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UNIVERSITY OF MYSORE

Estd.1916

Vishwavidyalaya Karyasoudha  
Crawford Hall, Mysore 570 005

(Re-accredited by NAAC at "A" Grade with a CGPA of 3.47)

(NIRF-2020 Ranked 27 in University Category & 47 in Overall Category)

No.: PMEB/AC10/759/2019-20

Date: 04-08-2020.

**NOTIFICATION**

Sub: Introduction of **B.Sc.(Optometry)** course under Specialized Programme from the academic year 2019-20- Reg.

Ref: 1. Decision of the BOS Meeting held on 22-11-2019.

2. Decision of the Faculty of Science & Technology meeting held on 18.02.2020.

3. Decision of the Academic Council meeting held on 18-06-2020.

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The Board of Studies in **B.Sc. Optometry (UG)** at its meeting held on **22.11.2019** has recommended to introduce Four Years(8 Semester) **B.Sc.(Optometry)** course in University of Mysore under specialized/specified program. The Regulations, Syllabus and Scheme of Examination was approved from the academic year 2019-20.

The Faculty of Science & Technology and the Academic Council at their meetings held on 18-02-2020 and 18-06-2020 respectively, have also approved the above said proposal and the same is hereby notified.

The Regulations and Syllabus of **B.Sc.(Optometry)** course is uploaded in University website. The contents may be downloaded from the University website [www.uni-mysore.ac.in](http://www.uni-mysore.ac.in).

**To:**

1. The Registrar(Evaluation), University of Mysore, Mysuru.
2. The Dean, Faculty of Science & Technology, DOS in Psychology, MGM.
3. Prof. N.K. Lokanath , Chairperson, BOS in B.Sc. Optometry(UG), DoS in Physics, MGM.
4. The Director, Malabar Institute of Optometry (A Unit of MEH Health Care(P) Ltd.,) 4th Division, 16<sup>th</sup> Ward, BN Road, Gundlupet.
5. The Deputy Registrar/ Asst. Registrar/ Superintendent, Examination Branch, UOM, Mysuru.
6. The Special Officer to Hon'ble Vice-Chancellor, University of Mysore, Mysuru.
7. The PA to Vice-Chancellor/Registrar/Registrar(Evaluation), University of Mysore, Mysuru.
8. Office Copy.

REGISTRAR  
REGISTRAR  
University of Mysore  
MYSURU - 570 005

REGULATIONS FOR CHOICE - BASED CREDIT AND SEMESTER SYSTEM FOR THE FOUR-YEAR UNDERGRADUATE PROGRAM

B.Sc. Optometry offered under the Specialized Programme sanctioned by the University of Mysore at Malabar Institute of Optometry, Gundalpet , Karnataka.

*Duration of the program* shall be four-years of Eight Semesters , the first six semesters set apart for class room instruction in theory and practicals in laboratory and the last two Semesters constituting a one-year Clinical Internship training in an Eye Hospital of repute. *Program* stands for the entire course of study and the examinations leading to the award of the degree.

*An academic week* is a unit of five working days in which the distribution of work is organized from Day 1 to Day 5 ,with five contact hours of one hours duration on each day. A sequence of 18 such weeks constitutes a Semester.

*Semester* means a term consisting of 90 working days including examination days distributed over a minimum of 18 weeks of 5 working days each.

*Course* means a segment of subject matter to be covered in a semester.


*Common Course* means a course that comes under the category of courses , including compulsory English and an additional language . *Core course* means a a compulsory course in a subject related to a particular degree program (here it is Optometry)

*Complementary course* means a course which is generally related to the cores course.

*Department* means the teaching department in the college which offers a program approved by the University as per the statutes and Act of the University.

*Department Co-ordinator* is a teacher appointed by the Department council to coordinate the continuous evaluation undertaken in that Department.

*Department Council* is a body of all the teachers in a particular department in the college.



*Parent Department* is the department which offers a particular degree program.

*College Co-ordinator* is a teacher nominated by the college council to co-ordinate the effective running of the process of internal evaluation undertaken by various departments in the college.

*Faculty Adviser* means a teacher from the parent department nominated by the department council who will advise the student in academic matters .

*Credit ( C )* is a unit of academic input measured in terms of weekly contact hours / course contents assigned to a course.

*Letter Credit* or simply Grade in a course is a letter symbol ( A,A+, B,C etc.) Grade shall mean the prescribed alphabetical Grade a student based on his/her performance in various examinations.

Each letter grade is assigned a *Grade Point ( G )* which is an integer indicating the numerical equivalent of a broad level of performance of a student in a course. *Grade Point* means point given to a Grade on seven point scale.

*Semester Grade Point Average (SGPA)* is the value obtained by dividing the sum of Grade Points obtained by a student in the various courses taken in a semester by the total number of credits in that Semester. SGPA shall be rounded off to two decimal places. SGPA determines the overall performance of a student at the end of a Semester.

*Credit Point (P)* of a course is the value obtained by multiplying the Grade Point (G) by the Credit (C) of the course.

*Credit Point of a Semester* is the product of the SGPA of that Semester and the credit load of that Semester.

*Credit Point of a Semester* = SGPA \* Total Credits of a Semester.

*Cumulative Grade Point Average (CGPA)* is the value obtained by dividing the sum of credit points in all the semesters taken by the students for the entire program by the total number of credits in the entire program and shall be rounded off by two decimal places.

*Grade Card* is the printed record of a student's performance awarded to him/her issued after the Semester -end examination.

## **Attendance :**

A student who abstains continuously for 14 days without informing the Principal or without sufficient reason shall have his/her name struck off the rolls .

75% attendance is mandatory for students to appear for the Semester Examination. Condonation of attendance to a maximum of 9 days in a semester subject to a maximum of two times in the entire duration of the program will be granted by the University on the recommendation of the Head of the Institution. Concession in the matter of attendance can be granted by the head of the Institution to students for participation in extra -curricular activities in deserving cases.

### **Semester Examinations**

The University will hold Semester Examinations at the end of each Semester. Practical Examinations will be conducted at the end of Even Semesters( ie: 2<sup>nd</sup>,4<sup>th</sup>&6<sup>th</sup> Semesters) only.

For the 7<sup>th</sup> and 8<sup>th</sup> Semester there shall be two papers in Special Clinics 1,2,3&4 marks for which will be awarded by the Department based on the evaluation of the performance of the students at the Hospitals where they undergo Internship.

### **EVALUATION AND GRADING.**

Mark system is followed in evaluation instead of direct grading for each question. For each course in the Semester Letter Grade, Grade Point and Percentage of marks are introduced in 7-point indirect grading system.

*Course Evaluation* for each course shall contain two parts.:

1. Internal assessment
2. External evaluation

*Twenty percent weight shall be given to the internal assessment. The Remaining 80 percent weight shall be for external evaluation.*

Twenty percent of the total marks in each course are for Internal assessment. The marks awarded in this category shall be sent by the Institution before the commencement of the Semester Examination.

The Internal Assessment shall be based on a pre-determined transparent system involving written test

/assignments/seminars/viva and attendance in respect of theory courses and lab involvement/ records and attendance in respect of Practical courses.

Internal Assessment of the Project will be based on its content, method of presentation, final conclusion and orientation to research aptitude.

Components with percentage of marks of Internal Evaluation of Theory courses are :

Attendance 25%, Assignment/Seminar/Viva 25% , and Test Paper 50%

For Practical Courses

Attendance 25% , Record 50%, and lab involvement 25% as far as Internal is concerned .

Attendance of each course will be evaluated as shown below :

Above 90% attendance	100% marks allotted for attendance
85% to 89%	80%
80% to 84%	60%
76% to 79%	40%
75%	20%

To ensure transparency the list of Internal Marks shall be displayed on the notice board before the commencement of the theory examination.

*Internal marks once awarded is FINAL and will not be changed .*

The tabulated list of Internal Marks shall be sent to the Controller of Examinations signed by the HOD and countersigned by the Principal.

Each course is evaluated by assigning marks with a letter grade (A+, A, B,C,D,E or F) to that course by the method of indirect grading.

An aggregate of E grade with 40% marks (after external and internal put together) is required in each course for a pass and also for awarding a degree.

Appearance for Internal Evaluation (IE) and End Semester Evaluation (external) are compulsory and no grade shall be awarded to a candidate if she/he is absent for IE/ESE or both. For a pass in each course 40% marks or E grade is necessary.

A student who fails to secure a minimum grade for a pass in a course is permitted to write the examination along with the next

batch. 10.6 After the successful completion of a semester, semester Grade point Average (SGPA) of a student in that semester is calculated using the formula given below.

For the successful completion of a semester, a student should pass all courses. However, a student is permitted to move to the next semester irrespective of SGPA obtained. SGPA of the student in that semester is calculated using the formula Sum of the credit points of all courses in a semester SGPA divided by Total credits in that semester.

The Cumulative Grade Point Average (CGPA) of the student is calculated at the end of a program. The CGPA of a student determines the overall academic level of the student in a program and is the criterion for ranking the students. CGPA can be calculated by the following formula. Total credit points obtained in six semesters CGPA divided by Total credits acquired (120)  
SGPA and CGPA shall be rounded off to two decimal places. CGPA determines the broad academic level of the student in a program and is the index for ranking students (in terms of grade points). An overall letter grade (cumulative grade) for the entire program shall be awarded to a student depending on her/his CGPA

#### GRADE CARD

The University shall issue to the students grade/marks card (by online) on completion of each semester, which shall contain the following information:

- a) Name of University
- b) Name of College
- c) Title of Under Graduate Program
- d) Semester concerned
- e) Name and Register Number of student
- f) Code number, Title and Credits of each Course opted in the semester
- g) Internal marks, External marks, total marks, Grade point (G) and Letter grade in each course in the semester
- h) The total credits, total credit points and SGPA in the Semester (corrected to two decimal places)
- i) Percentage of total marks

The final Grade/mark card issued at the end of the final semester shall contain the details of all courses taken during the entire program including those taken over and above the prescribed minimum credits for obtaining the degree. However, as already mentioned, for the computation of CGPA only the best performed courses with maximum grade points alone shall be taken subject to the minimum credits requirements (120) for passing a specific degree.

The final grade card shall show the percentage of marks, CGPA (corrected to two decimal places) and the overall letter grade of a student for the entire program.

The final grade/mark card shall also include the grade points and letter grade of common course, core courses, complementary courses and open courses separately. This is to be done in a seven point indirect scale.

#### AWARD OF DEGREE

The successful completion of all the courses (common, core, complementary courses) prescribed for the degree program with E grade (40%) shall be the minimum requirement for the award of degree.

#### GRIEVANCE REDRESSAL COMMITTEE

##### *College level*

The college shall form a Grievance Redressal Committee in each department comprising of course teacher and one senior teacher as members and the Head of the Department as Chairman. This committee shall address all grievances relating to the internal assessment grades of the students. There shall be a college level grievance redressal committee comprising of student advisor, two senior teaches and two staff council members (one shall be elected member) as members and Principal as Chairman.

##### *University Level*

The University shall form a Grievance Redressal Committee as per the existing norms.

## PROJECT EVALUATION

1. Evaluation of the Project Report shall be done under Mark System.
2. The evaluation of the project will be done at two stages:
  - a) Internal Assessment (supervising teachers will assess the project and award internal Marks)
  - b) External evaluation (external examiner appointed by the University)
  - c) Marks secured for the project will be awarded to candidates, combining the internal and external Marks

The Internal and External components are to be taken in the ratio 1:4

Assessment shall be on the following lines:

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Internal Assessment: 20% of the total

### Components

Punctuality	20
Use of Data	20
Scheme/Organization of report	30
Viva-Voce	30

External : 80% of the total

### Components

Relevance of the topic, Statement of objectives Methodology (Reference/Bibliography)	20
Presentation, Quality of analysis/Use of statistical tools, Findings&Recommendations	30
Viva -voce	50

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**UNIVERSITY OF MYSORE**  
**Choice- based Credit system of Bachelor's Degree Program in**  
**OPTOMETRY**

Sem	Sl#	Code	Course Title	Credit Pattern in LTP	Credit VALUE	Hours Per week in LTP	TOTAL HOURS	EXAMINATION MARKS			T O T A L
								C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	
I	001	L1.M1/K1/H1	Language 1 Malayalam/Kannada/Hindi Paper1	2:0:2	3	2: 0: 1	5	10	10	80	100
I	002	L2E1	Language 2 English Paper 1	2:0:2	3	2: 0: 1	5	10	10	80	100
I	003	OPTC1	Core1 Anatomy & Physiology	2:0:2	4	3: 0 :2	5	10	10	80	100
I	004	OPTC2	Core2 Physical Optics	2:0:2	4	3:0 :2	5	10	10	80	100
I	005	OPTA1	Complementary 1 : Bio-Chemistry	2:0:1	3	2: 0: 1	3	10	10	80	100
II	006	L1.M2/K2/H2	Language 1Malayalam/Kannada/ Hindi Paper2	2:0:2	3	2: 0: 1	5	10	10	80	100
II	007	L2E2	Language 2 English Paper 2	2:0:2	3	2: 0: 1	5	10	10	80	100
II	008	OPTC3	Core Paper 3 Anatomy & Physiology of the Eye	2:0:2	4	3: 0: 2	5	10	10	80	100
II	009	OPTC4	Core Paper 4 Geometrical Optics	2:0:2	4	3:0 :2	5	10	10	80	100
II	010	OPTA2	Complementary Paper 2 Microbiology	2:0:1	3	2: 0: 1	3	10	10	80	100
III	011	OPTP1	Practical I Physical& Geometrical Optics	1:0:3	4	3: 0: 2	3	15	15	120	150
III	012	L1.M3/K3/H3	Language 1 Malayalam/Kannada/ Hindi Paper 3	2:0:2	3	2: 0: 1	3	10	10	80	100
III	013	L2E3	Language 2 Communicative English Paper 1	2:0:2	3	2: 0: 1	4	10	10	80	100
III	014	OPTC5	Core 5 Optometric Optics	2:0:2	4	3: 0: 2	5	10	10	80	100
III	015	OPTC6	Core 6 Visual Optics 1	2:0:2	4	3: 0: 2	5	10	10	80	100
III	016	OPTC7	Core 7 Optometric Instruments	2:0:2	4	3: 0: 2	5	10	10	80	100
III	017	OPTA3	Complementary Paper 3 Optometric Instruments	2:0:1	3	2: 0: 1	4	10	10	80	100
IV	018	L1.M4/K4/H4	Language 1 Malayalam/Kannada/ Hindi Paper 4	2:0:2	3	2: 0: 1	4	10	10	80	100
IV	019	L2E4	Language 2 Communicative English Paper 2	2:0:2	3	2: 0: 1	4	10	10	80	100
IV	020	OPTC8	Core 8 Visual Optics 2	2:0:2	4	3: 0: 2	5	10	10	80	100
IV	021	OPTC9	Core 9 Dispensing Optics	2:0:2	4	3: 0: 2	5	10	10	80	100
IV	022	OPTC10	Core 10 Systemic Disease	2:0:2	4	3: 0: 2	5	10	10	80	100
IV	023	OPTA4	Complementary Paper 4 Pathology	2:0:1	3	3: 0: 2	5	10	10	80	100
IV	024	OPTP2	Major Practical I	1:0:3	4	1: 0: 4	5	15	15	120	150

Sem	Sl#	Code No.	Title of the Course	Credit Pattern in L:T:P	Credit Value	Hours Per week In L:T:P	Total hours	Examination			T O T A L
								C1	C2	C3	
V	024	OPTC11	Core 11 Contact Lens 1	2:0:2	4	3:0:2	5	10	10	80	100
V	025	OPTC12	Core 12 Ocular Disease 1	2:0:2	4	3:0:2	5	10	10	80	100
V	026	OPTC13	Core 13 Binocular Vision 1	2:0:2	4	3:0:2	5	10	10	80	100
V	027	OPTC14	Core 14 Low Vision Aid	2:0:2	4	3:0:2	5	10	10	80	100
V	028	OPTC15	Core 15 Occupational Optometry	2:0:2	4	3:0:2	5	10	05	60	075
V	028	OPTA3	Common Paper 1 Community Optometry	0:0:3	4	0:0:0	-	10	10	80	100
VI	029	OPTC16	Core 16 Contact Lens 2	2:0:2	4	3:0:2	5	10	10	80	100
VI	030	OPTC17	Core 17 Ocular disease 2	2:0:2	4	3:0:2	5	10	10	80	100
VI	031	OPTC18	Core 18 Binocular Vision 2	2:0:2	4	3:0:2	5	10	10	80	100
VI	032	OPTC19	Core 19 Optometry of the Children & the Aged	2:0:2	4	3:0:2	5	10	10	80	100
VI	033	OPTC20	Common Paper 2 : Nutrition	1:0:2	4	2:0:1	3	10	05	60	075
VI	034	OPTP3	Major Practical III	1:0:3	4	1:0:3	4	15	15	120	150
VI	035	OPTVP	Project & Viva	0:0:6	6	0:0:0	-	15	15	120	150
VI	036	OPTEA	Extension Activities	0:0:2	2	0:0:0	-	00	00	50	050
VII	037	OPTI1	Core 20 Special Clinics 1		10						250
VII	038	OPTI2	Core 21 Special Clinics 2		10						250
VIII	039	OPTI3	Core 22 Special Clinics 3		10						250
VIII	040	OPTI4	Core 2 Special Clinics 4		10						250
					180						

## SEMESTER 1

## CORE PAPER I - ANATOMY &amp; PHYSIOLOGY

**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. 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 should be able to:

- ☐ Comprehend the normal disposition, inter-relationships, gross, functional and applied anatomy of various structures in the human body.
- ☐ 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.
- ☐ Explain the normal functioning of various organ systems of the body and their interactions.
- ☐ Know the physiological principles underlying pathogenesis of disease

**Unit: I****General Anatomy:**

Introduction to Human Anatomy: Anatomy: Definition and its relevance in medicine and optometry - Planes of the body, relationship of structures, organ system, Skeleton System

**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 different tissues

**Muscles:**

Different types of muscles, their functional differentiation, their relationship with different structures, and their neural supply

**Blood vessels:**

Differentiation between arteries and veins, embryology, histology of both arteries and veins, Functional differences between the two, anatomical differences at different locations

**General Physiology:**

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

**Unit: II****Skin and appendages:**

Embryology, anatomical differences in different areas, functional and protective variations, innervations, relationship with muscles and nerves

**Lymphatic system:**

Embryology, functions, relationship with blood vessels and organs

**Glands:**

Embryology, different types of glands (exocrine and endocrine), functional differences, neural control of glands

**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

**Brain and Cranial nerves:**

Major parts of Brain, Protective coverings of the Brain, Cerebrospinal Fluid, Brain stem, Cerebellum, Diencephalon, Cerebrum, Cranial nerves

**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

**Unit: III**

**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

**EXCRETION:**

Body fluids – distribution, measurement & exchange, Kidney – structure of nephron – mechanism of urine formation – composition of the urine and abnormal constituents – urinary bladder & micturition

**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

**Unit: IV**

**REPRODUCTION:**

Male reproductive system – control & regulation , Female reproductive system – uterus – ovaries – menstrual cycle – regulation – pregnancy & delivery – breast – family planning

**Respiration:**

Mechanics of respiration – pulmonary function tests – transport of respiratory gases- neural and chemical regulation of respiration – hypoxia, cyanosis, dyspnoea – asphyxia.

**Circulation:**

General principles

Heart: myocardium – innervations – 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 - Environmental Physiology, Body temperature regulation (including skin Physiology). Exposure to low and high atmospheric pressure

**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, Special senses - (Elementary) Olfaction - Taste - Hearing

**Texts Books:**

1. B D Chaurasia: Handbook of general Anatomy, Third edition, CBS Publishers, New Delhi, 1996
2. GJ Tortora, B Derrickson: Principles of Anatomy and Physiology, 11<sup>th</sup> edition, John Wiley & Sons Inc, 2007
3. John Wiley & Sons Inc, New Jersey, 2007

**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, 6<sup>th</sup> edition, saunders company, Japan, 1981

## SEMESTER I

### CORE PAPER II - 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.

#### Unit: I

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.

Sources of light; Electromagnetic Spectrum.

#### Unit: II

Polarized light; linearly polarized light; and circularly polarized light.

Intensity of polarized light; Malus' Law; polarizers and analyzers; Methods of producing polarized light; Brewster's angle., Birefringence; ordinary and extraordinary rays.

Relationship between amplitude and intensity. Coherence; interference; constructive interference, destructive interference; fringes; fringe width

#### Unit: III

Double slits, multiple slits, gratings.

Diffraction; diffraction by a circular aperture; Airy's disc

Resolution of an instrument (telescope, for example); Raleigh's criterion

Scattering; Raleigh's scattering; Tyndall effect.

Fluorescence and Phosphorescence

#### Unit: IV

Basics of Lasers – coherence; population inversion; spontaneous emission; Einstein's theory of lasers.

Radiometry; solid angle; radiometric units; photopic and scotopic luminous efficiency and efficacy curves; photometric units

Inverse square law of photometry; Lambert's law.

Other units of light measurement; retinal illumination; Trolands **Text**

#### **Book:**

☐ Subrahmanyam N, Brij Lal, *A text book of Optics*, S. Chand Co Ltd, New Delhi, India, 2003.

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.

## SEMESTER I

### COMPLEMENTARY PAPER I – BIOCHEMISTRY

**Course Description:** This course 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

- ☐ Structure, function and interrelationship of biomolecules and consequences of deviation from normal.
- ☐ Integration of the various aspects of metabolism, and their regulatory pathways.
- ☐ Principles of various conventional and specialized laboratory investigations and instrumentation, analysis and interpretation of a given data.

#### Unit: I

Carbohydrates:

Glucose; fructose; galactose; lactose; sucrose; starch and glycogen (properties and tests, Structure and function)

Proteins:

Amino acids, peptides, and proteins (general properties & tests with a few examples like glycine, tryptophan, glutathione, albumin, hemoglobin, collagen)

#### Unit: II

Lipids:

Fatty acids, saturated and unsaturated, cholesterol and triacylglycerol, phospholipids and plasma membrane

Vitamins:

General with emphasis on A, B<sub>2</sub>, C, E and inositol (requirements, assimilation and properties)

#### Unit: III

Minerals:

Na, K, Ca, P, Fe, Cu and Se. (requirements, availability and properties) Hormones and their receptors basic concepts in metabolic regulation with examples, insulin, glucagons and thyroxine

Metabolism: General whole body metabolism (carbohydrates, proteins, lipids)

#### Unit: IV

Ocular Biochemistry

Various aspects of the eye, viz. tears, cornea, lens, aqueous, vitreous, retina and pigment epithelium rhodopsin. (The important chemicals in each and their roles). Clinical Biochemistry

Blood sugar, urea, creatinine and Bilirubin, cholesterol etc and significance of their estimation.

#### Text book:

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

#### Reference Books:

1. S. Ramakrishnan, K G Prasannan and R Rajan: Text book of Medical Biochemistry, Orient Longman, Madras, 1990
2. D.R. Whitehart: Biochemistry of the Eye, 2<sup>nd</sup> edition, Butterworth Heineman

## SEMESTER II

### CORE PAPER III - OCULAR ANATOMY & PHYSIOLOGY

**Course Description:** This course deals with detailed anatomy of the orbit, eyeball and cranial nerves associated with ocular functions. Ocular physiology deals with the physiological functions of each part of the eye.

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

- ⑦ Comprehend the normal disposition, inter-relationships, gross, functional and applied anatomy of various structures in the eye and adnexa and understand the basic principles of ocular embryology
- ⑦ 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.
- ⑦ Elucidate the physiological aspects of normal growth and development of the eye.
- ⑦ List the physiological principles underlying pathogenesis and treatment of disease of the eye.

#### Unit: I

Anatomy:

Cornea: Anatomy of all the layers, cellular structure, nerve supply, reason for transparency, refractive properties

Coats of eyeball:

Sclera (episclera & sclera), Choroid (Iris, ciliary body, choroid), Retina

Detailed anatomy, cellular structure, vasculature, nerve supply for all the above coats, pupils, nerve supply for pupillary actions, pupillary pathway. Crystalline lens, Aqueous, anterior chamber, vitreous body

#### Unit: II

Ocular Embryology

Detailed study of orbit

Ocular Adnexa and Lacrimal system

Extra ocular muscles (anatomy, innervations, action)

Orbital Blood supply

#### CRANIAL NERVES:

Detailed study of each of the following nerves in terms of their nuclei, course, relationship within brain, effects of compression etc at different regions Optic nerve

Oculomotor nerve

Trochlear nerve

Trigeminal nerve

Abducent nerve

Facial nerve

Visual Pathway, Autonomic Innervations of Ocular structures

#### Unit: III

Physiology:

Protective mechanisms in the eye

Precorneal tear film, eyelids and lacrimation

Extrinsic Ocular muscles, their actions and control of their movements

Saccadic, smooth pursuit and Nystagmic eye movements

Coats of the eye ball

Corneal Physiology

Aqueous humor and vitreous: Intra ocular pressure

Iris and pupil



**Unit: IV**

Crystalline lens and accommodation – presbyopia

Retina – structure and functions, dark and Light Adaptations

Vision – general aspects of sensation

Pigments of the eye and photochemistry, electrophysiology The visual stimulus, refractive errors

Visual acuity, vernier acuity and principle of measurement

visual perception – Binocular vision, stereoscopic vision, optical illusion

Visual pathway, central and cerebral connections, lesions of pathway and effects Colour vision and colour defects. Theories and diagnostic tests

**Text Book:**

1. A Remington: Clinical Anatomy of the Visual System, Second edition, Elsevier Butterworth Heinemann, Missouri, USA, 2005.
2. AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006

**Reference Books:**

1. AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition, CBS Publishers, New Delhi, 2006
2. RD Ravindran: Physiology of the eye, Arvind eye hospitals, Pondicherry, 2001
3. PL Kaufman, A Alm: Adler's Physiology of the eye clinical application, 10<sup>th</sup> edition, Mosby, 2002

## SEMESTER II

### CORE PAPER IV – GEOMETRIC OPTICS

**Course Description:** Geometric Optics is the study of light and its behavior 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.

#### Unit: I

Nature of light – light as electromagnetic oscillation; ideas of sinusoidal oscillations; amplitude and phase; speed of light in vacuum and other media; refractive index

Wavefronts – spherical, elliptical and plane; Curvature and vergence; rays; convergence and divergence in terms of rays and vergence; vergence at a distance Refractive index; its dependence on wavelength Fermat's and Huygen's Principle – Derivation of laws of reflection and refraction (Snell's law) from these principles Plane mirrors – height of the mirror; rotation of the mirror Reflection by a spherical mirror – paraxial approximation; sign convention; derivation of vergence equation

Imaging by concave mirror, Imaging by convex mirror, Reflectivity; transmittivity, Snell's Law; refraction at a plane surface

Glass slab; displacement without deviation; displacement without dispersion

Thin prisms; angle of prism; deviation produced by a prism; refractive index of the prism

#### Unit: II

Prisms; angular dispersion; dispersive power; Abbe's number. Definition of crown and flint glasses; materials of high refractive index

Thin prism – definition; definition of Prism diopter; deviation produced by a thin prism; its dependence on refractive index

Refraction by a spherical surface; *sign convention*; introduction to spherical aberration using image formed by a spherical surface of a distance object; *sag formula* Paraxial approximation; derivation of vergence equation

Imaging by a positive powered surface, Imaging by a negative powered surface

Vergence at a distance formula; effectivity of a refracting surface

Definition of a lens as a combination of two surfaces; different types of lens shapes.

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

Newton's formula; linear magnification; angular magnification

Nodal Planes, Thin lens as a special case of thick lens; review of sign convention

Imaging by a thin convex lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions

Imaging by a thin concave lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions

#### Unit: III

Field stops and apertures; entrance and exit pupils

Apertures and defocus blur

Receiver/detector diameter; depth of focus; depth of field

Chromatic Aberrations; methods of removing chromatic aberrations; Abbe number

Monochromatic Aberrations – deviation from paraxial approximation; difference between ray aberrations and wavefront aberrations

Third order aberrations – spherical aberrations; coma; astigmatism; distortion and curvature of fields

Ways of minimizing spherical aberrations – pupil size, bending of lens, shape factor Lens tilt  
– astigmatism

Higher order aberrations; introduction to Zernike Polynomials

Prentice's Rule

System of two thin lenses; review of front and back vertex powers and equivalent power, review of six cardinal points., System of more than two thin lenses; calculation of equivalent power using magnification formula

#### **Unit: IV**

Telescopes – Keplerian, Galilean and Newtonian; position of cardinal points, entrance and exit pupils; magnifications; advantages and disadvantages

Microscopes – magnification; tube length.

Gullstrand's Schematic Eye (GSE); calculation of the power of the cornea, the lens and the eye; axial length; calculation of the position of the cardinal points; magnification

GSE - Purkinje images and their reflectances

GSE - entrance and exit pupils for a 3mm pupil; ocular aberrations – spherical aberrations and coma; chromatic aberrations.

GSE – introduction to refractive errors - myopia and hyperopia; corneal curvature; axial length; far point; blur size calculations; corrections; astigmatism; blur size; circle of least confusion; correction.

GSE - Object closer than at infinity; introduction to accommodation; far point; near point; presbyopia; spectacle and contact Lens corrections - comparison of magnification

Cylindrical Lenses; image formation; relation between cylinder axis and line image orientation Imaging due to two cylinders in contact with axes parallel

Two cylinders in contact with axes perpendicular; line images and their orientations to the cylinders' powers; interval of Sturm; circle of least confusion (CLC); spherical equivalent; position of CLC

Spherical lens and a cylindrical lens in contact; spherical equivalent; interval of Sturm and CLC

Spherocylindrical lens notations – plus/minus cylinder form, cross cylinder/meridian form; transformations between them

#### **Text book:**

1. Pedrotti L. S, Pedrotti Sr. F. L, *Optics and Vision*, Prentice Hall, New Jersey, USA, 1998.
2. Subrahmanyam N, Brij Lal, *A text book of Optics*, S. Chand Co Ltd, New Delhi, India, 2003

#### **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.
3. Tunnaclyffe A. H, Hirst J. G, *Optics*, The association of British Dispensing Opticians, London, U.K., 1990.

**SEMESTER II  
COMPLEMENTARY PAPER II – MICROBIOLOGY**

**Course Description:** This course covers the basic biological, biochemical and pathogenic characteristics of pathogenic organisms.

**Course Objectives:** The objectives of the course are:

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

**Unit: I**

Introduction to Microbiology

Types of Microorganisms

Physiology of Microorganisms – Nutrition, Enzymes, Metabolism and energy, Microbial Growth

Sterilization and disinfection in the laboratory

**Unit: II**

Control of Microbial Growth – Antimicrobial methods and Chemotherapy

Microbes versus Humans- The development of Infection, the disease process, pathogenicity and virulence -

Ocular Bacteriology - Gram positive, (Staphylococcus aureus, Staphylococcus epidermidis, Streptococcus, propionibacterium, actinomyces, Nocardia) Bacteria including acid fast bacilli ( Myobacterium tuberculosis, Myobacterium leprae)

**Unit: III**

Ocular Bacteriology - Gram negative Bacteria (pseudomonas, haemophiilus, Brucella, Neisseria, Moraxella) Spirochetes (Treponema, Leptospiraceae)

**Unit: IV**

Virology: Classification of Viruses in Ocular Disease, Rubella, Adenovirus, Oncogenic Viruses (HPV, HBV, EBV, Retroviruses), HIV.

Fungi : Yeasts, Filamentous, Dimorphic - Intracellular parasites - Chlamydia, Protozoa (Taxoplasmosis, Acanthamoeba,) Helminths ( Toxocariasis, Filariasis, Onchocerciasis, Trematodes)

**Text books:**

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, NewDelhi, 1994
2. MACKIE & McCartney Practical Medical Microbiology, SYDNEY M. FINEGOLD & ELLEN JO BARON: Diagnostic Microbiology (DM)

## SEMESTER II

### CORE PRACTICAL I - GEOMETRIC & PHYSICAL OPTICS

(Examination at the end of second semester)

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
8. Thick Prism - determination of prism angle and dispersive power; calculation of the refractive index
9. Thin Prism - measurement of deviation; calculation of the prism diopter
10. Image formation by spherical mirrors
11. Convex lens - power determination using lens gauge, power determination using distant object method; power determination using the vergence formula
12. Concave lens - in combination with a convex lens - power determination.
13. Construction of a tabletop telescope - all three types of telescopes.
14. Construction of a tabletop microscope
15. Imaging by a cylindrical lens - relationship between cylinder axis and image orientation
16. 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
17. 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

## SEMESTER III

### ENGLISH COMMUNICATIVE SKILLS : PAPER 1

### CORE PAPER V - OPTOMETRIC OPTICS

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

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

- ② Measurement of lens power, lens centration using conventional techniques
- ② Transposition of various types of lenses
- ② Knowledge to identify different forms of lenses (equi-convex, planoconvex, periscopic, etc.)
- ② Knowledge to select the tool power for grinding process.
- ② Measurement of surface powers using lens measure.
- ② Method of laying off the lens for glazing process.
- ② Ophthalmic prism knowledge - effects, units, base-apex notation, compounding and resolving prisms.

- ☐ Knowledge of prism and decentration in ophthalmic lenses
- ☐ Knowledge of different types of materials used to make lenses and its characteristics
- ☐ Knowledge lens designs – single vision, bifocals, progressive lens
- ☐ Knowledge on tinted and protective lenses
- ☐ Knowledge on special lenses like iseikonic, spectacle magnifiers.
- ☐ Knowledge on spectacle frames – manufacture, materials

### Unit: I

Introduction – Light, Mirror, Reflection, Refraction and Absorption

Prisms – Definition, properties, Refraction through prisms, Thickness difference, Base-apex notation, uses, nomenclature and units, Sign Conventions, Fresnel's prisms, rotary prisms Lenses – Definition, units, terminology used to describe, form of lenses Vertex distance and vertex power, Effectivity calculations Lens shape, size and types i.e. spherical, cylindrical and Sphero-cylindrical

Transpositions – Simple, Toric and Spherical equivalent

Prismatic effect, centration, decent ration and Prentice rule, Prismatic effect of Plano-cylinder and Sphero-cylinder lenses

Spherometer & Sag formula, Edge thickness calculations

Magnification in high plus lenses, Minification in high minus lenses

Tilt induced power in spectacles

Aberration in Ophthalmic Lenses

### Unit: II

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

Best form of lenses & Safety standards for Ophthalmic lenses (FDA, ANSI, ISI, Others) Design of High Powered Lenses - Hi-index lenses, Calculation of Refractive index

Bifocal designs, their manufacturing & uses (Kryptok, Unis D, Executive, Invisible, Occupational)

Progressive Addition Lenses, modified near vision lenses (designs, advantages, limitations)

### Unit: III

Lens enhancements (Scratch resistant coatings – spin/dip, Anti-reflection coating, UV coating, Hydrophobic coating, anti-static coating)

Lens defects – Description and Detection

Glazing & edging (manual & automatic)

Special lenses

- ☐ Lenticulars
- ☐ Aspherics
- ☐ Fresnel lenses & Prisms
- ☐ Aniseikonic lenses
- ☐ Photochromics
- ☐ Polaroids
- ☐ Tinted lenses – Tints, filters

Project to ensure awareness on lens availability in Indian market

### Unit: IV

History of Spectacles, manufacturing overview, Definition, parts & measurements

Classification of frames – Materials (cover in detail), Colours and Temple position (advantages & disadvantages, where to use) , Special purpose frames (sports, kids, reading)

### Text Books:

1. Jalie M: The principles of Ophthalmic Lenses, The Association of Dispensing Opticians, London, 1972

**Reference Books:**

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

## SEMESTER III

### CORE PAPER VI - 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.

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

- ☐ to understand the fundamentals of optical components of the eye
- ☐ to gain theoretical knowledge and practical skill on visual acuity measurement, objective and subjective clinical refraction.

#### Unit: I

##### REVIEW OF GEOMETRICAL OPTICS

VERGENCE AND POWER; Conjugacy, object space and image space. Sign convention Spherical refracting surface, Spherical mirror; catoptric power, Cardinal points, Magnification

Light and visual function

Clinical Relevance of: Fluorescence, Interference, Diffraction, Polarization, Bi-refringence, Dichroism  
Aberration and application, Spherical and Chromatic

#### Unit: II

##### OPTICS OF OCULAR STRUCTURE

Cornea and aqueous

Crystalline lens

Vitreous

Schematic and reduced eye

#### Unit: III

##### MEASUREMENTS OF OPTICAL CONSTANTS OF THE EYE

Corneal curvature and thickness

Keratometry

3.3 Curvature of the lens and ophthalmophakometry

Axial and axis of the eye

Basic Aspects of Vision.

#### Unit: IV

Visual Acuity, Light and Dark Adaptation, Color Vision, Spatial and Temporal Resolution Science of Measuring visual performance and Application to Clinical Optometry

##### REFRACTIVE ANOMALIES AND THEIR CAUSES

Etiology of refractive anomalies Contributing variability and their ranges

Populating distributions of anomalies.

Optical component measurements

Growth of the eye in relation to refractive errors

#### Text books:

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

#### Reference Books:

1. M P Keating: Geometric, Physical and Visual optics, 2<sup>nd</sup> edition, Butterworth-Heinemann, USA, 2002
2. HL Rubin: Optics for clinicians, 2<sup>nd</sup> edition, Triad publishing company. Florida, 1974.



3. H Obstfeld: Optic in Vision- Foundations of visual optics & associated computations, 2<sup>nd</sup> edition, Butterworth, UK, 1982.
4. WJ Benjamin: Borish's clinical refraction, 2<sup>nd</sup> edition, Butterworth Heinemann, Missouri, USA, 2006
5. T Grosvenor: Primary Care Optometry, 4<sup>th</sup> edition, Butterworth - heinneman, USA, 2002

### SEMESTER III

#### CORE PAPER VII – OPTOMETRIC INSTRUMENTS & EXAMINATION OF VISUAL SYSTEM

**Course Description:** This course covers commonly used optometric instruments, its basic principle, description and usage in clinical practice. Also it covers various clinical optometry procedures involving external examination, anterior segment and posterior segment examination, neuroophthalmic examination, pediatric optometry examination, and Glaucoma evaluation.

**Course Objectives:** Upon completion of the course, the student should be able to gain theoretical knowledge and basic practical skill in handling the Optometric & Ophthalmic instruments - And 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.

#### Unit: I

##### REFRACTIVE INSTRUMENTS

- ▣ Optotypes and MTF, Spatial Frequency
- ▣ Test charts standards.
- ▣ Choice of test charts
- ▣ Trial case lenses
- ▣ Refractor (phoropter) head units
- ▣ Optical considerations of refractor units
- ▣ Trial frame design
- ▣ Near vision difficulties with units and trial frames
- ▣ Retinoscope – types available
- ▣ Adjustment of Retinoscopes- special features
- ▣ Objective optometers.

##### Infrared optometer devices.

- ▣ Projection charts
- ▣ Illumination of the consulting room.
- ▣ Brightness acuity test
- ▣ Vision analyzer
- ▣ Pupilometer
- ▣ Potential Acuity Meter
- ▣ Abberometer

#### Unit: II

##### OPHTHALMOSCOPES AND RELATED DEVICES

- ▣ Design of ophthalmoscopes - illumination
- ▣ Design of ophthalmoscopes- viewing
- ▣ Ophthalmoscope disc
- ▣ Filters for ophthalmoscopy
- ▣ Indirect ophthalmoscope

#### Unit: III

Lensometer, Lens gauges or clock  
 Slit Lamp, Tonometers  
 Keratometer and corneal topography, Refractometer  
 Orthoptic Instruments (Synoptophore Only), Color Vision Testing Devices Fields  
 Of Vision And Screening Devices Scans, ERG, New Instruments

Examination of Visual System  
History taking, Visual acuity estimation  
Extraocular motility, Cover test, Alternating cover test, Hirschberg test, Modified Krimsky, Pupils Examination, Maddox Rod, van Herrick,

**Unit: IV**

External examination of the eye, Lid Eversion  
Schirmer's, TBUT, tear meniscus level, NITBUT (keratometer),  
Color Vision, Stereopsis,  
Confrontation test, Photostress test,  
Slitlamp biomicroscopy, Direct Ophthalmoscopy,  
Digital pressure, Schiottz Tonometry, Applanation Tonometry  
Gonioscopy ROPLAS, Amsler test,  
Corneal Sensitivity, HVID  
Saccades and Pursuits

**Text books:**

1. David Henson: Optometric Instrumentations, Butterworth-Heinemann, UK, 1991
2. T Grosvenor: Primary Care Optometry, 5th edition, Butterworth - Heinemann, USA, 2007

**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
3. A K Khurana: Comprehensive Ophthalmology, 4<sup>th</sup> edition, New age international (p) Ltd. Publishers, New Delhi, 2007
4. D B. Elliott: Clinical Procedures in Primary Eye Care, 3<sup>rd</sup> edition, Butterworth-Heinemann, 2007
5. Jack J. Kanski Clinical Ophthalmology: A Systematic Approach, 6<sup>th</sup> edition, Butterworth-Heinemann, 2007
6. J.B Eskridge, J F. Amos, J D. Bartlett: Clinical Procedures in Optometry, Lippincott Williams and Wilkins, 1991
7. N B. Carlson, D I Kurtz: Clinical Procedures for Ocular Examination, 3<sup>rd</sup> edition, McGraw-Hill Medical, 2003

**SEMESTER III**

**COMPLEMENTARY PAPER III - PHARMACOLOGY**

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

**Course Objective:** At the end of the course students will be knowledgeable in the following:

- ☑ basic principles of Pharmacokinetics and Pharmacodynamics
- ☑ commonly used ocular drugs, mechanism, indications, contraindications, drug dosage, and adverse effects.

**Unit: I**

Pharmacokinetics : Drug absorption, distribution, metabolism and excretion  
Pharmacodynamics : Drug Handling by the body – effect of drug and the relationship between drug concentration and response, Drug – Receptor interactions

**Unit: II**

Ocular Pharmacology : Drug Handling by cells and Tissues - Pharmacokinetics, and Pharmacodynamics-specific to ocular surface and intraocular conditions

**Unit: III**

Delivery methods of Ocular Medication: Residence in the Conjunctival sac, drug vehicles affect drug delivery, advanced ocular delivery systems  
Reconstituting the tear film: Tear Substitutes

**Unit: IV**

Ocular Drugs and the Autonomic Nervous system: Parasympathetic( antimuscarinic) and Sympathetic  
Intraocular pressure Drugs  
Eicosanoids : prostaglandins,thromboxanes and leukotrienes  
Serotonin : Neurotransmitter; Glucocorticoids, Immunosuppressive agents  
Local Anaesthetics, Ocular Toxicity from systemic administration of Drugs

**Textbook:**

1. K D TRIPATHI: Essentials of Medical Pharmacology. 5<sup>th</sup> edition, Jaypee, New Delhi, 2004
2. Ashok Garg: Manual of Ocular Therapeutics, Jaypee, NewDelhi, 1996

**Reference Books:**

- ② T J Zimmerman, K S Kooner, M Sharir, R D Fechtner: Text Book of Ocular Pharmacology, Lippincott-Raven, Philadelphia, 1997

**SEMESTER IV****ENGLISH COMMUNICATIVE SKILLS : PAPER 2****CORE PAPER VIII -VISUAL OPTICS II**

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

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

- ② 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.

②

**Unit: I**

Refractive conditions

- ② Emmetropia
- ② Myopia
- ② Hyperopia
- ② Astigmatism
- ② Accommodation
- ② Presbyopia
- ② Anisometropia and Aniseikonia
- ② Aphakia and Pseudophakia

**Unit: II****Accommodation**

- ▣ Far and near points of accommodation
- ▣ Correction of spherical ametropia
- ▣ Axial versus refractive ametropia
- ▣ Relationship between accommodation and convergence, AC / A ratio

**Unit: III****Objective refraction**

- ▣ Streak Retinoscopy only

**Unit: IV****Subjective Refraction**

- ▣ Review of subjective refractive methods
- ▣ Cross cylinder methods for astigmatism, Astigmatic Fan Test
- ▣ Difficulties in subjective and objective tests and their avoidance
- ▣ Ocular refraction versus spectacle refraction
- ▣ Ocular accommodation versus spectacle accommodation
- ▣ Spectacle magnification and relative spectacle magnification
- ▣ Retinal image blur; depth of focus and depth of field
- ▣ Prescribing Prisms / Binocular Refraction

**Text books:**

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

**Reference Books:**

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

## SEMESTER IV

### CORE PAPER IX - DISPENSING OPTICS

**Course Description:** This course will deal with the dispensing aspects of spectacle lenses and frames needed to manage the customer in an Optical set up, from counseling to delivering the spectacles.

**Course Objective:** Skills to be acquired at the end of this course

- ☐ Reading of spectacle prescription
- ☐ Counseling the patient
- ☐ Lens edge thickness calculation
- ☐ Frame & lens measurements and selection
- ☐ Writing spectacle lens order
- ☐ Facial measurements - Interpupillary distance measurement and measuring heights (single vision, multifocal, progressives)
- ☐ Lens verification and axis marking and fitting of all lens types
- ☐ Final checking of finished spectacle with frame adjustments
- ☐ Delivery and follow-up
- ☐ Troubleshooting complaints and handling patient's questions.

#### Unit: I

Components of spectacle prescription & interpretation, transposition, Add and near power relation - Frame selection - based on spectacle prescription, professional requirements, age group, face shape

#### Unit: II

Measuring Inter-pupillary distance (IPD) for distance & near, bifocal height  
Lens & Frame markings, Pupillary centers, bifocal heights, Progressive markings & adjustments  
- facial wrap, pantoscopic tilt

#### Unit: III

Recording and ordering of lenses (power, add, diameter, base, material, type, lens enhancements)  
Neutralization - Hand & lensometer, axis marking, prism marking  
Faults in spectacles (lens fitting, frame fitting, patients complaints, description, detection and correction)  
Final checking & dispensing of spectacles to customers, counseling on wearing & maintaining of spectacles,  
Accessories - Bands, chains, boxes, slevets, cleaners, screwdriver kit Spectacle repairs - tools, methods, soldering, riveting, frame adjustments

#### Unit: IV

Special types of spectacle frames

- ☐ Monocles
- ☐ Ptosis crutches
- ☐ Industrial safety glasses
- ☐ Welding glasses

Frame availability in Indian market, FAQ's by customers and their ideal answers

#### Text Book:

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

#### Reference Book:

- ❑ David Wilson, Steve stenersen: Practical optical workshop, OTEN- DE, NSW TAFE Commission, 2002
- ❑ Margaret Dowaliby: Practical Aspects of Ophthalmic optics, Fourth edition, Butterworth Heinemann, USA, 2001

## SEMESTER IV

### CORE PAPER X – SYSTEMIC DISEASE

**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:

- ❑ Common Systemic conditions: Definition, diagnostic approach, complications and management options
- ❑ Ocular findings of the systemic conditions
- ❑ First Aid knowledge

#### Unit: I

##### Hypertension

- ❑ Definition, classification, Epidemiology, clinical examination, complications, and management.
- ❑ Hypertensive retinopathy

##### Diabetes Mellitus

- ❑ Classification, pathophysiology, clinical presentations, diagnosis, and management, Complications
- ❑ Diabetic Retinopathy

- ❑ Physiology, testing for thyroid disease, Hyperthyroidism, Hypothyroidism, Thyroiditis, Thyroid tumors
- ❑ Grave's Ophthalmopathy

##### Acquired Heart Disease

- ❑ Ischemic Heart Disease, Congestive heart failure, Disorders of cardiac rhythm
- ❑ Ophthalmic considerations

##### Cancer :

- ❑ Incidence
- ❑ Etiology
- ❑ Therapy
- ❑ Ophthalmologic considerations

#### Unit: II

##### Connective Tissue Disease

- ❑ Rheumatic arthritis
- ❑ Systemic lupus erythematosus
- ❑ Scleroderma
- ❑ Polymyositis and dermatomyositis
- ❑ Sjogren syndrome
- ❑ Behcet's syndrome
- ❑ Eye and connective tissue disease

##### Tuberculosis

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

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

Herpes and the eye - Hepatitis ( Hepatitis A, B, C)

Acquired Immunodeficiency Syndrome - Anemia (Diagnosis, clinical evaluation, consequences, Sickle cell disease, treatment, Ophthalmologic considerations)

#### Unit: III

Common Tropical Medical Ailments

- ☐ Malaria
- ☐ Typhoid
- ☐ Dengue
- ☐ Filariases
- ☐ Onchocerciasis
- ☐ Cysticercosis
- ☐ Leprosy

#### Genetics

- ☐ Introduction to genetics
- ☐ Organisation of the cell
- ☐ Chromosome structure and cell division
- ☐ Gene structure and basic principles of Genetics.
- ☐ Genetic disorders and their diagnosis.
- ☐ Genes and the eye
- ☐ Genetic counseling and genetic engineering.

#### Unit: IV

##### Nutritional and Metabolic disorders:

- ☐ Obesity
- ☐ Hyperlipidaemias
- ☐ Kwashiorkor
- ☐ Vitamin A Deficiency
- ☐ Vitamin D Deficiency
- ☐ Vitamin E Deficiency
- ☐ Vitamin K Deficiency
- ☐ Vitamin B<sub>1</sub>, B<sub>2</sub>, Deficiency
- ☐ Vitamin C Deficiency
- ☐ Myasthenia Gravis
- ☐ First Aid
- ☐ General Medical Emergencies
- ☐ Preoperative precautions in ocular surgeries

#### Psychiatry

- ☐ Basic knowledge of psychiatric condition and Patient Management

#### Text book:

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

### SEMESTER IV

#### CORE PRACTICAL II - EXAMINATION OF VISUAL SYSTEM

(Examination at the end of second semester)

1. History taking - General, Specific, Conditions
2. Lensometry
3. Vision Check, Pinhole acuity
4. Push up test (Amplitude of Accommodation)
5. Push up test ( Near point of Convergence)
6. Tear Break up time
7. Amsler's Grid test
8. Color vision test
9. Schirmer's test
10. Confrontation test
11. Slit lamp examination
12. Finger tension, Schiottz Tonometry, Applanation Tonometry
13. Negative Relative Accommodation
14. Positive Relative Accommodation

15. von Herick Grading of Anterior chamber depth
16. Accommodative facility( $\pm 2.00$  D)
17. IPD
18. HVID
19. Maddox rod (Phoria)
20. Negative Fusional vergence
21. Positive Fusional Vergence
22. Retinoscopy- Static, Dynamic and Cycloplegic Retinoscopy
23. Keratometry
24. Subjective Refraction – JCC, Clock Dial, Duochrome, Borish Delayed

**SEMESTER IV  
COMPLEMENTARY PAPER IV – PATHOLOGY**

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

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

- ☐ Inflammation and repair aspects.
- ☐ Pathology of various eye parts and adnexa

**Unit: I**

General Pathology : Principles  
Pathophysiology of Ocular Angiogenesis  
Ocular Infections

**Unit: II**

Pathology of cornea and Conjunctiva  
Pathology of Uvea  
Pathology of Glaucoma

**Unit: III**

Pathology of Retina  
Pathology of retina in systemic disease/disorders  
Pathology of eyelids and adnexa

**Unit: IV**

Pathology of orbital space occupying lesions  
Pathology of the optic nerve  
Retinoblastoma  
Pathology of Lens

**Text books:**

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

**Reference books:**

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

**SEMESTER V  
CORE PAPER XI- CONTACT LENS 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:



- ☐ Understand the basics of contact lenses
- ☐ List the important properties of contact lenses
- ☐ Finalise the CL design for various kinds patients
- ☐ Recognize various types of fitting
- ☐ Explain all the procedures to patient
- ☐ Identify and manage the adverse effects of contact lens

**Unit: I**

Introduction to Contact lenses

- ☐ Definition
- ☐ Classification / Types
- ☐ History of Contact Lenses

Optics of Contact Lenses

- ☐ Magnification & Visual field
- ☐ Accommodation & Convergence
- ☐ Back & Front Vertex Power / Vertex distance calculation

Review of Anatomy & Physiology of

- ☐ Tear film
- ☐ Cornea
- ☐ Lids & Conjunctiva

**Unit: II**

Introduction to CL materials

- ☐ Monomers, Polymers

Properties of CL materials

- ☐ Physiological (Dk, Ionicity, Water content)
- ☐ Physical (Elasticity, Tensile strength, Rigidity)
- ☐ Optical (Transmission, Refractive index)

Indications and contraindications Parameters / Designs of Contact Lenses & Terminology

RGP Contact Lens materials

Manufacturing Rigid and Soft Contact Lenses – various methods

**Unit: III**

Pre-Fitting examination – steps, significance, recording of results

Correction of Astigmatism with RGP lens

Types of fit – Steep, Flat, Optimum – on spherical cornea with spherical lenses

Types of fit – Steep, Flat, Optimum – on Toric cornea with spherical lenses

Calculation and finalising Contact lens parameters

Ordering Rigid Contact Lenses – writing a prescription to the Laboratory

Checking and verifying Contact lenses from Laboratory Modifications possible with Rigid lenses

**Unit: IV**

Common Handling Instructions

- ☐ Insertion & Removal Techniques
- ☐ Do's and Dont's
- ☐ Cleaning agents & Importance
- ☐ Rinsing agents & Importance
- ☐ Disinfecting agents & importance
- ☐ Lubricating & Enzymatic cleaners

Follow up visit examination

Complications of RGP lenses

**Text books:**

IACLE modules 1 - 10

CLAO Volumes 1, 2, 3

**Reference books:**

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

**SEMESTER V  
CORE PAPER XII - OCULAR DISEASE 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.

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

- ☒ on the etiology,
- ☒ epidemiology,
- ☒ symptoms,
- ☒ signs,
- ☒ course sequelae of ocular disease,
- ☒ diagnostic approach, and
- ☒ management of the ocular diseases.

**Unit: I**

a) **ORBIT**

- ☒ Applied Anatomy
- ☒ Proptosis
- ☒ Classification, Causes, Investigations)
- ☒ Enophthalmos
- ☒ Developmental Anomalies
- ☒ ( craniosynostosis, Craniofacial Dysostosis, Hypertelorism, Median facial cleft syndrome)
- ☒ Orbital Inflammations (Preseptal cellulites, Orbital cellulitis Orbital Periostitis, cavernous sinus Thrombosis)
- ☒ Grave's Ophthalmopathy
- ☒ Orbital tumors( Dermoids, capillary haemangioma, Optic nerve glioma)
- ☒ Orbital blowout fractures
- ☒ Orbital surgery (Orbitotomy)
- ☒ Orbital tumors
- ☒ Orbital trauma
- ☒ Approach to a patient with proptosis

**Unit: II**

b) **LIDS**

- ☒ Applied Anatomy
- ☒ Congenital anomalies
- ☒ 3. Oedema of the eyelids (Inflammatory, Solid, Passive edema)
- ☒ Inflammatory disorders (Blepharitis, External Hordeolum, Chalazion,
- ☒ Internal hordeolum, Molluscum Contagiosum)
- ☒ Anomalies in the position of the lashes and Lid Margin (Trichiasis, Ectropion, Entropion, Symblepharon, Blepharophimosis, Lagophthalmos, Blepharospasm, Ptosis).
- ☒ Tumors (Papillomas, Xanthelasma, Haemangioma, Basal carcinoma, Squamous cell carcinoma, sebaceous gland melanoma)

c) **LACRIMAL SYSTEM**

- ☒ Applied Anatomy
- ☒ Tear Film
- ☒ The Dry Eye ( Sjogren's Syndrome)
- ☒ The watering eye ( Etiology, clinical evaluation)

- ▣ Dacryocystitis
- ▣ Swelling of the Lacrimal gland ( Dacryoadenitis)

### Unit: III

#### d) CONJUNCTIVA

##### ▣ Applied Anatomy

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

#### e) CORNEA

##### ▣ Applied Anatomy and Physiology

##### ▣ Congenital Anomalies

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

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

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

##### ▣ Degenerations ( classifications, Arcus senilis, Vogt's white limbal girdle, Hassal-henle bodies, Lipoid Keratopathy, Band shaped keratopathy, Salzmann's nodular degeneration,

Droplet keratopathy, Pellucid Marginal degeneration)

##### ▣ 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)

##### ▣ Keratoconus, Keratoglobus

##### ▣ Corneal oedema, Corneal opacity, Corneal vascularisation

##### ▣ Penetrating Keratoplasty

### Unit: IV

#### f) UVEAL TRACT AND SCLERA

##### ▣ Applied Anatomy,

##### ▣ Classification of uveitis

##### Etiology

##### ▣ Pathology

##### ▣ Anterior Uveitis

##### ▣ Posterior Uveitis

##### ▣ Purulent Uveitis

##### ▣ Endophthalmitis

##### ▣ Panophthalmitis

##### ▣ Planitis

##### ▣ Tumors of uveal tract( Melanoma)

##### ▣ Episcleritis and scleritis

##### ▣ Clinical examination of Uveitis and Scleritis

### Text books:

- ▣ A K Khurana: Comprehensive Ophthalmology, 4<sup>th</sup> edition, New age international (p) Ltd. Publishers, New Delhi, 2007

### Reference Books:

- ▣ Stephen J. Miller :Parsons Diseases of the Eye, 18<sup>th</sup> edition, ChurchillLivingstone, 1990
- ▣ Jack J. Kanski Clinical Ophthalmology: A Systematic Approach, 6<sup>th</sup> edition, Butterworth - Heinemann, 2007

## SEMESTER V

### CORE PAPER XIII – 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:-
- ☐ Demonstrate an in-depth knowledge of the gross anatomy and physiology relating to the extroocular muscles.
- ☐ Provide a detailed explanation of, and differentiate between the aetiology, investigation and management of binocular vision anomalies.
- ☐ Adapt skills and interpret clinical results following investigation of binocular vision anomalies appropriately and safely.

### **Unit: I**

Binocular Vision and Space perception.

- ☐ Relative subjective visual direction.
- ☐ Retino motor value
- ☐ Grades of BSV
- ☐ SMP and Cyclopean Eye
- ☐ Correspondence,
- ☐ Fusion, Diplopia, Retinal rivalry
- ☐ Horopter
- ☐ Physiological Diplopia and Suppression
- ☐ Stereopsis, Panum's area, BSV.
- ☐ Stereopsis and monocular clues - significance.
- ☐ Egocentric location, clinical applications.
- ☐ Theories of Binocular vision.

### **Unit: II**

Anatomy of Extra Ocular Muscles.

- ☐ Rectii and Obliques, LPS.
  - ☐ Innervation & Blood Supply.
- Physiology of Ocular movements.
- ☐ Center of rotation, Axes of Fick.
  - ☐ Action of individual muscle.

Laws of ocular motility

- ☐ Donders' and Listing's law
- ☐ Sherrington's law
- ☐ Hering's law

### **Unit: III**

Unocular & Binocular movements - fixation, saccadic & pursuits.

- ☐ Version & Vergence.
  - ☐ Fixation & field of fixation
- Near Vision Complex
- Accommodation
- ☐ Definition and mechanism (process).
  - ☐ Methods of measurement.
  - ☐ Stimulus and innervation.
  - ☐ Types of accommodation.
  - ☐ Anomalies of accommodation – aetiology and management.

### **Unit: IV**

Convergence

- ☐ Definition and mechanism.
- ☐ Methods of measurement.
- ☐ Types and components of convergence - Tonic, accommodative, fusional, proximal.
- ☐ Anomalies of Convergence – aetiology and management.

Sensory adaptations Confusion

Suppression Investigations

Management Blind spot syndrome

Abnormal Retinal Correspondence

Investigation and management

Blind spot syndrome

Eccentric Fixation  
Investigation and management  
Amblyopia Classification  
Aeitiology Investigation Management

**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

**SEMESTER V  
CORE PAPER XIV - LOW VISION AID**

**Course Description:** This course deal with the definition of low vision, epidemiologyaspect 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 thefollowing:

- ☑ Definition and epidemiology of Low Vision
- ☑ Clinical examination of Low vision subjects
- ☑ Optical, Non-Optical, Electronic, and Assistive devices.
- ☑ Training for Low Vision subjects with Low vision devices
- ☑ Referrals and follow-up

**Unit: I**

Definitions & classification of Low vision  
Epidemiology of low vision

**Unit: II**

Model of low vision service  
Pre-clinical evaluation of low vision patients – prognostic & psychological factors; psycho-social impact of low vision, Types of low vision aids – optical aids, non-optical aids & electronic devices

**Unit: III**

Optics of low vision aids  
Clinical evaluation – assessment of visual acuity, visual field, selection of low vision aids, instruction & training, Pediatric Low Vision care

**Unit: IV**

Low vision aids – dispensing & prescribing aspects  
Visual rehabilitation & counseling  
Legal aspects of Low vision in India  
Case Analysis

**Text books:**

- ❑ Christine Dickinson: Low Vision: Principles and Practice Low vision care, E Vaithilingam: practice of
- ❑ Low vision – A guide book, Medical Research Foundation, 2000.

**Reference Books:**

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

**SEMESTER V  
CORE PAPER XV – OCCUPATIONAL OPTOMETRY**

**Course Description** : This course deals with general aspects of occupational health, Visual demand in various job, task analyzing 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:

- ❑ in visual requirements of jobs;
- ❑ in effects of physical, chemical and other hazards on eye and vision;
- ❑ to identify occupational causes of visual and eye problems;
- ❑ to be able to prescribe suitable corrective lenses and eye protective wear and
- ❑ to set visual requirements, standards for different jobs.

**Unit: I**

Introduction to Occupational health, hygiene and safety, international bodies like ILO, WHO, National bodies etc, Acts and Rules - Factories Act, WCA, ESI Act.

**Unit: II**

Electromagnetic Radiation and its effects on Eye

Light – Definitions and units, Sources, advantages and disadvantages, standards Color – Definition, Color theory, Color coding, Color defects, Color Vision tests

**Unit: II I**

Occupational hazards and preventive/protective methods Task Analysis

**Unit: IV**

Industrial Vision Screening – Modified clinical method and Industrial Vision test Vision Standards – Railways, Roadways, Airlines  
Visual Display Units  
Contact lens and work

**Text Books:**

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

**Reference Books:**

- ❑ G W Good: Occupational Vision Manual available in the following website: [www.aoa.org](http://www.aoa.org)
- ❑ N.A. Smith: Lighting for Occupational Optometry, HHSC Handbook Series, Safchem Services, 1999
- ❑ G Carson, S Doshi, W Harvey: Eye Essentials: Environmental & Occupational Optometry, Butterworth-Heinemann, 2008

**SEMESTER VI  
CORE PAPER XV I – CONTACT LENS 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:

- ☐ Understand the basics of contact lenses
- ☐ List the important properties of contact lenses
- ☐ Finalise the CL design for various kinds patients
- ☐ Recognize various types of fitting
- ☐ Explain all the procedures to patient
- ☐ Identify and manage the adverse effects of contact lens

**Unit: I**

SCL Materials & Review of manufacturing techniques  
Comparison of RGP vs. SCL  
Pre-fitting considerations for SCL  
Fitting philosophies for SCL

**Unit: II**

SCL fitting assessment  
Types of fit - Steep, Flat, Optimum  
Calculation and finalising SCL parameters

Disposable lenses

Advantages and availability

Soft Toric CL

- ☐ Stabilization techniques
- ☐ Parameter selection
- ☐ Fitting assessment

☐

**Unit: III**

Common Handling Instructions  
☐ Insertion & Removal Techniques  
☐ Do's and Dont's

Care and Maintenance of Soft lenses

- ☐ Cleaning agents & Importance
- ☐ Rinsing agents & Importance
- ☐ Disinfecting agents & importance
- ☐ Lubricating & Enzymatic cleaners

Follow up visit examination

Complications of Soft lenses Therapeutic contact lenses

- ☐ Indications
- ☐ Fitting consideration

**Unit: IV**

Specialty fitting

- ☐ Aphakia
- ☐ Pediatric
- ☐ Post refractive surgery
- ☐ Introduction to Bifocal CL

**Text books:**

- ☐ IACLE modules 1 - 10
- ☐ CLAO Volumes 1, 2, 3

**Reference books:**

- ☐ Anthony J. Phillips :Contact Lenses, 5<sup>th</sup> edition, Butterworth-Heinemann, 2006
- ☐ Elisabeth A. W. Millis: Medical Contact Lens Practice, Butterworth-Heinemann, 2004
- ☐ E S. Bennett ,V A Henry :Clinicalmanual of Contact Lenses, 3<sup>rd</sup> edition,Lippincott Williams and Wilkins, 2008

**SEMESTER VI  
CORE PAPER XV II – 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.

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

- ☐ on the etiology,
- ☐ epidemiology,
- ☐ symptoms,
- ☐ signs,
- ☐ course sequelae of ocular disease,
- ☐ diagnostic approach, and
- ☐ Management of the ocular diseases.

**Unit: I**

Retina and Vitreous:

- ☐ 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

Ocular Injuries:

Terminology : Closed globe injury ( contusion, lamellar laceration) Open globe injury ( rupture, laceration, penetrating injury, perforating injury)

- ☐ 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

**Unit: II**

Lens

- ☐ 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.

### Unit: III

#### Clinical Neuro-ophthalmology

- ☐ 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 Robertson pupil, Adie's tonic pupil)
- ☐ Optic neuritis, Anterior Ischemic optic neuropathy, Pappilloedema, optic atrophy
- ☐ Cortical blindness
- ☐ Malingering
- ☐ Nystagmus
- ☐ Clinical examination

### Unit: IV

#### Glaucoma

- ☐ Applied anatomy and physiology of anterior segment
- ☐ Clinical Examination
- ☐ Definitions and classification of glaucoma
- ☐ Pathogenesis of glaucomatous ocular damage
- ☐ Congenital glaucomas
- ☐ 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 Glaucomas

Management : common medications, laser intervention and surgical techniques

#### Text books:

- ☐ A K Khurana: Comprehensive Ophthalmology, 4<sup>th</sup> edition, New age international (p) Ltd. Publishers, New Delhi, 2007

#### Reference Books:

1. Stephen J. Miller :Parsons Diseases of the Eye, 18<sup>th</sup> edition, ChurchillLivingstone, 1990
2. Jack J. Kanski Clinical Ophthalmology: A Systematic Approach, 6<sup>th</sup> edition, Butterworth-Heinemann, 2007

## SEMESTER VI CORE PAPER XV III - BINOCULAR VISION II

#### 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 extrocular 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:-
- ☐ Demonstrate an in-depth knowledge of the gross anatomy and physiology relating to the extroocular muscles.
- ☐ Provide a detailed explanation of, and differentiate between the aetiology, investigation and management of binocular vision anomalies.
- ☐ Adapt skills and interpret clinical results following investigation of binocular vision anomalies appropriately and safely.

### **Unit: I**

Neuro-muscular anomalies, Classification and etiological factors

History - recording and significance.

Convergent strabismus

- ▣ Accommodative convergent squint
- ▣ Classification
- ▣ Investigation and Management
- ▣ B Non accommodative                      Convergent squint
- ▣ Classification
- ▣ Investigation and Management

### **Unit: II**

Divergent Strabismus

Classification

A& V phenomenon

Investigation and  
Management

Vertical strabismus

Classification

Investigation and  
Management

### **Unit: III**

Paralytic Strabismus

Acquired and Congenital

Clinical Characteristics

Distinction from comitant and restrictive Squint

Investigations

- ▣ History and symptoms
- ▣ Head Posture
- ▣ Diplopia Charting
- ▣ Hess chart
- ▣ PBCT
- ▣ Nine directions
- ▣ Binocular field of vision

Non surgical Management of Squint

### **Unit: IV**

Restrictive Strabismus

Features

- ▣ Musculo fascical anomalies
- ▣ Duane's Retraction syndrome
- ▣ Clinical features and management
- ▣ Brown's Superior oblique sheath syndrome
- ▣ Strabismus fixus
- ▣ Congenital muscle fibrosis
- ▣ Surgical management

### **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

**SEMESTER VI**  
**CORE PAPER XIX- GERIATRIC & PEDIATRIC OPTOMETRY**

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

And provide the students adequate knowledge in theoretical and practical aspects of diagnosis, and management of eye conditions related to pediatric 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:**

The student on taking this course should

- ❑ be able to identify, investigate the age related changes in the eyes.
- ❑ be able to dispense spectacles with proper instructions.
- ❑ adequately gained knowledge on common ocular diseases
- ❑ have a knowledge of the principal theories of childhood development, and visual development
- ❑ have the ability to take a thorough paediatric history which encompasses the relevant developmental, visual, medical and educational issues
- ❑ 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
- ❑ be familiar with the aetiology, clinical presentation and treatment of amblyopia, comitant strabismus and commonly presenting incomitant strabismus
- ❑ 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
- ❑ have knowledge of the art of dispensing contact lens, low vision aids and referral to the surgeon or other specialists at the appropriate timing. .

**Unit: I**

**Geriatric Optometry**

Structural , and morphological changes of eye in elderly Physiological changes in eye in the course of aging.

Introduction to geriatric medicine - epidemiology , need for optometry care, systemic diseases (Hypertension, Atherosclerosis, coronary heart disease, congestive Heart failure, Cerebrovascular disease, Diabetes, COPD)

Optometric Examination of the Older Adult

Ocular diseases common in old eye, with special reference to cataract, glaucoma, macular disorders, vascular diseases of the eye

Contact lenses in elderly

Pharmacological aspects of aging

Low vision causes, management and rehabilitation in geriatrics.

Spectacle dispensing in elderly - Considerations of spectacle lenses and frames

**Unit: II****Pediatric optometry**

Pediatric optometry

The Development of Eye and Vision

History taking Paediatric subjects

Assessment of visual acuity

Normal appearance, pathology and structural anomalies of a)

Orbit, Eye lids, Lacrimal system, Conjunctiva, Cornea, Sclera

Anterior chamber, Uveal tract, Pupil

c) Lens, vitreous, Fundus

Oculomotor system

**Unit: III**

Refractive Examination

Determining binocular status

Determining sensory motor adaptability

Compensatory treatment and remedial therapy for : Myopia, Pseudomyopia, Hyperopia, Astigmatism,

Anisometropia, Amblyopia

Remedial and Compensatory treatment of Strabismus and Nystagmus

**Unit: IV**

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

Anterior segment dysgenesis, Aniridia, Microphthalmos, Coloboma, Albinism

Spectacle dispensing for children

Paediatric contact lenses

Low vision assessment in children

**Text books :**

1. A.J. ROSSENBLOOM Jr & M.W.MORGAN: Vision and Aging, Butterworth-Heinemann, Missouri, 2007
2. Pediatric Optometry - JEROME ROSNER, Butterworth, London 1982
3. Paediatric Optometry - William Harvey/ Bernard Gilmartin, Butterworth -Heinemann, 2004

**References:**

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

**SEMESTER VI**  
**CORE PRACTICAL III – CONTACT LENS & LOW VISION AID**

1. Pre fitting evaluation
2. RGP CL insertion & Removal
3. Fitting assessment
4. Over refraction
5. Follow up examination
6. SCL insertion & Removal
7. Fitting assessment
8. Over refraction
9. Follow-up Examination
10. Toric contact lens fitting and assessment
11. Cosmetic contact lens fitting and assessment
12. Attending in low vision care clinic and history taking.
13. Determining the type of telescope and its magnification (Direct comparison method & calculated method)
14. Determining the change in field of view with different magnification and different eye to lens distances with telescopes and magnifiers.
15. Inducing visual impairment and prescribing magnification.
16. Determining reading speed with different types of low vision aids with same magnification.
17. Determining reading speed with a low vision aid of different magnifications.

**ELECTIVE 1-A**  
**NUTRITION**

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

**Course Objective:** At the end of the course student would have gained the knowledge of the following:

- ☐ Balanced diet.
- ☐ Protein, carbohydrates, vitamins, Minerals, carotenoids and eye.
- ☐ Nutrition and Ocular aging
- ☐ Adverse effects of ocular nutritional supplements

**Unit: I**

Introduction to Nutrition and Food Science, Food Groups and Food Pyramid  
Balanced diet for different age groups, Recommended dietary Allowances  
Assessment of Nutritional Status.

**Unit: II**

Energy – Units, Metabolisms, Energy expenditure, and Energy imbalance.  
Digestion, absorption and transport of Food  
Proteins and eye  
Lipids and eye  
Carbohydrates and eye  
Vitamins and eye

**Unit: III**

Minerals and trace elements and eye  
Carotenoids and eye  
Oxidative stress and the eye

**Unit: IV**

Vitamin A, C and E deficiency

Nutrition and ocular aging

Contraindications, Adverse reactions and ocular nutritional supplements

**Text books:**

- ⑦ M Swaminathan: Hand book of Food and Nutrition, fifth edition, Bangalore printing & publishing Co.Ltd, Bangalore,2004
- ⑦ C Gopalan, BV Rama Sastri, SC Balasubramanian: Nutritive Value of Indian Foods , National Institute of Nutrition, ICMR, Hyderabad,2004
- ⑦ Frank Eperjesi & Stephen Beatty: Nutrition and the Eye A practical Approach,

**ELECTIVE 2-A  
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:

- ⑦ Community based eye care in India.
- ⑦ Prevalence of various eye diseases
- ⑦ Developing Information Education Communication materials on eye and vision care for the benefit of the public
- ⑦ Organize health education programmes in the community
- ⑦ Vision screening for various eye diseases in the community and for different age groups.

**Unit: I**

Public Health Optometry: Concepts and implementation

Dimensions, determinants and indicators of health

Levels of disease prevention and levels of health care patterns

Epidemiology of blindness – Defining blindness and visual impairment

Eye in primary health care

Contrasting between Clinical and community health programs

**Unit: II**

Community Eye Care Programs

Community based rehabilitation programs

Nutritional Blindness with reference to Vitamin A deficiency

Vision 2020: The Right to Sight

**Unit: III**

Screening for eye diseases

National and International health agencies, NPCB Role of an optometrist in Public Health

Organization and Management of Eye Care Programs – Service Delivery models Health manpower and planning & Health Economics

**Unit: IV**

Evaluation and assessment of health programmes

Optometrists role in school eye health programmes

Basics of Tele Optometry and its application in Public Health

Information, Education and Communication for Eye Care programs

**Text books:**

- o GVS Murthy, S K Gupta, D Bachani: The principles and practice of community Ophthalmology, National programme for control of blindness, New Delhi, 2002
- o Newcomb RD, Jolley JL : Public Health and Community Optometry, Charles C
  
- o K Park: Park's Text Book of Preventive and Social Medicine, 19th edition, Banarsidas Bhanot publishers, Jabalpur, 2007

**Reference books:**

1. MC Gupta, Mahajan BK, Murthy GVS, 3<sup>rd</sup> edition. Text Book of Community Medicine, Jaypee Brothers, New Delhi, 2002

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