gained knowledge on various aspects of private optometric practice from Indian perspective.

**COURSE PLAN (Total: 15 hours)**

1. Business Management:

1.1 Practice establishment and development

1.2 Stock control and costing

1.3 Staffing and staff relations

1.4 Business computerization

2. Accounting Principles

2.1 Sources of finance

2.2 Bookkeeping and cash flow

3. Taxation and taxation planning

4. Professionalism and Values

4.1 Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality

4.2 Personal values- ethical or moral values

4.3 Attitude and behaviour- professional behaviour, treating people equally

4.4 Code of conduct , professional accountability and responsibility, misconduct

4.5 Differences between professions and importance of team efforts

4.6 Cultural issues in the healthcare environment

- **OCCUPATIONAL OPTOMETRY**

**COURSE DESCRIPTION:** This course deals with general aspects of occupational health, Visual demand in various job, task analysing method ,visual standards for various jobs , occupational hazards and remedial aspects through classroom sessions and field visit to the factories.

**COURSE OBJECTIVES:** At the end of the course the students will be knowledgeable in the following aspects:

1. In visual requirements of jobs;

2. In effects of physical, chemical and other hazards on eye and vision;

3. To identify occupational causes of visual and eye problems;

4. To be able to prescribe suitable corrective lenses and eye protective wear and

5. To set visual requirements, standards for different jobs.

**COURSE PLAN: (Total: 15 hours)**

1. Introduction to Occupational health, hygiene and safety, international bodies like ILO, WHO, National bodies etc.

1.1 Acts and Rules - Factories Act, WCA, ESI Act.

2. Electromagnetic Radiation and its effects on Eye

3. Light – Definitions and units, Sources, advantages and disadvantages, standards

4. Color – Definition, Color theory, Color coding, Color defects, Color Vision tests

5. Occupational hazards and preventive/protective methods

6. Task Analysis

7. Industrial Vision Screening – Modified clinical method and Industrial Vision test

8. Vision Standards – Railways, Roadways, Airlines

9. Visual Display Units

10. Contact lens and work

- **TEXT BOOKS:**

- PP Santanam, R Krishnakumar, Monica R. Dr. Santanam's text book of Occupational optometry. 1st edition, Published by Elite School of optometry , unit of Medical Research Foundation, Chennai, India , 2015
- R V North: Work and the eye, Second edition, Butterworth Heinemann, 2001

- **REFERENCE BOOKS:**
- G W Good: Occupational Vision Manual available in the following website: www.aoa.org
- N.A. Smith: Lighting for Occupational Optometry, HHSC Handbook Series, Safchem Services, 1999
- J Anshel: Visual Ergonomics Handbook, CRC Press, 2005
- G Carson, S Doshi, W Harvey: Eye Essentials: Environmental & Occupational Optometry, Butterworth-Heinemann, 2008

## ➢ MEDICAL LAW AND ETHICS

Medical ethics has developed into a well based discipline which acts as a "bridge" between theoretical bioethics and the bedside. The goal is "to improve the quality of patient care by identifying, analyzing, and attempting to resolve the ethical problems that arise in practice". Doctors are bound by, not just moral obligations, but also by laws and official regulations that form the legal framework to regulate medical practice.
Legal and ethical considerations are firmly believed to be an integral part of medical practice in planning patient care.

**COURSE PLAN (Total: 15 hours)**
Few of the important and relevant topics that need to focus on are as follows:
1. Medical ethics - Definition - Goal - Scope b
2. Introduction to Code of conduct
3. Basic principles of medical ethics –Confidentiality
4. Malpractice and negligence - Rational and irrational drug therapy
5. Autonomy and informed consent - Right of patients
6. Care of the terminally ill- Euthanasia
7. Organ transplantation
8. Medico legal aspects of medical records –Medico legal case and type- Records and document related to MLC - ownership of medical records -

Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.

9. Professional Indemnity insurance policy

10. Development of standardized protocol to avoid near miss or sentinel events
11. Obtaining an informed consent.

- **RESEARCH PROJECT/DISSERTATION**

**Total: 30 hours**

Team of students will be doing a research project under the guidance of a supervisor ( who could be optometrists/vision scientists/ ophthalmologist). Student will get the experience of doing a research in systematic approach – identifying the primary question, literature search, identifying the gaps in the literature, identifying the research question, writing up the research proposal, data collection, data analysis, thesis writing and presentation.

- **CLINICAL OPTOMETRY V (STUDENTSHIP)**

**Total: 45hours**

The course is the final series of five directed clinical courses. The student will complete the clinical training by practicing all the skills learned in classroom and clinical instruction. Practical aspects of Binocular vision II, public health & community optometry, and occupational optometry will be covered under the studentship.

## FOURTH YEAR

The internship time period provides the students the opportunity to continue to develop confidence and increased skill in diagnosis and management. Students will demonstrate competence in beginning, intermediate, and advanced procedures in above areas. Students will participate in advanced and specialized treatment procedures. The student will complete the clinical training by practicing all the skills learned in classroom and clinical instruction.

Internships postings can be in the following locations: Eye Hospitals, Eye clinics in general hospital, Independent eye clinics, Optometric clinics in eye hospitals, general hospitals or optical showrooms, optical showrooms and other relevant locations wherein the learning objective can be achieved. Short period of training to eye care (instruments, optical, contact lens) related manufacturing set-ups, corporates and nongovernmental organisations.

**Internship:**

1. Primary Eye Care 25 %
2. Dispensing Optics 25 %
3. Contact Lens 10%
4. Low Vision Aids 10%
5. Orthoptics 10%
6. Diagnostics 10 %
7. Anterior Segment clinic 5%
8. Posterior Segment Clinic 5%

**Skills based outcomes and monitorable indicators for Optometrist:**
**First year:**
1. Role play
2. Clinical Observations
3. Vision Check
4. Basic Lensometry

**Second year:**
1. History taking
2. CEVS practical
3. Refraction Hands On including optical dispensing
4. Clinical Observations
5. Vision screening camps

**Third year:**
1. Clinical Observation
2. Hands-on under senior optometrists
3. Case reporting
4. Case discussion
5. Vision screening camps
6. Diagnostic interpretation