



SANTOSH
Deemed to be University
(Established u/s 3 of the UGC Act, 1956)

Bachelor of Optometry
(B.Optom)

The Yearly Theory Examination Papers in 4 Sections containing 20 Marks of each section which should cover complete Syllabus viz:

- I. Short Notes - 4 x 5 Marks = 20 Marks
- II. Long Notes - 2 x 10 Marks = 20 Marks
(Problem Based)
- III. Long Question - 1 x 20 Marks = 20 Marks
- IV. MCQs - 20 x 1 Mark = 20 Marks

Total Theory	80 Marks
Internal Assessment	20 Marks
Viva	20 Marks
Practical Internal	20 Marks
University Practical	60 Marks
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Total	200 Marks

Total Marks for each paper is proposed to be 200 Marks Maximum and a student shall be declared to have passed if he/she has secured more than 50 % in Theory Components including viva and 50 % in Practical components.

SANTOSH DEEMED TO BE UNIVERSITY, GHAZIABAD, DELHI NCR
PROPOSAL FOR FOLLOWING UNIQUE PATTERN FOR THE NEW COURSE INTRODUCED

S.No	Course	Year	No. of Papers	Internal Assessment weightage / Marks (Per Paper)	University Theory Marks (Per paper)	Viva	Practical Internal	Practical University	Other Remarks
1.	B.Optom	1 st	5	20	80	20	20	60	It is proposed that each paper will be assessed for 200 Marks including internal assessment and Internal Practical
		2 nd	5	20	80	20	20	60	
		3 rd	5	20	80	20	20	60	
2.	B.Sc. Clinical Nutrition & Dietetics	1 st	5	20	80	20	20	60	
		2 nd	5	20	80	20	20	60	
		3 rd	5	20	80	20	20	60	
3.	M.Sc. Clinical Psychology	1 st	4	20	80	20	20	60	
		2 nd	4	20	80	20	20	60	
4.	M.Sc. Trauma and Critical Care	1 st	4	20	80	20	20	60	
		2 nd	4	20	80	20	20	60	

S.No	Course	Year	No. of Papers	Internal Assessment weightage / Marks (Per Paper)	University Theory Marks (Per paper)	Viva	Practical Internal	Practical University	Other Remarks	
5.	M.Sc. Medical Imaging Technology	1 st	4	20	80	20	20	60		
		2 nd	4	20	80	20	20	60		
6.	M.H.A	1 st	4	20	80	20	20	60		
		2 nd	4	20	80	20	20	60		
7.	M.Sc. Medical Lab Technology	1 st	4	20	80	20	20	60		
		2 nd	4	20	80	20	20	60		
8.	M.S.W. Community Medicine	1 st	4	20	80	20	20	60		
		2 nd	4	20	80	20	20	60		
9.	M.Sc. Sports Medicine and Exercise Sciences	1 st	4	20	80	20	20	60		It is proposed that each paper will be assessed for 200 Marks including internal assessment and Internal Practical
		2 nd	4	20	80	20	20	60		

Introduction:

About Optometry:-

Optometry means a health care profession that is autonomous and concerned specially with examining the eye for the defect and faults of refraction. With prescribing correctional lenses, Eye exercises / or visual rehabilitation care for visually impaired with diagnosing disease of the eye, and with treating such disease or referring then for treatment.

Definition of optometry -

“Optometrist are primary health care practitioners of the eye and visual system to provide comprehensive eye and vision care, which includes refraction and dispensing, detection/ diagnoses and co-management of disease in the eye and the rehabilitation of conditions of the visual system”

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

- 1.1 Be able to develop skills to provide comprehensive eye examination
 - 1.a To acquire knowledge on ocular structures, its functions and pathological changes
 - 1.b To carryout ophthalmic investigations
 - 1.c To impart knowledge with regard to common eye diseases
 - 1.d To impart knowledge on treatment modalities from the perspective of counselling
 - 1.e To acquire knowledge about the referral guidelines for ocular and systemic conditions
- 1.2 Be able to correct refractive error and provide spectacle prescription
- 1.3 Be able to fit, evaluate, prescribe and dispense contact lenses for refractive correction and other ocular conditions
- 1.4 Be able to assess the low vision and provide comprehensive low vision care
- 1.5 Be able to have adequate knowledge to develop skill in manufacturing of spectacle lenses, contact lenses and low vision devices.
- 1.6 Be able to do complete binocular vision assessment, manage non-strabismic binocular vision anomalies and refer condition which warrants surgery
- 1.7 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.
- 1.8 Have knowledge and skill for early detection of various ocular conditions and pathologies – Refractive error, Strabismus, Cataract, Diabetic retinopathy, Glaucoma etc.
- 1.9 Have knowledge regarding organizations of eye banks and preservation of ocular tissues.
- 1.10 Have knowledge on sensory substitution and other rehabilitation measures for totally visually challenged.
- 1.11 Have knowledge of counselling on visual/ocular hygiene, nutritional and environmental modifications

Expectation from the future graduates in the providing patient care.

- 1 Optometrist will work independently or in conjunction with other eye/health care professionals.
- 2 The optometrist will be knowledgeable, skillful and analytical in diagnosis, treatment

planning, management of visual defects & impairments and in co-managements of ocular conditions.

- 3 The optometrist can work in hospitals (both private and public sectors), optical outlets and/or work as independent practitioner
- 4 The course will lead to a basic degree in optometry, which is considered as the minimum essential for statutory registration of optometrists in countries where optometry has been brought under legislation.
- 5 Undertake public health optometry projects and vision screening eye camps in schools, colleges, urban slums, rural areas and also practice occupational optometry in industries.
- 6 Public education on ocular hygiene and related nutritional and environmental counselling.
- 7 Offer a helping hand and or efficiently manage and successfully run any ophthalmic clinic, optometry department in hospitals, optical shops, and offer product expertise in ophthalmic industry & trade.

Eligibility for admission:

The Candidates who possess 10+2 /HSC with English, Physics, Chemistry and Biology or (Botany & Zoology) [OR] English, Physics, Chemistry, Mathematics or its equivalent qualifications from a Recognized Board.

[OR]

The Candidates who possess Diploma in Optometry are eligible for admission to B.Optom Course (Lateral Entry).

GENERAL RULES

Duration of the course

The B Optom undergraduate degree program is of four years duration (3+1) including one year of compulsory internship.

Duration of the course: 4 (3+1) years or 8 (6+2) semesters.

Total hours –3075 (didactics+ practical +internship) (300 additional hours to be spent on research project)

Annual scheme

First year academic calender

Commencement of class - august

First sessional exam - 20 oct to 30 oct

Second sessional exam - 20 jan to 30 jan

Model exam (with practical) - 15 may to 15 june

University exam (practical) - 15 june to 15 july

Annual vocation - After the exam

SECOND YEAR

Commencement of class - august

first sessional exam - 20oct to 30 oct Second

sessional exam - 20 jan to 30 jan Modal

exam (practical) - 15 may to 15 june

University exam (practical) - 15 june to 15 july Annual

vocation - after the exam

THIRD YEAR

Commencement of class - august

First sessional exam - 20 oct to 30 oct

Second sessional exam - 20 jan to 30 jan

Model exam (with practical) - 15 may to 15 june

University exam (practical) - 15 june to 15 july

Annual vocation - After the exam

INTERNSHIP

Commencement of internship - 1 august

Completion of internship - 31july

Medium of instruction:

English shall be the medium of instruction for all the subjects of study and for examination of the course.

III. EXAMINATION REGULATION

Attendance:

A candidate has to secure minimum-

- 1 75% attendance in theoretical
- 2 80% in Skills training (practical) for qualifying to appear for the final examination.

Internal Assessment:

1. Regular periodic assessment shall be conducted throughout the course at least two sessional examinations in theory and preferably to practical examination should be conducted in each subject. The model examination should be same pattern of university examination .

2. A candidate secure a minimum of 50% marks in the internal assessment of each subject to be eligible to appear for the university examination

3. The internal assesment will be done by the department twice during the course period in a gap not more then 5 months and final modern exam which will be the same pattern of university examination at 3rd sessional examination . The period of sessional examination of academic year as are follows;

* First sessional exam - oct

* Secound sessional exam - jan

* Model sessional exam - may and june

Competency Standard

Classification Units of Competency Skills at Entry level for optometrist

Communication Skills

- 1 Professional Conduct
- 2 Patient Examination and management.
- 3 Optical Dispensing
- 4 Documentation

UNIVERSITY EXAMINATIONS

1. University examination shall be conducted at the end of every academic year.

2. A candidate who satisfies the requirement of attendance, internal assessment marks, as stipulated by the university shall be eligible to appear for the university examination .

3. One Academic year will be 12 months including the days of the university examination year will be counted from the date of commencement of classes which will include the inauguration day.

4. The minimum pass for the internal assessment is 50% and for the university examination is 50%.

5. If the candidate fails in either theory and practical paper , he/she has to re-appear

for both the papers (theory and practical)/.

6. maximum number of attempts permitted for each paper is 5 included the first attempt

7. The maximum period to complete the course shall not exceed 6 years.

8. all practical examination will be conducted in the respective clinical areas.

9. Numbers of candidate for practical examinations should be maximum 10-12 per day

10. One internal and external examiner should jointly conduct the theory evaluation and practical examination for each student during the final examination every years

ELIGIBILITY FOR UNIVERSITY EXAMINATION

A student who has secured 50% marks for internal assessment is qualified to appear for university examination provided he/she satisfies percentage of attendance requirement as already mentioned at the clause III

VALUATION OF THEORY - REVALUATION OF PAPERS

1. Valuation work will be under taken by the examiners .

2. there will be re-valuation for the university for all the university examinations fees time to time

3. Application for re-valuation should be submitted with in 10 days from date of result of examination declared and it should be submitted to the office with payment of fees principal .

SUPPLEMENTARY EXAMINATIONS

Every main university examination will be followed by the supplementary examination which will normally be held with in 4-6 months from the date of completion of the main examinations .

As stipulated under clause no.2 under internal assessment , H.O.D will hold an internal examination 3-4 weeks prior to the date of the university of examinations, marks secured in the said examinations will be taken fir the purpose of internal assessment .HODs will send such details to the principal ten days prior to the date of commencement of university examinations.

Students who have not passed/cleared all or any subjects in the first university

examinations will be permitted to attend the second year classes and also eligible to appear for second year university examinations along with first year supplementary examination. However he/she can appear for the third (final) year university examination, only if he/she clears all the subjects in the first as well as in the second year examinations.

Same attendance and internal marks of the main examinations will be considered for the supplementary examinations, unless the HOD furnish fresh internal marks and attendance after conducting fresh examinations.

Students of supplementary batches are expected to prepare themselves for the university examinations. No extra coaching is expected to be provided by the institution. In case at any time the institution has to provide extra coaching, students will be required to pay fees as fixed for the said coaching.

RULES REGARDING CARRYOVER SUBJECTS

A candidate will be permitted to continue the second and third year respectively of the course even if he/she has failed in the first or second year university examinations.

A candidate must have passed in all subjects to become eligible to undergo compulsory internship of one year, for the candidates who have not passed all the subjects duration of the third year shall be extended until they become eligible to undergo compulsory internship.

CRITERIA FOR PASSED IN UNIVERSITY EXAMINATIONS – REGULATIONS ;

ELIGIBILITY CRITERIA FOR PASS IN UNIVERSITY EXAMINATIONS

In each of the subjects, a candidate must obtain 50% in aggregate for a pass and the details are as follows;

- * A separate minimum of 50% for internal assessment
- * 50% in theory and 40% in oral/viva
- * A separate minimum of 50% in aggregate for practicals / clinics (university examination).
- * overall 50% in the minimum pass in subject aggregate (university theory + viva/oral + practicals + internal assessments (T&P))

EVALUATIONS AND GRADE;

1. Minimum marks for pass shall be 50% in each of the theory and practical paper separately (including internal assessment in all subjects)
2. A candidate who passes the examination in all subjects with an aggregate of 50% marks and above and less than 65% shall be declared to have passed the examinations in the second class .
3. A candidate who passes the examinations in all subjects in the first attempts obtaining not less 65% of the aggregates marks for all the three years shall be declared to have passed the examination with first class
4. A candidate who secured an aggregates of 75% or above marks is awarded distinction a candidates who secure not less than 75% marks in any subjects will be deemed to have passed the examination with distinction in that subjects provided he/she passes the whole examination in the first attempt
5. A candidate who takes more than one attempt in any subjects and pass subsequently shall be ranked only in pass class
6. A candidate passing the entire course is placed in second class/first class/distinction based on the cumulative percentage of the aggregates marks of all the subjects in the I,II&III(final) university examinations.
7. rank in the examination :- Aggregate marks of all three years regular examination will be considered for awarding rank for the graduate examinations for the courses where the numbers of students are more than 15 rank will be calculated as under .

- * Topmost score will be declared as first rank
- * second to the top most will be declared as second rank
- * third to the topmost will be declared as third rank

Curriculum Outline

First Year:-

Sl. No.	Course Titles
BOP101	General Anatomy & ocular anatomy
BOP102	General Physiology & ocular physiology
BOP103	General Biochemistry & ocular biochemistry
BOP104	Physical optics & Geometrical Optics
BOP105	Clinical Optometry & Visual Optics

SECOND YEAR :-

Sl. No.	Course Titles
BOP201	Basic and ocular pathology , microbiology & pharmacology
BOP202	Optometric optics & Dispensing Optics
BOP203	Clinical examination of visual system & ophthalmic instrument
BOP204	Ocular disease
BOP205	Low vision aids

Third year:-

Sl. No.	Course Titles
BOP301	Contact lenses
BOP302	Binocular vision
BOP303	Systemic eye disease
BOP304	Public health / community and occupational optometry
BOP305	Pediatric and geriatric optometry

**Internship is for 12 months (1st august – 31st july) or 1 year. Total number of days (after deducting for national holidays & Sundays + Examination): 250 days (6 days / week; 6 hours / day)
= 1500 hours or minimum of 18 weeks /semester (216 days).**

**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 (thesis) needs to be submitted at the end of internship**

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:

- 4.1 Comprehend the normal disposition, inter-relationships, gross, functional and applied anatomy of various structures in the human body.
- 4.2 Identify the microscopic structures of various tissues, and organs in the human body and correlate the structure with the functions.
- 4.3 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.

TEXT BOOKS:-

- 1 MARIANO S.H. DIFILORE: 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 - 110 032.

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.

PREREQUISITES: Higher secondary level biology or remedial biology

COURSE PLAN:

Sl. No.	Topics	No. of hrs.
1	Introduction to Human Anatomy: Anatomy: Definition and its relevance in medicine and optometry Planes of the body, relationship of structures, organ system	1
2	Skeleton System	3
3	Tissues of the Body: Epithelium, connective tissue, bone and cartilage, Embryology, histology, different types of each of them, types of cells, cellular differentiation and arrangements in	3

Sl. No.	Topics	No. of hrs.
	different tissues	
4	Muscles: Different types of muscles, their functional differentiation, their relationship with different structures, their neural supply	3
5	Blood vessels: 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: Embryology, anatomical differences in different areas, functional and protective variations, innervations, relationship with muscles and nerves	3
7	Lymphatic system: Embryology, functions, relationship with blood vessels and organs	1
8	Glands: Embryology, different types of glands (exocrine and endocrine), functional differences, neural control of glands	2
9	Nervous system: 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: 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.

OCULAR ANATOMY

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

OBJECTIVES: At the end of the course, 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.

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

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

PREREQUISITES: General anatomy.

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.

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.

TEXT BOOKS:-

- 1 L Prakasam reddy, 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, 200

REFERENCE BOOKS:-

- 1 AK Khurana, Indu Khurana: 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 Jersey, 2007

PREREQUISITES: Higher secondary level biology or remedial biology

COURSE PLAN:

Sl. No.	Topics	No. of hrs.
1	CELL STRUCTURE & ORGANIZATION Tissue organization Epithelium Connective tissue –Collagen fibers –Elastic fibers –Areolar fibers Cartilage –Bone Contractile tissue –striated –skeletal –cardiac –non striated –plain –myoepithelial General principles of cell physiology Physiology of skeletal muscle	4
2	BLOOD: Composition Volume measurement & variations Plasma proteins –classification & functions Red blood cells –development, morphology & measurements –functions & dysfunctions. White blood cells –development –classification, morphology –functions & dysfunctions Platelets –morphology –development, functions & dysfunctions Clotting –factors –mechanism –anti- coagulants dysfunctions Blood grouping –classification –importance in transfusion, Rh factor & incompatibility Suspension stability Osmotic stability Reticulo endothelial system <ul style="list-style-type: none"> ○ Spleen ○ lymphatic tissue ○ Thymus ○ bone marrow ○ immune system ○ cellular ○ Humoral ○ Autoimmune 	4
Sl. No.	Topics	No. of hrs.

3	DIGESTION: General arrangement Salivary digestion –functions & regulations Gastric digestion –functions & regulations Pancreatic digestion –functions & regulations Intestinal digestion –functions & regulations Liver & bile Absorption Motility Deglutition Vomiting Defecation Functions of large intestine Neurohumoral regulations of alimentary functions, summary	2
4	EXCRETION: 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: Hormone mechanism –negative feed backs –tropic action –permissive action –cellular action, hypothalamic regulation Thyroid - hormones, actions, regulations Adrenal cortex - hormones, actions, regulations Adrenal medulla –hormones, actions, regulations Parathyroid - hormones, actions, regulations Islets of pancreas –hormones, actions, regulations Miscellaneous _ hormones, actions, regulations Common clinical disorders	3
6	REPRODUCTION: Male reproductive system –control & regulation Female reproductive system –uterus –ovaries –menstrual cycle –regulation –pregnancy & delivery –breast –family planning	1
7	RESPIRATION: Mechanics of respiration –pulmonary function tests –transport of respiratory gases- neural and chemical regulation of respiration –hypoxia, cyanosis, dyspnoea– asphyxia.	1
8	CIRCULATION: General principles 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 Body temperature regulation (including skin Physiology). Exposure to low and high atmospheric pressure	2
Sl. No.	Topics	No. of hrs.

10	NERVOUS SYSTEM: Neuron –Conduction of impulse –synapse –receptor. Sensory organization –pathways and perception Reflexes –cerebral cortex –functions. Thalamus –Basal ganglia Cerebellum. Hypothalamus. Autonomic nervous system –motor control of movements, posture and equilibrium – 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

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

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

REFERENCE BOOKS:

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

PREREQUISITES: General Physiology

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)

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 is the required aim of this course.

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.

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

REFERENCE BOOKS:

- 1 S. Ramakrishnan, K G Prasanna and R Rajan: Text book of Medical Biochemistry, Orient Longman, Madras, 1990
- 2 D.R. Whitehart: Biochemistry of the Eye, 2nd edition, Butterworth Heinemann, Pennsylvania, 2003

PREREQUISITES: Higher secondary level chemistry with good knowledge of organic chemistry.

COURSE PLAN

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

PRACTICAL (Total: 15 hours)

2.1 Reactions of monosaccharides, disaccharides and starch:

Glucose	Fructose
Galactose	Maltose, lactose
Sucrose	Starch

2.2 Analysis of Unknown Sugars

Estimation:

Photometry	Biofluid of choice – blood, plasma, serum
Standard graphs	Glucose
Proteins	Urea
Creatinine	Bilirubin

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.

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

REFERENCE BOOKS:

- 1 S. Ramakrishnan, K G Prasanna and R Rajan: Text book of Medical Biochemistry, Orient Longman, Madras, 1990
- 2 D R Whitehart: Biochemistry of the Eye, 2nd edition, Butterworth Heinemann, Pennsylvania, 2003

PREREQUISITES: Higher secondary level chemistry with good knowledge of organic chemistry and knowledge of Biochemistry I

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.

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.

TEXT BOOK: Subrahmanyam N, BrijLal, A text book of Optics, S. Chand Co Ltd, New Delhi, India, 2003.

REFERENCE BOOKS:

- 1 Pedrotti L. S, Pedrotti Sr. F. L, Optics and Vision, Prentice Hall, New Jersey, USA, 1998.
- 2 Keating NM. P, Geometric, Physical and Visual Optics, Butterworth- Heinemann, Massachusetts, USA, 2002.

PREREQUISITES: Higher secondary level mathematics and physics.

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

GEOMETRICAL OPTICS

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.

TEXT BOOK:

- 1 Tunncliffe 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.

PREREQUISITES: Higher secondary level mathematics and physics.

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
No.	Topics	No of hrs.

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; its 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 distant 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)

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

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. 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.

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.

PREREQUISITES: Higher secondary level mathematics and physics.

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 dioptric 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

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.

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.

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.

TEXT BOOK:

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

REFERENCE BOOKS:

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

PREREQUISITES: Geometrical optics, Physical optics, Ocular Physiology

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

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.

TEXT BOOK/REFERENCE BOOKS:

- 1 Theodore Grosvenor: Primary Care Optometry, 5th edition, Butterworth –Heinemann, 2007

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

PREREQUISITES: Geometrical Optics, Physical Optics & Ocular Physiology, Visual optics -I

COURSE PLAN

Sl. No	Topics	No. of Hrs
1.	Accommodation & Presbyopia <ul style="list-style-type: none"> • Far and near point of accommodation • Range and amplitude of accommodation • Mechanism of accommodation • Variation of accommodation with age 	6
Sl. No	Topics	No. of Hrs
	<ul style="list-style-type: none"> • Anomalies of accommodation • Presbyopia • Hypermetropia and accommodation 	
2.	Convergence: <ul style="list-style-type: none"> • Type, Measurement and Anomalies • Relationship between accommodation and convergence-AC/A ratio 	3
3.	Objective Refraction (Static & Dynamic) <ul style="list-style-type: none"> • Streak retinoscopy • Principle, Procedure, Difficulties and interpretation of findings • Transposition and spherical equivalent • Dynamic retinoscopy various methods • Radical retinoscopy and near retinoscopy • Cycloplegic refraction 	8
4.	Subjective Refraction: <ul style="list-style-type: none"> • Principle and fogging • Fixed astigmatic dial(Clock dial),Combination of fixed and rotator dial(Fan and block test),J.C.C • Duochrome test <ul style="list-style-type: none"> ○ Binocular balancing- alternate occlusion, prism dissociation, dissociate Duochrome balance, Borish dissociated fogging ○ Binocular refraction-Variou techniques 	8

5.	Effective Power & Magnification : <ul style="list-style-type: none"> • Ocular refraction vs. Spectacle refraction • Spectacle magnification vs. Relative spectacle magnification • Axial vs. Refractive ametropia, Knapp's law • Ocular accommodation vs. Spectacle accommodation • Retinal image blur-Depth of focus and depth of field 	5
	Total number of hours	30

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.

TEXT BOOK K S Ratnagar: Pathology of the eye & orbit, Jaypee brothers Medical Publishers, 1997

REFERENCE BOOKS:

- 1 CORTON KUMAR AND ROBINS: Pathological Basis of the Disease, 7th Edition, Elsevier, New Delhi, 2004.
- 2 S R Lakhani Susan AD & Caroline JF: Basic Pathology: An introduction to the mechanism of disease, 1993.

PREREQUISITES: Higher Secondary Biology, General and Ocular Anatomy, General and Ocular Physiology

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

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.

TEXT BOOK:

- 1 BURTON G.R.W: Microbiology for the Health Sciences, third edition, J.P. Lippincott Co., St. Louis, 1988.
- 2 M J Pelczar (Jr), ECS Chan, NR Krieg : Microbiology ,fifth edition, TATA McGRAW-HILL

Publisher, New Delhi,1993

REFERENCE BOOKS:

- 1 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
- 2 SYDNEY M. FINEGOLD & ELLEN JO BARON: Diagnostic Microbiology (DM) 5)

PREREQUISITES: Higher secondary Biology

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.

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.

TEXT BOOK/REFERENCE BOOKS:

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

PREREQUISITES: General Physiology & Biochemistry

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

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 (equi- convex, planoconvex, periscopic, etc.)
- 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


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

REFERENCE BOOKS:

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

PREREQUISITES: Physical Optics, Geometrical Optics

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
- 

Second year

OPTOMETRIC OPTICS II & Dispensing Optics

OPTOMETRIC OPTICS II

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

TEXT BOOK/REFERENCE BOOKS:

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

PREREQUISITES: Geometrical Optics, Physical Optics & Ocular Physiology, Optometric Optics - I

COURSE PLAN

Sl. No	Topics	No. of Hrs
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1.	Spectacle Lenses - II: <ul style="list-style-type: none"> • Manufacture of glass • Lens materials • Lens surfacing • Principle of surface generation and glass cements • Terminology used in Lens workshop • Lens properties • Lens quality • Faults in lens material • Faults on lens surface 	5
Sl. No	Topics	No. of Hrs
	<ul style="list-style-type: none"> • Methods of Inspecting the quality of lenses • Safety standards for ophthalmic lenses (FDA, ANSI, ISI, Others) 	
2.	Spectacle Frames: <ul style="list-style-type: none"> • Types and parts • Classification of spectacle frames-material, weight, temple position, Coloration • Frame construction • Frame selection • Size, shape, mounting and field of view of ophthalmic lenses 	5
3.	Tinted & Protective Lenses <ul style="list-style-type: none"> • Characteristics of tinted lenses Absorptive Glasses • Polarizing Filters, Photochromic & Reflecting filters • Safety lenses-Toughened lenses, Laminated Lenses, CR 39, Polycarbonate lenses 	5
4.	Multifocal Lenses: <ul style="list-style-type: none"> • Introduction, history and development, types • Bifocal lenses, Trifocal & Progressive addition lenses 	3
5.	Reflection from spectacle lens surface & lens coatings: <ul style="list-style-type: none"> • Reflection from spectacle lenses - ghost images -Reflections in bifocals at the dividing line • Antireflection coating, Mirror coating, Hard Multi Coating [HMC], Hydrophobic coating 	2
6.	Miscellaneous Spectacle: <ul style="list-style-type: none"> • Iseikonic lenses • Spectacle magnifiers • Recumbent prisms • Fresnel prism and lenses • Lenticular & Aspherical lenses • 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, sleeves, cleaners, screwdriver kit	2
9	Spectacle repairs –tools, methods, soldering, riveting, frame adjustments	1
10	Special types of spectacle frames ➤ Monocles ➤ Ptosis crutches ➤ Industrial safety glasses ➤ 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

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

TEXT BOOK: T Grosvenor: Primary Care Optometry, 5th edition, Butterworth –Heinemann, USA, 2007.

REFERENCE BOOKS:

- 1 A K Khurana: Comprehensive Ophthalmology, 4th edition, New age international(p) Ltd. Publishers, New Delhi, 2007
- 2 D B. Elliott :Clinical Procedures in Primary Eye Care,3rd edition, Butterworth-Heinemann, 2007
- 3 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 , DI Kurtz: Clinical Procedures for Ocular Examination ,3rd edition, McGraw-Hill Medical, 2003

PREREQUISITES: Optometric Instruments, Pharmacology

COURSE PLAN (Total: 30 hours)

- 1 History taking
- 2 Visual acuity estimation
- 3 Extraocular motility, Cover test, 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

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

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

REFERENCE BOOKS:

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

PREREQUISITES: Geometrical optics

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

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.

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

REFERENCE BOOKS:

- p.1 Stephen J. Miller : Parsons Diseases of the Eye, 18th edition, Churchill Livingstone, 1990
- p.2 Jack J. Kanski Clinical Ophthalmology: A Systematic Approach, 6th edition, Butterworth - Heinemann, 2007

PREREQUISITES: Ocular anatomy and Ocular Physiology, Ocular Biochemistry and Microbiology, Pharmacology

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, Molluscum Contagiosum)
 - 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 uveal tract(Melanoma)
 - 6.12 Episcleritis and scleritis
 - 6.13 Clinical examination of Uveitis and Scleritis

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.

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

REFERENCE BOOKS:

- p.1 Stephen J. Miller : Parsons Diseases of the Eye, 18th edition, Churchill Livingstone, 1990
- p.2 Jack J. Kanski Clinical Ophthalmology: A Systematic Approach, 6th edition, Butterworth-Heinemann, 2007

PREREQUISITES: Ocular anatomy and Ocular Physiology, Ocular Biochemistry and Microbiology, Ocular Disease - I

COURSE PLAN

Sl. No	Topics	No. of Hrs
1.	Retina and Vitreous: <ul style="list-style-type: none"> • Applied Anatomy • Congenital and Developmental Disorders (Optic Disc: Coloboma, Drusen, Hypoplasia, Medullated nerve fibers; Persistent Hyaloid Artery) • Inflammatory disorders (Retinitis : Acute purulent , Bacterial, Virus, mycotic) • Retinal Vasculitis (Eales’s) • Retinal Artery Occlusion (Central retinal Artery occlusion) • Retinal Vein occlusion (Ischaemic, Non Ischaemic , Branch retinal vein occlusion) • Retinal degenerations : Retinitis Pigmentosa, Lattice degenerations • Macular disorders: Solar retinopathy, central serous retinopathy, cystoid macular edema, Age related macular degeneration. • Retinal Detachment: Rhegmatogenous, Tractional, Exudative) • Retinoblastoma • Diabetic retinopathy 	12
2.	Ocular Injuries: Terminology : Closed globe injury (contusion, lamellar laceration) Open globe injury (rupture, laceration, penetrating injury, perforating injury) <ul style="list-style-type: none"> • Mechanical injuries (Extraocular foreign body, blunt trauma, perforating injury, sympathetic ophthalmitis) • Non Mechanical Injuries (Chemical injuries, Thermal, Electrical, Radiational) • Clinical approach towards ocular injury patients 	3
3.	Lens <ul style="list-style-type: none"> • Applied Anatomy and Physiology • Clinical examination • Classification of cataract • Congenital and Developmental cataract • Acquired (Senile, Traumatic, Complicated, Metabolic, Electric, Radiational, Toxic) • Morphological: Capsular, Subcapsular, Cortical, Supranuclear, Nuclear, Polar. • Management of cataract (Non-surgical and surgical measures; preoperative evaluation, Types of surgeries,) • Complications of cataract surgery • Displacement of lens: Subluxation, Displacement • Lens coloboma, Lenticonus, Microspherophakia. 	10

4.	Clinical Neuro-ophthalmology	12
Sl. No	Topics	No. of Hrs
	<ul style="list-style-type: none"> • 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 	
5.	Glaucoma <ul style="list-style-type: none"> • Applied anatomy and physiology of anterior segment • Clinical Examination • Definitions and classification of glaucoma • Pathogenesis of glaucomatous ocular damage • Congenital glaucoma's • Primary open angle glaucoma • Ocular hypertension • Normal Tension Glaucoma • Primary angle closure glaucoma (Primary angle closure suspect, Intermittent glaucoma, acute congestive, chronic angle closure) • Secondary Glaucoma's • Management : common medications, laser intervention and surgical techniques 	8
	Total number of hours	45

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

TEXT BOOKS:

- 1 Christine Dickinson: Low Vision: Principles and Practice Low vision care, 4th edition, Butterworth-Heinemann, 1998
- 2 Sarika G, Sailaja MVSE Vaithilingam: practice of Low vision –A guide book, Medical Research Foundation, 2015.

REFERENCE BOOKS:

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

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.

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

TEXT BOOKS:

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

PREREQUISITES: Geometrical optics, Visual optics, Ocular Anatomy, Ocular Physiology, Biochemistry, Ocular Microbiology, Ocular Disease, Optometric Instruments

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 Don't'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

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 lens

TEXT BOOKS:

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

PREREQUISITES: Geometrical optics, Visual optics, Ocular Anatomy, Ocular Physiology, Biochemistry, Ocular Microbiology, Ocular Disease, Optometric Instruments

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 (at SN during clinics)

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.

TEXT BOOKS:

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

PREREQUISITES: Ocular anatomy, Physiology

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 Donders'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 Classification
 - 12.2 Aetiology

12.3 Investigation

12.4 Management

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. The student on completion of the course should be able to independently investigate and diagnose case of strabismus with comments in respect to retinal correspondence and binocular single vision. The student should be able to perform all the investigations to check retinal correspondence, state of Binocular Single Vision, angle of deviation and special investigations for paralytic strabismus.

TEXT BOOKS:

- 1 Pradeep Sharma: Strabismus simplified, New Delhi, First edition, 1999, Modern publishers.
- 2 Fiona J. Rowe: Clinical Orthoptics, second edition, 2004, Blackwell Science Ltd
- 3 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
- 4 Mitchell Scheiman; Bruce Wick: Clinical Management of Binocular Vision Heterophoric, Accommodative, and Eye Movement Disorders, 2008, Lippincot Williams & Wilkins publishers

PREREQUISITES: Ocular Anatomy, Ocular Physiology, Binocular Vision –I.

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.

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

TEXT BOOKS:

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

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, Hypothyroidism, 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 (Herpes 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.

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 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.

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, Jolley JL : 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 Banarsidas Bhanot publishers, Jabalpur, 2007

REFERENCE BOOKS: MC Gupta, Mahajan BK, Murthy GVS, 3rd edition. Text Book of Community Medicine, Jaypee Brothers, New Delhi, 2002

PREREQUISITES: Ocular Disease, Visual optics, Optometric Instruments, Clinical Examination of Visual System

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

Information, Education and Communication for Eye Care programs

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.

TEXT BOOKS:

- 1 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

- 2 R V North: Work and the eye, Second edition, Butterworth Heinemann, 2001

REFERENCE BOOKS:

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

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

GERIATRIC OPTOMETRY & PAEDIATRIC 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.

TEXT BOOKS: A.J. ROSSENBLOOM Jr & M.W.MORGAN: Vision and Aging, Butterworth-Heinemann, Missouri, 2007.

REFERENCE BOOKS:

- 1 OP Sharma: Geriatric Care –A textbook of geriatrics and Gerontology, viva books, New Delhi, 2005
- 2 VS Natarajan: An update on Geriatrics, Sakthi Pathipagam, Chennai, 1998
- 3 DE Rosenblatt, VS Natarajan: Primer on geriatric Care A clinical approach to the older patient, Printers Castle, Cochin, 2002

PREREQUISITES: Ocular anatomy, Physiology, Ocular Disease

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

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 medical

information 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: At the end of the course the student is expected to:

- 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

TEXT BOOKS:

- 1 Pediatric Optometry - JEROME ROSNER, Butterworth, London 1982
- 2 Paediatric Optometry –William Harvey/ Bernard Gilmartin, Butterworth –Heinemann, 2004

REFERENCE BOOKS:

- 1 Binocular Vision and Ocular Motility - VON NOORDEN G K Burian Von Noorden's, 2nd Ed., C.V. Mosby Co. St. Louis, 1980.
- 2 Assessing Children's Vision. By Susan J Leat, Rosalyn H Shute, Carol A Westall.45 Oxford: Butterworth-Heinemann, 1999.
- 3 Clinical pediatric optometry. LJ Press, BD Moore, Butterworth- Heinemann, 1993

PREREQUISITES: Ocular anatomy, Physiology, Ocular Disease

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

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.

Project is spread through sixth to eighth semester.

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. The students are expected to work for minimum 6 hours per day and this may be more depending on the need and the healthcare setting.

During these semesters students also will continue the research work allotted during the sixth semester and submit the final report and make presentation in front of the experts.

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.

Skills based outcomes and monitorable indicators for Optometrist

First year:

- 1.1 Role play
- 1.2 Clinical Observations
- 1.3 Vision Check

1.4 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 interpretations

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% |

Year	Procedures	Minimum Number	Comments
I year	Role Play (Patient- Optometrist)	3 cases	
	Clinical Observation and Report writing	6 cases	
	Vision Check (Snellen's Chart) – Distance + Near	12 cases	
	Lensometry (Spherical lenses)		
II year	History taking <ul style="list-style-type: none"> - General - Specific - Conditions 	9 cases	Can practice on the following complaints : Blurred Vision, Headache, Pain, redness, Watering, Flashes, Floaters, Blackspots
	Lensometry	100 cases	Simple Sphere, Simple cylinder, Spherocylinder (90, 180, Oblique degrees), Bifocals, PAL

	Vision Check (log MAR) Pinhole acuity	100 cases	Simulation, especially to show and ask the students to interpret the findings.
	Extraocular Motility	10 cases	
	Cover test	10 cases	Video output Simulation of various conditions
	Alternate Cover test	10 cases	Video output Simulation of various conditions
	Hirschberg test	10 cases	Video output Simulation of various conditions
	Modified Krimsky test	3 cases	Video output Simulation of various conditions
	Push up test (Amplitude of	10 cases	
Year	Procedures	Minimum Number	Comments
	Accommodation)	(1 case in presbyopic age)	
	Push up test (Near point of Convergence)	10 cases	
	Stereopsis test	10 cases	
	Tear Break up time	10 cases	
	Amsler's Grid test	10 cases (simulate)	Simulation of various conditions
	Photostress test	10 cases (Normals)	
	Color vision test	10 cases	
	Schirmer's test	10 cases	
	Confrontation test	10 cases	
	Slit lamp illumination	3 cases	
	Slit lamp examination	10 cases	
	Finger tension	10 cases (Normals)	
	Schiotz Tonometry	10 cases (Normals)	
	Applanation Tonometry	10 cases (Normals)	
	Negative Relative Accommodation	10 cases	
	Positive Relative Accommodation	10 cases	
	von Herick Grading of Anterior chamber depth	10 cases	
	Accommodative facility(± 2.00 D)	10 cases	
	Corneal Sensitivity test	10 cases	
	IPD	10 cases	
	Proptosis evaluation	1 demo	Video demonstration of cases
	Ptosis evaluation	1 demo	Video demonstration of cases
	Pupillary evaluation -Direct -Consensual -RAPD	10 cases	
	HVID	10 cases	
	Maddox rod (Phoria)	10 cases	
	Negative Fusional vergence	10 cases	
	Positive Fusional Vergence	10 cases	

II year	Retinoscopy- Static, Dynamic and Cycloplegic Retinoscopy	25 + 25 +25 cases	Model eye for retinoscopy.
	Keratometry	25 cases	
	Subjective Refraction JCC Clock Dial Duochrome Borish Delayed	25 cases	
	Addition calculation	25 cases	Give more simulated problems and discuss on it
III year	Direct ophthalmoscope	10 cases (Normals)	Show slides of various commonly seen retinal conditions
	Visual Field chart interpretation	10 cases – discussion	Both kinetic and Static
Year	Procedures	Minimum Number	Comments
	B scan Interpretation	10 cases – discussion	
	A scan chart Interpretation	10 cases – discussion	Discussion having different types of wave patterns
	Case Analysis	10 cases	
	+90 D lens	10 cases (Normals)	Slides of various Cup: Disc ratios can be shown
III year	Gonioscopy	5 cases (Normals)	Slides of abnormal angles
	Posting in optometry clinics	5+5+5+5+10 cases	Pediatric/contact lens/Low vision/ Orthoptics/ GOPD
	Camps	4 camps	School screening, Cataract
	IDO (on each other)	10 cases(Normals)	Slides of abnormal fundus
	Case Analysis -	5+ 5+ 5+ 5 cases	Pathology Binocular Vision Clinical Refraction Dispensing optics
IV year CLINICAL INTERNSHIP	General OPD (History taking –DO)	500 cases	Weekly 1 case report submission
	Contact Lens	20 cases (5 RGP+ 5 Soft + 5 toric)	Totally 3 different case reports submission at the end of the postings
	Opticals	100 cases	Weekly 1 case report submission
	Low Vision care Clinic	10 cases	Totally 3 different case reports submission at the end of the postings
	Binocular Vision clinic	10 cases	Totally 3 different case reports submission at the end of the postings
	Ophthalmology clinic (Common eye conditions)	50 cases	Totally 3 different case reports submission at the end of the postings
	Camps	10 camps	Camp report submission

Choice of Electives in the programs

- Electives: The choice of electives and option to choose specialties like eye banking , ocular

prosthesis , ocular imaging, electrophysiology , vision therapy , refractive surgery etc. will be time to time added as per the changing trends.

TEMPLATE OF QUESTION PAPER (1st – YEAR)

SANTOSH DEEMED TO BE UNIVERSITY

COURSE : B.OPTOMETRY

YEAR ; 1st YEAR

SUBJECT

Time : 3hour

Total marks : 80

Section : A

Time : 11/2 hour

40Marks

1. Write shorts notes on :

(4 X 5 = 20)

A)

B)

C)

D)

2 Describe _____ (10)

3. Describe _____ (10)

Section : B

Time : 11/2 hour

40Marks

1. Write shorts notes on :

(4 X 5 = 20)

A)

B)

C)

D)

2 Describe _____ (10)

3. Describe _____ (10)

TEMPLATE OF QUESTION PAPER (2nd & 3rd – YEAR)

SANTOSH DEEMED TO BE UNIVERSITY

COURSE : B.OPTOMETRY

YEAR ; 2nd YEAR

SUBJECT

Time : 3hour

Total max marks : 80

Time : 20 mins

Section : A – M.C.Q

(20x1 = 20)

- 1.
- 2.
- 3.
- 4.
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- 15.
- 16.
- 17.
- 18.
- 19.
- 20.

Section B – Short Answer type (30 marks)

1. Write a notes on _____ (6)
2. Describe _____ (6)
3. Describe _____ (6)
4. Describe _____ (6)
5. Describe _____ (6)

Section – C – Essay type answers (30 marks)

6. explain _____ (15)
7. Write an essay on _____ (15)

THEORY SUBJECTS FOR FIRST YEARS :-

1. basic anatomy and ocular anatomy
2. basic physiology and ocular physiology
3. general biochemistry and ocular biochemistry
4. physical optics and geometric optics
5. optometric optics I

THEORY SUBJECT FOR SECOND YEAR

1. basic and ocular pathology/microbiology/pharmacology
2. optometric optics II
3. clinical exam of visual system & ophthalmic instrument
4. Ocular disease
5. visual optics
6. Low vision aid & optometric investigation

THEORY SUBJECT FOR THIRD YEAR

1. Contact lens
2. binocular vision and advanced orthoptics
3. major eye disease and systemic disease and aeye
4. public health , cummunity and occupational optometry
5. pediatric and geriatric optometry
6. dispensing optics



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ghaziabad , uttarpradesh