


INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)
PALLAVARAM - CHENNAI
ACCREDITED BY NAAC WITH 'A' GRADE
*Marching Beyond 30 Years Successfully*

# B.Sc OPTOMETRY

**Curriculum and Syllabus 2023**

**Based on Choice Based Credit System (CBCS) and Outcome Based Education (OBE)**

**Effective from the Academic year 2023-2024**

**School of Allied Health Sciences**

## 1. SHORT TITLE AND COMMENCEMENT:

These regulations shall be called "Specific Regulations for the B.Sc. Optometry Programme of Vels Institute of Science Technology and Advanced Studies, Deemed to be University u/s3 of UGC act 1956. These Regulations are applicable to the students who are admitted to the B.Sc. Optometry in this University.

As per the decision of the Academic Council of this University, these regulations have been preparedby adopting the regulations of the VISTAS.

## 2. AIMS:

The aim of the course is to,

1. Enable the students for excellence in the practice of optometry.
2. Develop in students interpersonal skills for the sensitive and responsive delivery of eye care.
3. Provide the opportunity for students to develop their potential for leadership in theirprofession and community.

Enable continuing education for practicing optometrists to maintain and enhance their clinical competence.

## 3. OBJECTIVES

On completion of the four years B.Sc. Optometry Programmes the graduateswill

1. Develop skills to provide comprehensive eye examination
   a. To acquire knowledge on ocular structures, its functions and pathological changes
   b. To carryout ophthalmic investigations
   c. To impart knowledge with regard to common eye diseases
2. To impart knowledge on treatment modalities from the perspective of counselling Acquire knowledge about the referral guidelines for ocular and systemic conditions Be able to correct refractive error and provide spectacle prescription
3. Able to fit, evaluate, prescribe and dispense contact lenses for refractive correction and other ocular conditions
4. Assess the low vision and provide comprehensive low vision care
5. Acquire adequate knowledge to develop skill in manufacturing of spectacle lenses, contact lenses and low vision devices.
6. Able to do complete binocular vision assessment, manage non-strabismus binocular vision anomalies and refer condition which warrants surgery
7. Assess the visual demands for various occupations and match into the visual capabilities. Also be able to advice on eye safety wear for variousoccupations.
8. Interpret knowledge and skill for early detection of various ocular conditions and pathologies – Refractive error, Strabismus, Cataract, Diabetic retinopathy, Glaucoma etc.
9. Apply knowledge of counselling on visual/ocular hygiene, nutritional and Environmental modifications

## 4. ELIGIBILITY FOR ADMISSION

1. The minimum age for admission shall be 17 years on or before 31st December of the year inwhich admission is sought.
2. A Candidate desiring to join the B.Sc. Optometry course should have passed the HSC/CBSE/ISC or other equivalent examination with one of the following subject combinations:

i) Physics, Chemistry, Biology & Mathematics

ii) Physics, Chemistry, Botany & Zoology.

3. A candidate is required to obtain 50% in the Entrance exam conducted by the VISTAS

## 5. DURATION OF THE COURSE:

The duration of the B.Sc. Optometry Degree course shall be 4Years Four-year full- time programme comprising 8 Semesters including internship. (One Year Internship) under Choice based Credit System.

## 6. MEDIUM OF INSTRUCTION:

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

## 7. COMMENCEMENT OF THE COURSE:

The course shall commence from August of the academic year.

## 8. WORKING DAYS IN A SEMESTER:

Each semester shall consist of not less than 100 working days and each academic year shallhave a total of 200 working days

## 9. REGISTRATION

A Candidate admitted to the course shall be registered by remitting the prescribed feesalong with the Application form for registration duly filled with in the stipulated dates.

## 10. COMMENCEMENT OF THE EXAMINATIONS:

Regular Semester Examinations will commence from last week of November andlast week of April

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

## 11. COURSE INSTRUCTION & SCHEME OF EXAMINATION

### SEMESTER 1

| Sl.No. | Category | Course Titles | Hours/Credits | | | | | | | Maximum Marks | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Lecture | | Tutorial | | Practical | | Total | I | | U | | Total |
| | | | Hours | Credits | Hours | Credits | Hours | Credits | Cred | Theory | Practical | Theory | Practical | |
| 3.1 | Program Core Theory | General Anatomy Theory | 45 | 3 | 30 | 1 | - | - | 4 | 25 | - | 75 | - | 100 |
| 3.2 | Program Core Theory | General Physiology Theory | 45 | 3 | 30 | 1 | - | - | 4 | 25 | - | 75 | - | 100 |
| 3.3 | Program Core | General Biochemistry Theory | 45 | 3 | 30 | 1 | - | - | 4 | 25 | - | 75 | - | 100 |
| 3.4 | Program Core | Geometrical Optics-I Theory | 45 | 3 | - | - | - | - | 3 | 25 | - | 75 | - | 100 |
| 3.5 | Program Core | Nutrition Theory | 30 | 2 | - | - | - | - | 2 | 25 | - | 75 | - | 100 |
| 3.5 | Program Core-Lab | General Physiology Practical | - | - | - | - | 30 | 1 | 1 | - | 50 | - | 50 | 100 |
| 3.7 | Program Core-Lab | Geometrical Optics-I Practical | - | - | - | - | 30 | 1 | 2 | - | 50 | - | 50 | 100 |
| 3.8 | ProgramElective | Communication And Soft Skills | 30 | 2 | - | - | - | - | 2 | 100 | - | - | - | 100 |
| | | | | | | | | Total | 22 | | | | Total | 800 |

## SEMESTER 2

| Sl. No. | Category | Course Titles | Hours/Credits | | | | | | | Maximum Marks | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Lecture | | Tutorial | | Practical | | Total | IA | | UA | | Total |
| | | | Hours | Credits | Hours | Credits | Hours | Credits | Credits | Theory | Practical | Theory | Practical | |
| 3.1 | Program Core Theory | Ocular Anatomy Theory | 30 | 2 | 30 | 1 | - | - | 3 | 25 | - | 75 | - | 100 |
| 3.2 | Program Core Theory | Ocular Physiology | 30 | 2 | 30 | 1 | - | - | 3 | 25 | - | 75 | - | 100 |
| 3.3 | Program Core Theory | Ocular Biochemistry Theory | 30 | 2 | 30 | 1 | - | - | 3 | 25 | - | 75 | - | 100 |
| 3.4 | Program Core Theory | Physical Optics Theory | 45 | 3 | - | - | - | - | 3 | - | 50 | - | 50 | 100 |
| 3.5 | Program Core- Theory | Geometrical Optics-II Theory | 45 | 3 | - | - | - | - | 3 | - | 50 | - | 50 | 100 |
| 3.6 | Program Core-Lab | Ocular Anatomy Practical | - | - | - | - | 30 | 1 | 1 | - | 50 | - | 50 | 100 |
| 3.7 | Program Core-Lab | Ocular Physiology- | - | - | - | - | 30 | 1 | 1 | - | 50 | - | 50 | 100 |
| 3.8 | Program Core-Lab | Ocular Biochemistry-Practical | - | - | - | - | 30 | 1 | 1 | - | 50 | - | 50 | 100 |
| 3.9 | Program Core-Lab | Physical Optics- Practical | - | - | - | - | 30 | 1 | 1 | - | 50 | - | 50 | 100 |
| 3.10 | Program Core-Lab | Geometrical Optics-II-Practical | - | - | - | - | 30 | 1 | 1 | - | 50 | - | 50 | 100 |
| 3.11 | Program Core | Clinical Optometry-I | - | - | - | - | 30 | 1 | 1 | | 50 | 50 | - | 100 |
| 3.12 | Program Elective | Basic Computers & Information Science* | 30 | 2 | - | - | - | - | 2 | 100 | - | - | - | 100 |
| | | | | | | | | Total | 23 | | | | Total | 1200 |

## SEMESTER 3

| Sl.No. | Category | Course Titles | Hours/Credi | | | | | | | Maximum Marks | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Lecture | | Tutorial | | Practical | | Total | IA | | UE | | Total |
| | | | Hours | Credits | Hours | Credits | Hours | Credits | Credits | Theory | Practical | Theory | Practical | |
| 3.1 | Program Core | Basic & Ocular Microbiology | 15 | 1 | 30 | 1 | - | - | 2 | 25 | | 75 | - | 100 |
| 3.2 | Program Core | Visual optics –I | 45 | 3 | 30 | 1 | - | - | 4 | 25 | | 75 | - | 100 |
| 3.3 | Program Core | Optometric optics-I | 30 | 2 | 30 | 1 | - | - | 3 | 25 | | 75 | - | 100 |
| 3.4 | Program Core | Basic and Ocular Pharmacology | 30 | 2 | 30 | 1 | | | 3 | 25 | | 75 | | 100 |
| 3.5 | Program Core | Ocular Diseases | 30 | 2 | 30 | 1 | | | 3 | 25 | | 75 | | 100 |
| 3.6 | Program Core | Clinical examination of visual system | 30 | 2 | 30 | 1 | | | 3 | 25 | | 75 | | 100 |
| 3.7 | Program Core Lab | Visual optics –I | | | | | 30 | 1 | 1 | | 50 | | 50 | 100 |
| 3.8 | Program Elective | Psychology* | 30 | 2 | - | - | - | - | 2 | 100 | | - | | 100 |
| 3.9 | Program core | Clinical Optometry | - | - | - | - | 60 | 2 | 2 | 50 | 50 | - | - | 100 |
| **Total** | | | | | | | | | **23** | | | **Total** | | **900** |

## SEMESTER 4

| Sl.No. | Category | Course Titles | Hours/Credits | | | | | | | Maximum Marks | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Lecture | | Tutorial | | Practical | | Total | I | | U | | Total |
| | | | Hours | Credits | Hours | Credits | Hours | Credits | Credits | Theory | Practical | Theory | Practical | |
| 4.1 | Program Core | Optometric optics–II & Dispensing | 45 | 3 | 30 | 1 | - | - | 4 | 25 | | 75 | - | 100 |
| 4.2 | Program Core | Visual Optics- II | 45 | 3 | 30 | 1 | - | - | 4 | 25 | | 75 | - | 100 |
| 4.3 | Program Core | Ocular Disease II | 45 | 3 | 30 | 1 | - | - | 4 | 25 | | 75 | - | 100 |
| 4.4 | Program Core | Pathology | 30 | 2 | 30 | 1 | | | 3 | 25 | | 75 | | 100 |
| 4.5 | Program Core | Optometric Instruments | 45 | 3 | 30 | 1 | | | 4 | 25 | | 75 | | 100 |
| 4.6 | Program Core Lab | Visual optics –II Lab | | | | | 60 | 2 | 2 | | 50 | | 50 | 100 |
| 4.7 | Program Core | Clinical Optometry | - | - | - | - | 60 | 2 | 2 | 50 | 50 | - | - | 100 |
| **Total** | | | | | | | | | **23** | | | **Total** | | **700** |

## SEMESTER 5

| Sl.No. | Category | Course Titles | Hours/Credi | | | | | | | Maximum Marks | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Lecture | | Tutorial | | Practical | | Total | I | | U | | Total |
| | | | Hours | Credits | Hours | Credits | Hours | Credits | Credits | Theory | Practical | Theory | Practical | |
| 5.1 | Program Core | Contactlens–I | 45 | 3 | 30 | 1 | - | - | 4 | 25 | | 75 | - | 100 |
| 5.2 | Program Core | Low Visioncare | 45 | 3 | 30 | 1 | - | - | 4 | 25 | | 75 | - | 100 |
| 5.3 | Program Core | Geriatric Optometry Pediatric Optomet | 30 | 2 | 30 | 1 | - | - | 4 | 25 | | 75 | - | 100 |
| 5.4 | Program Core | Binocular Vision- I | 45 | 3 | 30 | 1 | - | - | 3 | 25 | | 75 | | 100 |
| 5.5 | Program Core | Systemic Disease | 30 | 2 | - | - | - | - | 2 | 25 | | 75 | | 100 |
| 5.7 | Program Core Lab | Low Visioncare-Lab | | | | | 30 | 1 | 1 | | 50 | - | 50 | 100 |
| 5.6 | Program Elective | Medical Law and Ethics* | 30 | 2 | - | - | - | - | 2 | 100 | | - | | 100 |
| 5.8 | Program Core | Clinical Optometry | - | - | - | - | 60 | 2 | 2 | 50 | 50 | - | - | 100 |
| **Total** | | | | | | | | | **22** | | | | **Total** | **800** |

## SEMESTER 6

| Sl.No. | Category | Course Titles | Hours/Credi | | | | | | | Maximum Marks | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Lecture | | Tutorial | | Practical | | Total | IA | | UA | | Total |
| | | | Hours | Credits | Hours | Credits | Hours | Credits | Credits | Theory | Practical | Theory | Practical | |
| 6.1 | Program Core | Contact Lens–II | 45 | 3 | 30 | 1 | - | - | 4 | 25 | - | 75 | - | 100 |
| 6.2 | Program Core | Binocular Vision –II | 45 | 3 | 30 | 1 | - | - | 4 | 25 | - | 75 | - | 100 |
| 6.3 | Program Core | Public Health & Community | 30 | 2 | 30 | 1 | - | - | 3 | 25 | - | 75 | - | 100 |
| 6.4 | Program Core | Occupational | 45 | 3 | 30 | 1 | - | - | 3 | 25 | - | 75 | - | 100 |
| 6.5 | Program Elective | Practice | 30 | 2 | - | - | - | - | 2 | 25 | - | 75 | - | 100 |
| 6.6 | Program Elective | Statistics and Research | 30 | 2 | - | - | - | - | 2 | 25 | - | 75 | - | 100 |
| 6.7 | Program Core Lab | Binocular Vision–II | - | - | - | - | 30 | 1 | 1 | - | 50 | | 50 | 100 |
| 6.8 | Program Core | Clinical Optometry | - | - | - | - | 60 | 2 | 2 | 50 | 50 | - | - | 100 |
| **Total** | | | | | | | | | **21** | | | | **Total** | **800** |

**SEMESTER 7 & 8**

| Sl.No. | Category | Course Titles | Hours/Credits | | | | MaximumMarks | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | IA | | UA | | |
| | | | Theory | Tutorial | Practical | Total | Theory | Practical | Theory | Practical/Viv | |
| 7.1 | Project | Project | - | 2 | - | 2 | - | 50 | - | 50 | 100 |
| 7.2 | Internship | Internship | - | 38 | - | 38 | - | 50 | - | 50 | 100 |
| **Total** | | | | | | **40** | **Total** | | | | **200** |

**12. SUBMISSION OF LABORATORY RECORD NOTE BOOKS:**

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

**13. INTERNAL ASSESSMENT:**

a) A minimum of two written internal assessment examinations shall be conducted in each subject during a semester and the Best / Average marks of two examinations shall be takeninto consideration for the award of internal marks.

b) A model practical examinations shall be conducted in each subject (wherever practical have been included in the curriculum) shall be taken into consideration for award of internal marks in practical.

c) Tests will be conducted giving sufficient time for preparation

d) No repeat, reschedule and postponement of the assessment date is permitted.

e) Students shall compulsorily attend any three continuous assessments.

**14. ATTENDANCE REQUIRED FOR ADMISSION TO EXAMINATIONS:**

**(a)** No candidate shall be permitted to appear for the University examinations, unless he/she attends the course for the prescribed period.

**(b)** Every candidate is required to put in a minimum of 80% of attendance both in theory andpractical separately in each subject for admission to the examination.

**(c)** A candidate lacking in the prescribed attendance in any subject in theory and /or practicalshall not be admitted to the entire examination.

## 15. CONDONING LACK OF ATTENDANCE

1. Condoning of shortage of attendance up to a maximum of 10% in the prescribed eligible attendance for admission to year end examination rests with the discretionary power of the Vice Chancellor. A Candidate lacking in attendance should submit an application in the prescribed form and remit the stipulated fee, 15 days prior to the commencement of the theory examination, The Head of the Department should satisfy himself on the reasonableness of the candidate's request while forwarding the application of the candidate to the Controller of Examinations, who would obtain the Vice – Chancellor's approval for admission to the examination. No application would be accepted if it is not forwarded through proper channel.

2. Condoning lack of attendance should be taken up for consideration under the followingcircumstances:-

a) Any illness affecting the candidate – Candidates should submit a medicalcertificate from registered medical practitioners.

b) Any unforeseen tragedy in the family. The parents/ guardian should give in writing aboutwhat had happened.

c). Participation in National Service Scheme and other co-curricular activities representingthe University.

## 16. RE-ADMISSION AFTER BREAK OF STUDY:

A separate regulation is available for all the UG/PG courses of this university for the readmission of candidates after a break of study.

## 17. INTERNSHIP

1. Internship means 8 hours of integrated clinical duties in which 2 weeks of evening andnight shift duties are included
2. Internship should be carried out as 8 Hours per day @ 48 hours per week
3. Students will be supervised by the Faculties & well Trained Professionals during Internship.
4. Internship will be started after passing in the third year Examination.

## 18. YEAR END EXAMINATIONS

1. Commencement of the Examination will be in November /April
2. If the date of commencement falls on Saturdays, Sundays or declared public holidays, the examination shall begin on the next working day.
3. The duration of the examination of each subject is 3hours.

4. Minimum pass marks shall be 50 % in each of the theory and practical papers separately except in Internal papers.
5. Minimum Pass marks in Internal papers Shall be 50%.
6. Carryover of failed subjects.

a. A candidate has to pass in theory and practical examinations separately in each of the subject.
b. If a candidate fails in either theory or practical of the subjects, he/she has to reappear for both the Theory and Practical.
c. The candidate if fails can be permitted for admission to next year.
d. The candidate shall have to clear all the previous examination before appearing for the Sixth Semester examination.

## 19. REVALUATION / RETOTALLING OF ANSWER PAPERS:

There is provision for revaluation of the answer papers of failed candidates in any examination. However, the failed candidates cannot apply for retotaling.

## 20. CREDITS

Credits will be assigned on the basis of the lectures (L) /tutorials (T) Clinical Training (CR) /laboratory work (P) /Research Project (RP) and other form of learning in a 15-20 week schedule.

- L- One credit for one hour lecture per week (1 credit = 15 hours)
- P/T – One credit for every two hours of laboratory or practical (1 credit = 30 hours)
- CR – One credit for every two hours of Clinical Training/Clinical Rotation/Posing (1 credit = 30 hours)
- RP – One credit for every two hours of Research Project per week – Max Credit 20-25 (1 credit =30 hours)

## 21. GRADING SYSTEM

Based on the performance, each student shall be awarded a final grade at the end of the semester for each course. Absolute grading is used by converting the marks to grade, based on pre-determined class intervals. UGC 10-point grading system is used with pass grade modified.

| Letter Grade | Grade Point | Range of Marks* |
|---|---|---|
| O (Outstanding) | 10 | 85 % & Above |
| A+ (Excellent) | 9 | 80 -84.99 % |
| A (Very Good) | 8 | 75-79.99 % |
| B+ (Good) | 7 | 65-74.99 % |
| B (Above Average) | 6 | 60- 64.99 % |
| C (Average) | 5 | 50 -59.99 % |
| P (Pass) | - | > 50% |
| F (Fail) / RA (Reappear) | 0 | < 49.99% |
| AB (Absent) | 0 | - |

A candidate is declared to have pass in a course if he /she secures a minimum 50% marks the university theory & practical Examinations separately & 50% in aggregate of university theory/practical & internal assessment put together

**Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):**

SPGA is the weighted average of the grade points obtained in all courses by the student during the semester

**SGPA Computation:**

$$SGPA = \frac{\sum_{i}^{n} (C_i \times (GP)_i}{\sum^{n} C_i}$$

**Wheíe $C_i$ - cíedits foí the couíse, $(GP)_i$ - the gíade point obtained foí the $i^{th}$ couíse , n – total numbeí of couíses and the sum is oveí all the couíses taken in that semesteí, including those in which the students has secuíed "F" and "Ab" gíades.**

**CGPA Computation:**

**Computation of CGPA:**

CGPA is calculated with SGPA of all semesters to two decimal points and is indicated in final grade in mark card/transcript showing grades of all 8 semesters and their courses/subjects.

$$CGPA = \frac{\sum_{i}^{í} S_i \times (SGPA)_i}{\sum_{i}^{í} S_i}$$

where:-$S_i$- sum of credits in $i^{th}$ semester , $(SGPA)_i$- semester grade point average earned in $i^{th}$ semester and r- number of semester and the sum is over all the semesters under consideration. The cumulative grade point average (CGPA) is calculated by consideration all the courses taken from the first semester onwards for regular students and from third semester onwards taken for lateral entry students.

## 22. CLASSIFICATION OF SUCCESSFUL CANDIDATES

The CGPA arrived at the completion of the course shall be the criteria for the classification of successful candidates as below:

**Cumulative Grades and GradePoints**

| Letter Grade | Grade Point | Range of Marks* |
|---|---|---|
| O (Outstanding) | 10 | 85 % & Above |
| A+ (Excellent) | 9 | 80 -84.99 % |
| A (Very Good) | 8 | 75-79.99 % |
| B+ (Good) | 7 | 65-74.99 % |
| B (Above Average) | 6 | 60- 64.99 % |
| C (Average) | 5 | 50 -59.99 % |
| P (Pass) | - | > 50% |
| F (Fail) / RA (Reappear) | 0 | < 49.99% |
| AB (Absent) | 0 | - |

a) Successful candidates who secure 75% marks and above as a course aggregate in the first appearance taking University theory, practical, project / dissertation evaluation and viva shall alone be awarded Distinction. This will also apply for award of University rank.

b) Successful candidates who secure 60% marks and above as a course aggregate in the University theory, practical, project / dissertation evaluation and viva shall be awarded First Class.

All others who secure 40-59% in gross 1percentage will be classified to have passed in Second Class.

**23. PATTERN OF QUESTION PAPER FOR UNIVERSITY EXAMINATION:**

| | | |
|---|---|---|
| **Essay** | **2 x 15** | **= 30 Marks** |
| **Short Notes** | **5 x 5** | **= 25 Marks** |
| **Short Answers** | **10 x 2** | **= 20 Marks** |
| **Total** | | **75 Marks** |

**24. GRACE MARKS**

Maximum of 5 grace marks for each subject is permitted, and grace marks should not exceed8 marks in total marks for one academic year in theory paper only.

**25. MINIMUM MARKS REQUIRED FOR PASS IN ALL OTHER SUBJECTS**

A candidate is declared to have passed in a course if he/she secures a minimum of 50% marks in university theory and practical examinations separately and 50% in aggregate of University theory /practical and internal assessment put together.

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**SYLLABUS CORE COURSES**

## FIRST SEMESTER

## GENERAL

## ANATOMY

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

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

**COURSE PLAN:**

| Sl. No | Topics |
|---|---|
| 1 | Introduction to Human Anatomy:<br>Anatomy: Definition and its relevance in medicineand<br>optometry Planes of thebody, relationship of structures, organ<br>system |
| 2 | Skeleton System |
| 3 | Tissues of the Body:<br>Epithelium, connective tissue, bone and cartilage, Embryology, histology, different<br>types of each of them, types of cells, cellular differentiation and arrangements in |
| | different tissues |
| 4 | Muscles:<br>Different types of muscles, their functional differentiation, their relationship with<br>different structures, their neural supply |
| 5 | Bloodvessels:<br>Differentiation between arteries and veins, embryology, histology ofboth arteriesand veins, Functional differences between the two, anatomical differences at different locations |
| 6 | Skin and appendages:<br>Embryology, anatomical differences in different areas, functional and protective<br>variations, innervations, relationship with muscles and nerves |

| | |
|---|---|
| 7 | Lymphatic system:<br>Embryology, functions, relationship with blood vessels andorgans |
| 8 | Glands:<br>Embryology, different types of glands (exocrine and endocrine), functional<br>differences, neural control of glands |

| | |
|---|---|
| 9 | Nervous system:<br>Parts of Nervous system, cell types of nervous system, Blood-brainbarrier, Reflex<br>arc, Peripheral Nerves, Spinal nerves, Nerve fibers, Autonomic Nervoussystem |
| 10 | Brain and Cranial nerves:<br>Major parts of Brain, Protective coverings of the Brain, CerebrospinalFluid, Brain<br>stem, Cerebellum, Diencephalon, Cerebrum, Cranial nerves |

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

**TEXT BOOKS: -**


1. MARIANO S.H. DIFIORE: Atlas of Human Histology, 5th Ed. 1981, Lea and Feliger.
2. G.J. TORTORA & N.P ANAGNOSTAKOS: Principles of Anatomy and Physiology. (recent edition)
3. B.D. CHAURASIA: Handbook of General Anatomy, 2nd Ed., CBS Publishers and Distributors, New Delhi - 110 032.


**REFERENCE BOOKS:-**


1. PETER L. WILLIAMS AND ROGER WARWICK: - Gray's Anatomy - Descriptive and Applied, 36th Ed., 1980, Churchill Livingstone.
2. T.S. RANGANATHAN: Textbook of Human Anatomy, 1982, S. Chand & Co., New Delhi 110 055.
3. INDERBIR SINGH: Human Embryology, 3rd Ed., Macmillan India, 1981.
4. R. KANAGASUNTHARAM, P. SIVANANDA-SINGHAM & A. KRISHNAMURTI: Anatomy- Regional, Functional, & Clinical, P.G. Publisher, Singapore 1987.


## GENERAL PHYSIOLOGY

**COURSE OBJECTIVES**: At the end of the course the student will be able to:

- Explain the normal functioning of various organ systems of the body and their interactions.
- Elucidate the physiological aspects of normal growth and development.
- Describe the physiological response and adaptations to environmental stresses.
- Know the physiological principles underlying pathogenesis of disease.

**COURSE PLAN:**

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

| | |
|---|---|
| 3 | DIGESTION:<br>General arrangement<br>Salivary digestion –functions & regulations<br>Gastric digestion –functions & regulations<br>Pancreatic digestion –functions &<br>regulationsIntestinal digestion –functions &<br>regulations Liver & bile<br>AbsorptionMotility<br>DeglutitionVomiting<br>Defecation<br>Functions of large intestine<br>Neurohumoral regulations of alimentary functions, summary |
| 4 | EXCRETION:<br>Body fluids –distribution, measurement & exchange, Kidney –structureof nephron –mechanism of urine formation –composition of the urine and abnormal constituents –urinary bladder & micturition |
| 5 | ENDOCRINES:<br>Hormone mechanism –negative feed backs –tropic action –permissive<br>action – cellular action, hypothalamic regulation<br>Thyroid - hormones, actions,<br>regulationsAdrenal cortex - hormones,<br>actions, regulations Adrenal medulla –<br>hormones, actions, regulations Parathyroid<br>- hormones, actions,<br>regulations Islets of pancreas –hormones,<br>actions, regulations Miscellaneous<br>_ hormones, actions, regulations<br>Common clinical disorders |
| 6 | REPRODUCTION:<br>Male reproductive system –control & regulation<br>Female reproductive system –uterus –ovaries –menstrual cycle –<br>regulation –<br>pregnancy & delivery –breast –family planning |
| 7 | RESPIRATION:<br>Mechanics of respiration –pulmonary function tests –transport of respiratory gases- neural and chemical regulation of respiration – hypoxia, cyanosis, dyspnoea– asphyxia. |

| | |
|---|---|
| 8 | CIRCULATION:<br>General principles<br>Heart: myocardium –innervation –transmission of cardiac impulse-<br>Events duringcardiac cycle –cardiac output. Peripheral circulation:<br>peripheral resistances – arterial blood pressure –measurements –factors<br>regulation variations –capillary circulation – venous circulation.<br>Special circulation: coronary cerebral –<br>Miscellaneous |

| | |
|---|---|
| 9 | ENVIRONMENTAL PHYSIOLOGY<br>Body temperature regulation (including skin Physiology). Exposure to low and high<br>atmospheric pressure |
| 10 | NERVOUS SYSTEM:<br>Neuron –Conduction of impulse –synapse –<br>receptor.Sensory organization –pathways and perception<br>Reflexes –cerebral cortex –functions. Thalamus –Basal ganglia<br>Cerebellum.<br>Hypothalamus.<br>Autonomic nervous system –motor control of movements, postureand equilibrium<br>–<br>conditioned reflex, eye hand co-ordination |
| 11 | SPECIAL SENSES –(Elementary) Olfaction –Taste –Hearing |

**TEXT BOOKS:-**


1. L Prakasam reddy, Fundamentals of Medical Physiology, 4th Edition, Paras medical Publisher, Hyderabad, 2008
2. Sujit K. Chaudhuri, Concise Medical Physiology, 6th edition, New Central Book Agency, Kolkata, 2008
3. AK Khurana, Indu Khurana: Anatomy and Physiology of Eye, Second edition,CBS Publishers, New Delhi, 2006


**REFERENCE BOOKS:-**


1. A C Guyton: Text book of Medical Physiology, 8th edition, saunders company, Japan,
2. G J Tortora, B Derrickson: Principles of anatomy & physiology,11th edition, Harper & Row Publishers, New York
3. John Wiley & Sons Inc, New Jersey, 2007


**PRACTICAL**

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

## GENERAL BIOCHEMISTRY

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

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

**COURSE PLAN**

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

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

**REFERENCE BOOKS:**


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

**PRACTICAL**

1. Reactions of monosaccharides, disaccharides and starch: Glucose Fructose
   Galactose Maltose, lactose
   Sucrose Starch

2. Analysis of Unknown Sugars Estimation**:**
   Photometry Biofluid of choice – blood, plasma, serum
   Standard graphs Glucose
   Proteins Urea
   Creatinine Bilirubin

## GEOMETRICAL OPTICS-I

**COURSE OBJECTIVES**: The objective of this course is

1. To equip the students with a thorough knowledge of mirrors and lenses.

2. Able to predict the basic properties of the images formed on the retina by the optics of the eye.

**COURSE PLAN**

| No. | Topics |
|---|---|
| 1. | Nature of light –light as electromagnetic oscillation; ideas of sinusoidal oscillations; amplitude and phase; speed of light in vacuum and other media; refractive index. |
| 2. | Wavefronts–spherical, elliptical and plane; Curvature and vergence; rays; convergenceand divergence in terms of rays and vergence; vergence at a distance |
| 3. | Refractive index; its dependence on wavelength |
| 4. | Fermat's and Huygen's Principle –Derivation of laws of reflection and refraction(Snell's law) from these principles |
| 5. | Plane mirrors –height of the mirror; rotation of the mirror |
| 6. | Reflection by a spherical mirror –paraxial approximation; sign convention; derivationof vergence equation |
| 7. | Imaging by concave mirror, convex mirror |
| 8. | Reflectivity; transmissivity; Snell's Law, Refraction at a plane surface |

| | |
|---|---|
| 9. | Glass slab; displacement without deviation; displacement without dispersion |
| 10. | Thick prisms; angle of prism; deviation produced by a prism; refractive index of the prism |
| 11. | Prisms; angular dispersion; dispersion power; Abbe's number. |
| 12. | Definition of crown and flint glasses; materials of high refractive index |
| 13. | Thin prism –definition; definition of Prism dioptre; deviation produced by a thin prism; it dependence on refractive index |
| 14. | Refraction by a spherical surface; sign convention; introduction to spherical aberration using image formed by a spherical surface of a distance object; sag formula |
| 15. | Paraxial approximation; derivation of vergence equation |
| 16. | Imaging by a positive powered surface and negative powered surface |
| 17. | Vergence at a distance formula; effectivity of a refracting surface |
| 18. | Definition of a lens as a combination of two surfaces; different types of lens shapes. |
| 19. | Image formation by a lens by application of vergence at a distance formula; definitions of front and back vertex powers; equivalent power; first and second principal planes/points; primary and secondary focal planes/points; primary and secondary focal lengths |
| 20. | Newton's formula; linear magnification; angular magnification |
| 21. | Nodal Planes |
| 22. | Thin lens as a special case of thick lens; review of sign convention |
| 23. | Imaging by a thin convex lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions |
| 24. | Imaging by a thin concave lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions |
| 25. | Prentice's Rule |
| 26. | System of two thin lenses; review of front and back vertex powers and equivalent power, review of six cardinal points. |
| 27. | System of more than two thin lenses; calculation of equivalent power using magnification formula |

**TEXT BOOK:**


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


**REFERENCE BOOKS:**


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

**PRACTICAL**

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

## NUTRITION

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

**COURSE PLAN**

1. Introduction.
   - 1.1 History of Nutrition
   - 1.2 Nutrition as a science
   - 1.3 Food groups, RDA
   - 1.4 Balanced diet, diet planning.
   - 1.5 Assessment of nutritional status
2. Energy
   - 2.1 Units of energy.
   - 2.2 Measurements of energy and value of food
   - 2.3 Energy expenditure.
   - 2.4 Total energy/calorie requirement for different age groups and diseases.
   - 2.5 Satiety value
   - 2.6 Energy imbalance- obesity, starvation.
   - 2.7 Limitations of the daily food guide.
3. Proteins
   - 3.1 Sources and functions
   - 3.2 Essential and non- essential amino- acids.
   - 3.3 Incomplete and complete proteins
   - 3.4 Supplementary foods.
   - 3.5 PEM and the eye
   - 3.6 Nitrogen balance
   - 3.7 Changes in protein requirement.
4. Fats
   - 4.1 Sources and functions
   - 4.2 Essential fatty acids

## 4.3 Excess and deficiency

4.4 Lipids and the eye.

4.5 Hyperlipidemia, heart diseases, atherosclerosis.

5. Minerals
   5.1 General functions and sources
   5.2 Macro and micro minerals associated with the eye.
   5.3 Deficiencies and excess –ophthalmic complications (e.g. iron, calcium, iodine etc.)
6. Vitamins
   6.1 General functions, and food sources
   6.2 Vitamin deficiencies and associated eye disorders with particular emphasis to Vitamin A
   6.3 Promoting sound habits in pregnancy, lactation and infancy.
   6.4 Nutrient with antioxidant.
   6.5 Properties
   6.6 Digestion of Proteins, carbohydrates & lipids
7. Essential amino acids.
8. Miscellaneous
   8.1 Measles and associated eye disorders, low birth weight

**TEXT BOOK:**


1. M Swaminathan: Hand book of Food and Nutrition, fifth edition, Bangalore printing & publishing Co.Ltd, Bangalore, 2004
2. C Gopalan, BV Rama Sastri, SC Balasubramanian: Nutritive Value of Indian Foods, National Institute of Nutrition, ICMR, Hyderabad,2004
3. Frank Eperjesi & Stephen Beatty: Nutrition and the Eye A practical Approach, Elsevier Butterworth- Heinemann, USA, 2006


## ENGLISH AND COMMUNICATION

**COURSE OBJECTIVES**:

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

**COURSE PLAN**

| Functional English | Topics |
|---|---|
| Unit 1<br>Basics of Grammar | Vocabulary<br>Synonyms, Antonyms, Prefix and Suffix, Homonyms, Analogies and Portmanteau words |

| | |
|---|---|
| Unit II<br>Basics of Grammar – Part II | Active, Passive, Direct and Indirect speech,Prepositions, Conjunctions and Euphemisms |
| Unit III<br>Writing Skills | Letter Writing, Email, Essay, Articles, Memos, oneword substitutes, note making and Comprehension |

| | |
|---|---|
| Unit IV<br>Writing and Reading | Summary writing, Creativewriting, newspaperreading |
| Unit V<br>Practical Exercise | Formal speech, Phonetics, semantics and pronunciation |
| **Communication** | |
| Introduction | • Communication process.<br>• Elements ofcommunication<br>• Barriers of communication andhow to overcomethem.<br>• Nuances for communicating with patients and theirattenders in hospitals |
| Speaking | • Importance of speaking efficiently<br>• Voiceculture.<br>• Preparation of speech. Secrets of good delivery<br>• Audience psychology, handling<br>• Presentation skills.<br>• Individual feedback for each student<br>• Conference/Interview technique |
| Listening | • Importance of listening<br>• Self-assessment<br>• Action plan execution.<br>• Barriers in listening.<br>• Good and persuasive listening |
| Reading | • What is efficient and fast reading<br>• Awareness of existing reading habits<br>• Tested techniques for improving speed<br>• Improving concentration and comprehensionthrough systematicstudy. |
| Non Verbal Communication | • Basics of non-verbal communication<br>• Rapport building skills using neuro-linguistic programming (NLP) |
| Communication in Optometrypractice | |

**TEXT BOOK**:


1. Graham Lock, Functional English Grammar: Introduction to second Language Teachers. Cambridge University Press, New York, 1996.
2. Gwen Van Servellen. Communication for Health care professionals: Concepts,practice and evidence, Jones & Bartlett Publications , USA, 2009


**SECOND**

**SEMESTER**

**OCULAR**

**ANATOMY**

**COURSE OBJECTIVES**:

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

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

**COURSE PLAN**

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

3.4 Lens
3.5 Vitreous body
4. Eyelids
5. Conjunctiva

6. Embryology

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

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

**PRACTICAL**

1. Eye: Practical dissection of bull's eye
2. Orbit: Practical demonstration of orbital structures.

## OCULAR P H Y S I O LO G Y

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

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

**COURSE PLAN**

1. Protective mechanisms in the eye: Eye lids and lacrimation, description of the globe
2. Extrinsic eye muscles, their actions and control of their movements
3. Coats of the eye ball
4. Cornea
5. Aqueous humor and vitreous: Intra ocular pressure
6. Iris and pupil
7. Crystalline lens and accommodation – presbyopia
8. Retina – structure and functions
9. Vision – general aspects of sensation
10. Pigments of the eye and photochemistry
11. The visual stimulus, refractive errors
12. Visual acuity, Vernier acuity and principle of measurement
13. Visual perception – Binocular vision, stereoscopic vision, optical illusions
14. Visual pathway, central and cerebral connections
15. Colour vision and colour defects. Theories and diagnostic tests
16. Introduction to electro physiology
17. Scotopic and Photopic vision
18. Color vision, Color mixing
19. Mechanism of accommodation
20. Retinal sensitivity and Visibility
21. Receptive stimulation and flicker

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

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

**REFERENCE BOOKS:**

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

**PRACTICAL**

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

## OCULAR BIOCHEMISTRY

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

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

**COURSE PLAN**

1. Hormones basic concepts in metabolic regulation with examples say insulin.
2. Metabolism: General whole body metabolism (carbohydrates, proteins, lipids)
3. Ocular Biochemistry: Various aspects of the eye, viz., cornea, lens aqueous, vitreous,

retina and pigment rhodopsin. (The important chemicals in each and their roles.)

Immunology of anterior segment

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

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

**REFERENCE BOOKS**:

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

**PRACTICAL**

1. Quantitative analysis
2. Abnormal constituents in urine, sugar proteins, ketones, blood and bile salts.

## PHYSICAL OPTICS

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

**COURSE PLAN**

| No. | Topics |
|---|---|
| 1. | Nature of light –light as electromagnetic oscillation –wave equation; ideas of sinusoidal oscillations –simple harmonic oscillation; transverse nature of oscillation; concepts of frequency, wavelength, amplitude and phase. |
| 2. | Sources of light; Electromagnetic Spectrum. |
| 3. | Polarized light; linearly polarized light; and circularly polarized light. |
| 4. | Intensity of polarized light; Malus'Law; polarizers and analyzers; Methods of producing polarized light; Brewster's angle. |
| 5. | Birefringence; ordinary and extraordinary rays. |
| 6. | Relationship between amplitude and intensity. |
| 7. | Coherence; interference; constructive interference, destructive interference; fringes;fringe width. |
| 8. | Double slits, multiple slits, gratings. |
| 9. | Diffraction; diffraction by a circular aperture; Airy's disc |
| 10 | Resolution of an instrument (telescope, for example); Raleigh's criterion |

| | |
|---|---|
| 11 | Scattering; Raleigh's scattering; Tyndall effect. |
| 12 | Fluorescence and Phosphorescence |
| 13 | Basics of Lasers –coherence; population inversion; spontaneous emission; Einstein's theory of lasers. |
| 14 | Radiometry; solid angle; radiometric units; photopic and scotopic luminous efficiency and efficacy curves; photometric units |
| 15 | Inverse square law of photometry; Lambert's law. |
| 16 | Other units of light measurement; retinal illumination; Trolands |

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

**REFERENCE BOOKS**:


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


**PRACTICAL**

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

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

## GEOMETRICAL OPTICS II

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

**COURSE PLAN**

1. Vergence and vergence techniques revised.
2. Gullstrand's schematic eyes, visual acuity, Stile Crawford

3. Emmetropia and ametropia

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

**TEXT BOOK:**


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


**REFERENCE BOOKS:**


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


**PRACTICAL**

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

## BASIC COMPUTERS AND INFORMATION SCIENCE

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

1. Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.
2. Input output devices: Input devices (keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices (monitors, pointers, plotters, screen image projector, voice response systems).
3. Processor and memory: The Central Processing Unit (CPU), main memory.Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.
4. Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).
5. Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.
6. Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet,creating graphs.
7. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.
8. Introduction of Operating System: introduction, operating system concepts, types of operating system.
9. Computer networks: introduction, types of networks (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.
10. Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.
11. Application of Computers in clinical settings.

## CLINICAL OPTOMETRY I

## (STUDENTSHIP)

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

## ***Third Semester***

## OCULAR MICROBIOLOGY

**COURSE OBJECTIVE:**

At the end of the semester the students should be able to

- Know the concepts of sterilization and disinfection procedures and their applications.
- Understand the basic principles of immunology.
- Understand the basic fundamental aspects of bacteria, virus, fungus and parasites, and study the common disease caused by them.

**Unit I**

History and introduction to microbiology, study the morphology of bacterial cell and their functions.

**Unit II**

Basic concepts about infection, (Source, portal of entry & spread) immunity, biomedical waste management and standard precautions

**Unit III**

Sterilization and disinfection procedures and their application.

**Unit IV**

Common bacterial, viral, fungal and parasitic pathogens and the diseases caused by them with preventive and treatment measures.

**Unit V**

Applied microbiology- Sexually transmitted diseases, hospital acquired infections, urinarytract infections, skin and soft tissue infections and anaerobic infections.

**Unit VI-Ocular Microbiology**

-Morphology and principles of cultivating bacteria
-Sterilization and disinfections used in laboratory and hospital practice
-Common bacterial infections of the eye.
-Common fungal infections of the eye
-Common viral infections of the eye.
-Common parasitic infections of the eye

**Recommended books**


- Prof C P Baveja - Text book of Microbiology.
- Satish Gupte- Text Book of Microbiology

## Microbiology Lab

**Spotters**

- Disposable syringe
- Sterile cotton swab
- Bacterial filters
- Anaerobic jars
- Gram stained smears showing gram positive cocci and gram negative bacilli
- Gram stained smears showing Candida
- Culture growth of Aspergillus and dermatophytes
- Bacterial culture media plates (Blood agar, chocolate agar and MacConkey's agar)
- Antibiotic susceptibility test
- Ascaris lumbricoides
- Taenia

**Clinical case discussion with charts**

- Skin and soft tissue infections
- Clostridial infections
- Ring worm/ Tinea infections
- Food poisoning
- Gastroenteritis

**TEXT BOOK:**


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


**REFERENCE BOOKS:**


1. KJ Ryan, CG Ray: Sherris Medical Microbiology- An Introduction to infectious Diseases, fourth edition, McGRAW HILL Publisher, New Delhi, 1994 MACKIE & McCartney Practical Medical Microbiology
2. SYDNEY M. FINEGOLD & ELLEN JO BARON: Diagnostic Microbiology (DM) 5)


## VISUAL OPTICS I

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

1. To understand the fundamentals of optical components of the eye

2. To gain theoretical knowledge and practical skill on visual acuity measurement, objectiveand subjective clinical refraction.

**COURSE PLAN**

1. Review of Geometrical Optics: Vergence and power
   - 1.1 Conjugacy, object space and image space
   - 1.2 Sign convention
   - 1.3 Spherical refracting surface
   - 1.4 Spherical mirror; catoptric power
   - 1.5 Cardinal points
   - 1.6 Magnification
   - 1.7 Light and visual function
   - 1.8 Clinical Relevance of: Fluorescence, Interference, Diffraction, Polarization, Bi-refringence, Dichroism
   - 1.9 Aberration and application Spherical and Chromatic
2. Optics of Ocular Structure
   - 2.1 Cornea and aqueous
   - 2.2 Crystalline lens
   - 2.3 Vitreous
   - 2.4 Schematic and reduced eye
3. Measurements of Optical Constants of the Eye
   - 3.1 Corneal curvature and thickness
   - 3.2 Keratometry
   - 3.3 Curvature of the lens and ophthalmophakometry
   - 3.4 Axial and axis of the eye
   - 3.5 Basic Aspects of Vision.
     - 3.5.1 Visual Acuity
     - 3.5.2 Light and Dark Adaptation
     - 3.5.3 Color Vision
     - 3.5.4 Spatial and Temporal Resolution
     - 3.5.5 Science of Measuring visual performance and application to Clinical Optometry
4. Refractive anomalies and their causes
   - 4.1 Etiology of refractive anomalies
   - 4.2 Contributing variability and their ranges
   - 4.3 Populating distributions of anomalies.
   - 4.4 Optical component measurements
   - 4.5 Growth of the eye in relation to refractive errors

**TEXT BOOK:**

1. A H Tunnacliffe: Visual optics, The Association of British Optician, 1987

2. AG Bennett & RB Rabbets: Clinical Visual optics, 3rd edition, Butterworth Heinemann,1998

**REFERENCE BOOKS:**

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

## OPTOMETRIC OPTICS I

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

1. Measurement of lens power , lens centration using conventional techniques
2. Transposition of various types of lenses •Knowledge to identify different forms of lenses (equi- convex, planoconvex, periscopic, etc.)
3. Knowledge to select the tool power for grinding process.
4. Measurement of surface powers using lens measure.

**COURSE PLAN**

**Introduction –Light, Mirror, Reflection, Refraction and Absorption**

1. Prisms –Definition, properties, Refraction through prisms, Thickness difference, Base-apex notation, uses, nomenclature and units, Sign Conventions, Fresnel's prisms, rotary prisms
2. Lenses –Definition, units, terminology used to describe, form of lenses
3. Vertex distance and vertex power, Effectivity calculations
4. Lens shape, size and types i.e. Spherical, cylindrical and Sphero-cylindrical
5. Transpositions –Simple, Toric and Spherical equivalent
6. Prismatic effect, centration, decentration and Prentice rule, Prismatic effect of Plano- cylinder and Spherocylinderlenses
7. Spherometer & Sag formula, Edge thickness calculations
8. Magnification in high plus lenses, Minification in high minus lenses
9. Tilt induced power in spectacles
10. Aberration in Ophthalmic Lenses

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

**REFERENCE BOOKS:**

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

edition, Butterworth- Heinemann, USA, 1996

## BASIC AND OCULAR PHARMACOLOGY

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

1. Basic principle of pharmacokinetics & Pharmacodynamics
2. Commonly used ocular drugs, mechanism, indications, contraindications, drug dosage and adverse effects.

**COURSE PLAN**

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

**TEXT BOOK/REFERENCE BOOKS:**


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

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

followingaspects of ocular diseases:

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

**COURSE PLAN**

1. Orbit
   - 1.1 Applied Anatomy
   - 1.2 Proptosis (Classification, Causes, Investigations)
   - 1.3 Enophthalmos
   - 1.4 Developmental Anomalies (craniosynostosis, Craniofacial Dysostosis, Hypertelorism, Median facial cleft syndrome)
   - 1.5 Orbital Inflammations (Preseptal cellulites, Orbital cellulitis Orbital Periostitis, cavernous sinus Thrombosis)
   - 1.6 Grave's Ophthalmopathy
   - 1.7 Orbital tumors( Dermoids, capillary haemangioma, Optic nerve glioma)
   - 1.8 Orbital blowout fractures
   - 1.9 Orbital surgery (Orbitotomy)
   - 1.10 Orbital tumors
   - 1.11 Orbital trauma
   - 1.12 Approach to a patient with proptosis
2. Lids
   - 2.1 Applied Anatomy
   - 2.2 Congenital anomalies (Ptosis, Coloboma, Epicanthus, Distichiasis, Cryptophthalmos)
   - 2.3 Oedema of the eyelids(Inflammatory, Solid, Passive edema)
   - 2.4 Inflammatory disorders (Blepharitis, External Hordeolum, Chalazion ,Internalhordeolum, Molluscum Contagiosum)
   - 2.5 Anomalies in the position of the lashes and Lid Margin (Trichiasis, Ectropion, Entropion, Symblepharon, Blepharophimosis, Lagophthalmos, Blepharospasm, Ptosis).
   - 2.6 Tumors (Papillomas, Xanthelasma, Haemangioma, Basal carcinoma, Squamous cell carcinoma, sebaceous gland melanoma)
3. Lacrimal System
   - 3.1 Applied Anatomy
   - 3.2 Tear Film
   - 3.3 The Dry Eye ( Sjogren's Syndrome)
   - 3.4 The watering eye ( Etiology, clinical evaluation)

## 3.5 Dacryocystitis

4. Swelling of the Lacrimal gland( Dacryoadenitis)Conjunctiva
   - 4.1 Applied Anatomy
   - 4.2 Inflammations of conjunctiva ( Infective conjunctivitis – bacterial, chlamydial, viral , Allergic conjunctivitis, Granulomatous conjunctivitis)
   - 4.3 Degenerative conditions( Pinguecula, Pterygium, Concretions)
   - 4.4 Symptomatic conditions( Hyperaemia, Chemosis, Ecchymosis, Xerosis, Discoloration)
   - 4.5 Cysts and Tumors
5. Cornea
   - 5.1 Applied Anatomy and Physiology
   - 5.2 Congenital Anomalies (Megalocornea, Microcornea, Cornea plana, Congenital cloudy cornea)
   - 5.3 Inflammations of the cornea (Topographical classifications: Ulcerative keratitis andNon ulcerative
   - 5.4 Etiological classifications: Infective, Allergic, Trophic, Traumatic, Idiopathic)Degenerations ( classifications, Arcussenilis, Vogt's white limbal girdle, Hassal-henle bodies, Lipoid Keratopathy, Band shaped keratopathy, Salzmann's nodular degeneration, Droplet keratopathy, Pellucid Marginal degeneration)
   - 5.5 Dystrophies ( Reis Buckler dystrophy,Recurrent corneal erosion syndrome, Granular dystrophy, Lattice dystrophy, Macular dystrophy, cornea guttata, Fuch's epithelial endothelial dystrophy, Congenital hereditary endothelial dystrophy)
   - 5.6 Keratoconus, Keratoglobus
   - 5.7 Corneal oedema, Corneal opacity, Corneal vascularisation
   - 5.8 Penetrating Keratoplasty
6. Uveal Tract and Sclera
   - 6.1 Applied Anatomy,
   - 6.2 Classification of uveitis
   - 6.3 Etiology
   - 6.4 Pathology
   - 6.5 Anterior Uveitis
   - 6.6 Posterior Uveitis
   - 6.7 Purulent Uveitis
   - 6.8 Endophthalmitis
   - 6.9 Panophthalmitis
   - 6.10 Pars Planitis
   - 6.11 Tumors of uveal tract( Melanoma)
   - 6.12 Episcleritis and scleritis
   - 6.13 Clinical examination of Uveitis and Scleritis

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

**REFERENCE BOOKS:**


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


## CLINICAL EXAMINATION OF THE VISUAL SYSTEM

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

**COURSE PLAN**

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

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

**REFERENCE BOOKS:**


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

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

## PSYCHOLOGY

**UNIT 1: Basic Concepts of Psychology**

Definition of Psychology, Origin of Psychology - Philosophical roots of psychology, Schools of Psychology –Structuralism – Gestalt – Functionalism – Behaviorism - Psychoanalysis – Humanistic. Fields of Psychology - Work of a psychologist – Applications of psychology.

**UNIT 2: Learning principles and methods**

Definition of learning, Factors In The Process of Learning Classical conditioning - Operant Conditioning – The principle of reinforcement and Punishment. Theory of learning. Cognitive learning- Latent learning, Insight learning, and Imitation.

**UNIT 3: Motivation, Emotion, Memory and forgetting**

Motivation - Definition of motivation – Theories of motivation - Physiological basis of motivation – Motivational factors in aggression – Self-actualization motivation. Emotion – Emotional expression –Theories of emotions. Kinds of remembering – Retrieval processes – The nature of forgetting – Two process theories of memory – Improving memory –Language and thought – Symbols and concepts – Structure – Forms of thought - Thinking and reasoning –

Concept formation.

**UNIT 4; Development, Sensory Processes and Perception.**

Erikson's stages of psychosocial development Lawrence Kohlberg's stages of moral development Freud’s Stages of Psychosexual Development Physiological basis of behavior – The brain and nervous system –The sensory process , Some general characteristic of senses – Five senses

,Perception: Organization – The role of learning in perception – Perception and attention –Perceptual process.

**UNIT 5: Intelligence & Personality**

Theories of intelligence – Measuring Intelligence – Kinds of intelligence tests – Ability – Formation of aptitude and attitude – Aptitude tests –Creativity and its tests.

Personality – Definition of Personality – Theories of Personality – Assessment of Personality. Social Factors Influencing Personality.

**UNIT 6: Social Psychology**

Definition, Nature, Subject Matter and Scope Of Social Psychology-Applications and Importance of Social Psychology, Groups: Definition and Type- Primary And

Secondary Groups Social Interaction, Social and Inter-Personal Relations. Inter-personal attraction – Love and Companionship. Prosocial-behavior. Modes of empathy: self – other differentiation and development of empathy. Social influence: attitude and conformity. Definition - Characteristics and Classification of Crowd. Leadership: Definition and characteristics, Defense Mechanisms, frustration and conflict, sources of frustration and conflict, types of conflicts. Aggression and Types of aggression.

**UNIT 6: Health Psychology**

Definition of Health Psychology -Relating Health Psychology to other fields Clinical Health Psychology, Public Health Psychology, Community Health Psychology, Critical Health Psychology

Abnormal Psychology: Concepts of normality and abnormality, causation of mental illness, neuroses, psychoses, psychosomatic disorders, measures to promote mental health.

Stress - Definitions- Models of Stress – Theories of Stress - Stress reactions – Coping and Stress Management techniques, Pain and its management - Psychological reactions of a patient to loss –

Stages of Acceptance by Kubler-Ross.

**REFERENCES:**

1. Clifford T. Morgan, Richard a. King, John R. Weis and John

Schopler,"Introduction toPsychology" – 7th Edition. Tata McGraw Hill Book Co.

New Delhi, 1993.

2. Baron, R. A., & Byrne, D (2006), "Social psychology", New Delhi: Prentice

hall of Indiaprivate limited.

3. Elliot Aronson, Timothy D. Wilson, Robin M. Akert, Samuel R. Sommers,

"Socialpsychology" 9th edition published by Pearson education, Inc.,2006

4. Shelley E. Taylor. "Health Psychology" Third Edition. McGraw Hill International Editions,1995.

5. Swaminathan, V.D, Latha Sathish, "Psychology for Effective Living", Department ofPsychology, University of Madras.

6. Coleman, James. 1980. "Abnormal Psychology and modern life". New Delhi: Tata McGrawHill Ltd.

**CLINICAL OPTOMETRY II (STUDENTSHIP)**

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

***Fourth Semester***

**OPTOMETRIC OPTICS II & DISPENSING OPTICS OPTOMETRIC OPTICS II**

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

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

15. Troubleshooting complaints and handling patient's questions

**COURSE PLAN**

| Sl. No | Topics |
|---|---|
| 1. | Spectacle Lenses - II:<br>• Manufacture of glass<br>• Lens materials<br>• Lens surfacing<br>• Principle of surface generation and glass cements<br>• Terminology used in Lens workshop<br>• Lensproperties<br>• Lens quality<br>• Faults in lens material<br>• Faults on lens surface<br>• Methods of Inspecting the quality of lenses<br>• Safety standards for ophthalmic lenses (FDA, ANSI, ISI, Others) |
| 2. | Spectacle Frames:<br>• Typesand parts<br>• Classification of spectacle frames-material, weight, temple position, Coloration<br>• Frame construction<br>• Frame selection<br>• Size, shape, mounting and field of view ofophthalmic lenses |
| 3. | Tinted & Protective Lenses<br>• Characteristics of tinted lenses Absorptive Glasses<br>• Polarizing Filters, Photochromic & Reflecting filters<br>• Safety lenses-Toughened lenses, Laminated Lenses, CR 39, Polycarbonate lenses |
| 4. | Multifocal Lenses:<br>• Introduction, history and development, types<br>• Bifocal lenses, Trifocal & Progressive addition lenses |
| 5. | Reflection from spectacle lens surface & lens coatings:<br>• Reflection from spectacle lenses - ghost images -Reflections in bifocals at the dividing line<br>• Antireflection coating, Mirror coating, Hard Multi Coating [HMC], Hydrophobic coating |
| 6. | Miscellaneous Spectacle:<br>• Iseikonic lenses<br>• Spectacle magnifiers<br>• Recumbent prisms<br>• Fresnel prism and lenses<br>• Lenticular &Aspherical lenses<br>• High Refractive index glasses |

**DISPENSING OPTICS**

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

**TEXT BOOK/REFERENCE BOOKS:**


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


**VISUAL OPTICS II:**

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

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

**COURSE PLAN:**

| Sl. No | Topics |
|---|---|
| 1. | **Accommodation & Presbyopia**<br>• Far and near point of accommodation<br>• Range and amplitudeof accommodation<br>• Mechanism of accommodation<br>• Variation of accommodationwithage<br>• Anomalies of accommodation<br>• Presbyopia<br>• Hypermetropia and accommodation |
| 2. | **Convergence:**<br>• Type, Measurement and Anomalies<br>• Relationship between accommodation and convergence-AC/A ratio |
| 3. | **Objective Refraction (Static & Dynamic)**<br>• Streak retinoscopy<br>• Principle, Procedure, Difficulties and interpretation of findings<br>• Transposition and spherical equivalent<br>• Dynamic retinoscopy various methods<br>• Radical retinoscopy and near retinoscopy<br>• Cycloplegic refraction |
| 4. | **Subjective Refraction:**<br>• Principle and fogging<br>• Fixed astigmatic dial(Clock dial),Combinationof fixed and rotatordial(Fan and block test),J.C.C<br>• Duochrome test<br>o Binocular balancing- alternate occlusion, prism dissociation, dissociate Duochrome balance, Borish dissociated fogging<br>o Binocular refraction-Various techniques |
| 5. | **Effective Power &Magnification** :<br>• Ocular refraction vs. Spectacle refraction<br>• Spectacle magnification vs. Relative spectacle magnification<br>• Axial vs. Refractive ammetropia, Knapp's law<br>• Ocular accommodation vs. Spectacle accommodation<br>• Retinal image blur-Depth of focus anddepth of field |

**TEXT BOOK/REFERENCE BOOKS:**


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

Heinemann, Missouri, USA,2006

## OCULAR DISEASE II:

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

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

**COURSE PLAN :**

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

| | |
|---|---|
| 2. | **Ocular Injuries: Terminology** : Closed globe injury ( contusion, lamellar laceration) Open globe injury ( rupture, laceration, penetrating injury, perforating injury)<br>• Mechanical injuries ( Extraocular foreign body, blunt trauma, perforating injury, sympathetic ophthalmitis)<br>• Non Mechanical Injuries ( Chemical injuries, Thermal, Electrical, Radiational)<br>• Clinical approach towards ocular injury patients |
| 3. | **Lens**<br>• Applied Anatomy and Physiology<br>• Clinical examination<br>• Classification of cataract<br>• Congenital and Developmental cataract<br>• Acquired ( Senile, Traumatic, Complicated, Metabolic, Electric, Radiational, Toxic)<br>• Morphological: Capsular, Subcapsular, Cortical, Supranuclear, Nuclear, Polar.<br>• Management of cataract ( Non-surgical and surgical measures; preoperative evaluation, Types of surgeries,)<br>• Complications of cataract surgery<br>• Displacement oflens: Subluxation, Displacement<br>• Lens coloboma, Lenticonus, Microsperophakia. |
| 4. | **Clinical Neuro-ophthalmology**<br>• Anatomy of visual pathway<br>• Lesions of the visual pathway<br>• Pupillary reflexes and abnormalities (Amaurotic light reflex, Efferent pathway defect, Wernicke's hemianopic pupil, Marcus gunn pupil. Argyll Robetson pupil, Adie's tonic pupil)<br>• Optic neuritis, Anterior Ischemic optic neuropathy, Pappilloedema, optic atrophy<br>• Cortical blindness<br>• Malingering<br>• Nystagmus<br>• Clinical examination |
| 5. | **Glaucoma**<br>• Applied anatomy and physiology of anterior segment<br>• Clinical Examination<br>• Definitions and classification of glaucoma<br>• Pathogenesis of glaucomatous ocular damage<br>• Congenital glaucoma's<br>• Primary open angle glaucoma<br>• Ocular hypertension<br>• Normal Tension Glaucoma<br>• Primary angle closure glaucoma ( Primary angle closure suspect, Intermittent glaucoma, acute congestive, chronic angle closure)<br>• Secondary Glaucoma's<br>• Management : common medications, laser intervention and surgical techniques |

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

**REFERENCE BOOKS:**

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

## PATHOLOGY

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

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

**COURSE PLAN**

**Inflammation and repair**

1. Infection in general
2. Specific infections
   - 2.1 Tuberculosis
   - 2.2 Leprosy
   - 2.3 Syphilis
   - 2.4 Fungal infection
   - 2.5 Viral chlamydial infection
3. Neoplasia
4. Haematology
   - 4.1 Anemia
   - 4.2 Leukemia
   - 4.3 Bleeding disorders
5. Circulatory disturbances
   - 5.1 Thrombosis
   - 5.2 Infarction
   - 5.3 Embolism
6. Clinical pathology
   - 6.1 Interpretation of urine report
   - 6.2 Interpretation of blood smears.
7. Immune system
8. Shock, Anaphylaxis.
9. Allergy

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

**REFERENCE BOOKS:**

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

## OPTOMETRICINSTRUMENTS

**OBJECTIVES**: Upon completion of the course, the student should be able to gain theoretical knowledge and basic practical skill in handling the following instruments

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

**COURSE PLAN**

1. Refractive instruments
   - 1.1 Optotypes and MTF, Spatial Frequency
   - 1.2 Test charts standards.
   - 1.3 Choice of test charts
   - 1.4 Trial case lenses
   - 1.5 Refractor (phoropter) head units
   - 1.6 Optical considerations of refractor units
   - 1.7 Trial frame design
   - 1.8 Near vision difficulties with units and trial frames
   - 1.9 Retinoscope – types available
   - 1.10 Adjustment of Retinoscopes- special features
   - 1.11 Objective optometers.
   - 1.12 Infrared optometer devices.
   - 1.13 Projection charts
   - 1.14 Illumination of the consulting room.
   - 1.15 Brightness acuity test
   - 1.16 Vision analyzer
   - 1.17 Pupilometer
   - 1.18 Potential Acuity Meter
   - 1.19 Abberometer
2. Ophthalmoscopes and related devices
   - 2.1 Design of ophthalmoscopes – illumination
   - 2.2 Design of ophthalmoscopes- viewing

2.3 Ophthalmoscope disc

2.4 Filters for ophthalmoscopy

2.5 Indirect ophthalmoscope

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

**TEXT BOOK:**

David Henson: Optometric Instrumentations, Butterworth- Heinnemann, UK,1991

**REFERENCE BOOKS:**


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


**CLINICAL OPTOMETRY III (STUDENTSHIP)**

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

## FIFTH SEMESTER

## CONTACT LENSES

## I

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

11. Understand the basics of contact lenses
12. List the important properties of contact lenses
13. Finalise the CL design for various kinds patients
14. Recognize various types of fitting
15. Explain all the procedures to patient
16. Identify and manage the adverse effects of contact lens

**COURSE PLAN**

3. Introduction to Contact lenses
   - Definition
   - Classification / Types
4. History of Contact Lenses
5. Optics of Contact Lenses
   - Magnification & Visual field
   - Accommodation & Convergence
   - Back & Front Vertex Power / Vertex distance calculation
6. Review of Anatomy & Physiology of
   - Tear film
   - Cornea
   - Lids & Conjunctiva
7. Introduction to CL materials
   - Monomers, Polymers
8. Properties of CL materials
   - Physiological (Dk, Ionicity, Water content)
   - Physical (Elasticity, Tensile strength, Rigidity)
   - Optical (Transmission, Refractive index)
9. Indications and contraindications
10. Parameters / Designs of Contact Lenses & Terminology
11. RGP Contact Lens materials
12. Manufacturing Rigid and Soft Contact Lenses – various methods
13. Pre-Fitting examination – steps, significance, recording of results
14. Correction of Astigmatism with RGP lens
15. Types of fit – Steep, Flat, Optimum – on spherical cornea with spherical lenses
16. Types of fit – Steep, Flat, Optimum – on Toric cornea with spherical lenses
17. Calculation and finalising Contact lens parameters
18. Ordering Rigid Contact Lenses – writing a prescription to the Laboratory

19. Checking and verifying Contact lenses from Laboratory
20. Modifications possible with Rigid lenses

21. Common Handling Instructions
    - Insertion & Removal Techniques
    - Do's and Dont's
22. Care and Maintenance of Rigid lenses
    - Cleaning agents & Importance
    - Rinsing agents & Importance
    - Disinfecting agents & importance
    - Lubricating & Enzymatic cleaners
23. Follow up visit examination
24. Complications of RGP lenses

**TEXT BOOKS:**

1.Anthony J. Phillips : Contact Lenses, 5thedition, 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, 3rd edition, Lippincott Williams and Wilkins, 2008

## LOW VISION CARE

**COURSE OBJECTIVES:** At the end of the course, the student will be knowledgeable in thefollowing:

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

**COURSE PLAN:**

1. Definitions & classification of Low vision 2.Epidemiology of low vision
3. Model of low vision service
4. Pre-clinical evaluation of low vision patients – prognostic & psychological factors; psycho-social impact of low vision
5. Types of low vision aids – optical aids, non-optical aids & electronic devices
6. Optics of low vision aids
7. Clinical evaluation – assessment of visual acuity, visual field, selection of low vision aids, instruction & training
8. Pediatric Low Vision care
9. Low vision aids – dispensing & prescribing aspects
10. Visual rehabilitation &counseling
11. Legal aspects of Low vision in India
12. Case Analysis

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

## GERIATRIC OPTOMETRY & PAEDIATRIC OPTOMETRY

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

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

**COURSE PLAN**

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

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

**REFERENCE BOOKS:**

1. OP Sharma: Geriatric Care –A textbook of geriatrics and Gerontology, viva books, NewDelhi, 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 olderpatient, Printers Castle, Cochin, 2002.

## PEDIATRIC OPTOMETRY

**COURSE OBJECTIVES:** At the end of the course the student is expected to:

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

development

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

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

**COURSE PLAN**

- The Development of Eye and Vision
- History taking Paediatric subjects
- Assessment of visual acuity
- Normal appearance, pathology and structural anomalies of
  - Orbit, Eye lids, Lacrimal system,
  - Conjunctiva, Cornea, Sclera Anterior chamber, Uveal tract, Pupil
  - Lens, vitreous, Fundus Oculomotor system
- 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
- Paediatric eye disorders : Cataract, Retinopathy of Prematurity, Retinoblastoma,Neuromuscular conditions (myotonic dystrophy, mitochondrialcytopathy), and Genetics
- Anterior segment dysgenesis, Aniridia, Microphthalmos, Coloboma, Albinism
- Spectacle dispensing for children
- Paediatric contact lenses
- Low vision assessment in children

**TEXT BOOKS:**

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

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

## BINOCULAR VISION I

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

- Demonstrate an in-depth knowledge of the gross anatomy and physiology relating

to theextraocular muscles.

- Provide a detailed explanation of, and differentiate between the etiology, investigation andmanagement of binocular vision anomalies.
- Adapt skills and interpret clinical results following investigation of binocular vision anomalies appropriately and safely.

**COURSE PLAN**

- 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.
- 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
- Donder's and Listing's law
- Sherrington's law
- Hering's law
- Uniocular& 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.
- 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:**

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

## SYSTEMIC DISEASES

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

- ➢ Common Systemic conditions: Definition, diagnostic approach, complications andmanagement options
- ➢ Ocular findings of the systemic conditions
- ➢ First Aid knowledge

**COURSE PLAN**

1. Hypertension
   - Definition, classification, Epidemiology, clinical examination, complications, andmanagement.
   - Hypertensive retinopathy
2. Diabetes Mellitus
   - Classification, pathophysiology, clinical presentations,diagnosis, and management,Complications

- Diabetic Retinopathy

3. Thyroid Disease
   - Physiology, testing for thyroid disease, Hyperthyroidism, Hypothroidism, Thyroiditis,Thyroid tumors
   - Grave's Ophthalmopathy
4. Acquired Heart Disease
   - Ischemic Heart Disease, Congestive heart failure, Disorders of cardiac rhythm
   - Ophthalmic considerations
5. Cancer :
   - Incidence
   - Etiology
   - Therapy
   - Ophthalmologic considerations
   - Connective Tissue Disease
   - Rheumatic arthritis
   - Systemic lupus erythematosus
   - Scleroderma
   - Polymyositis and dermatomyositis
   - Sjogren syndrome
   - Behcet's syndrome
   - Eye and connective tissue disease
6. Tuberculosis
   - Aetiology, pathology, clinical features, pulmonary tuberculosis, diagnosis,complications, treatment tuberculosis and the eye.
7. Herpes virus ( Herepes simplex, Varicella Zoster, Cytomegalovirus, Epstein Barr Virus)
   - Herpes and the eye
8. Hepatitis ( Hepatitis A, B, C)
9. Acquired Immunodeficiency Syndrome
10. Anemia ( Diagnosis, clinical evaluation, consequences, Sickle cell disease, treatment,Ophthalmologic considerations)
11. Common Tropical Medical Ailments
    - Malaria
    - Typhoid
    - Dengue
    - Filariases
    - Onchocerciasis
    - Cysticercosis
    - Leprosy
12. Nutritional and Metabolic disorders:
    - Obesity
    - Hyperlipidaemias
    - Kwashiorkor
    - Vitamin A Deficiency

- Vitamin D Deficiency
- Vitamin E Deficiency
- Vitamin K Deficiency
- Vitamin B1,B2, Deficiency
- Vitamin C Deficiency

13. Myasthenia Gravis
14. First Aid
    General Medical Emergencies
    Preoperative precautions in ocular surgeries
15. Psychiatry
    - Basic knowledge of psychiatric condition and Patient Management
16. 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.

**TEXT BOOKS:**

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

## RESEARCH METHODOLOGY AND BIOSTATISTICS

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

**COURSE PLAN**

**Research Methodology**

- Introduction to research methods
- Identifying research problem
- Ethical issues in research
- Research design
- Types of Data
- Research tools and Data collection methods
- Sampling methods
- Developing a research proposal

**Biostatistics**

- Basics of Biostatistics
  - Introduction of Biostatistics
  - Measures of Morality
  - Sampling
  - Statistical significance
  - Correlation
  - Sample size determination.
  - Statistics –Collection of Data - presentation including classification and diagrammatic representation –frequency distribution. Measures of central tendency; measures of dispersion.
  - Theoretical distributions.
  - Binomial
  - Normal
  - Sampling –necessity of methods and technique
  - Chi. Square test (2 x 2)
- Hospital Statistics
- Use of computerized software for statistics

**TEXT BOOKS:**

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

**CLINICAL OPTOMETRY IV (STUDENTSHIP)**

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

**Sixth Semester**

**CONTACT LENSES**

**II**

**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

**COURSE PLAN:**

1.SCL Materials & Review of manufacturing techniques

2.Comparison of RGP vs. SCL

3. Pre-fitting considerations for SCL

4. Fitting philosophies for SCL

5. Fit assessment in Soft Contact Lenses: Types of fit – Steep, Flat, Optimum 6.Calculation and finalising SCL parameters

- Disposable lenses
- Advantages and availability

7. Soft Toric CL

- Stabilization techniques
- Parameter selection
- Fitting assessment

8. Common Handling Instructions

- Insertion & Removal Techniques
- Do's and Dont's

9. Care and Maintenance of Soft lenses

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

10.Follow up visit examination

11.Complications of Soft lenses

12.Therapeutic contact lenses

- Indications
- Fitting consideration

13.Specialty fitting

- Aphakia
- Pediatric
- Post refractive surgery

14.Management of Presbyopia with Contact lenses

**TEXT BOOKS:**

1. Anthony J. Phillips : Contact Lenses, 5thedition, 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, 3rd edition, Lippincott Williams and Wilkins, 2008

## BINOCULAR VISION II

**COURSE OBJECTIVES:** The objective of this course is ,

- To inculcate the student with the knowledge of different types of strabismus its etiology signs and symptoms, necessary investigations and also management.
- The student able to independently investigate and diagnose case of strabismus with comments in respect to retinal correspondence and binocular single vision.
- The student should be able to perform all the investigations to check retinalcorrespondence, state of Binocular Single Vision, angle of deviation and special investigations forparalytic strabismus.

**COURSE PLAN:**

- Neuro-muscular anomalies
  - Classification and etiological factors
- History – recording and significance.
- Convergent strabismus
  - Accommodative convergent squint
    - Classification
    - Investigation and Management
  - Non accommodative Convergent squint
    - Classification
    - Investigation and Management
- Divergent Strabismus
  - Classification
  - A& V phenomenon
  - Investigation and Management
- Vertical strabismus
  - Classification
  - Investigation and Management
- 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
- Amblyopia and Treatment of Amblyopia
- Nystagmus

- Non-surgical Management of Squint
- 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:**


- Pradeep Sharma: Strabismus simplified, New Delhi, First edition, 1999, Modern publishers.
- Fiona J. Rowe: Clinical Orthoptics, second edition, 2004, Blackwell Science Ltd
- Gunter K. Von Noorden: BURIAN- VON NOORDEN'S Binocular vision and ocular motility theory and management of strabismus, Missouri, Second edition, 1980, C. V. Mosby Company
- Mitchell Scheiman; Bruce Wick: Clinical Management of Binocular Vision Heterophoric, Accommodative, and Eye Movement Disorders, 2008, Lippincot Williams & Wilkins publishers


## PUBLIC HEALTH AND COMMUNITY OPTOMETRY

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

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

**COURSE PLAN**

- Public Health Optometry: Concepts and implementation, Stages of diseases
- 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
- Community Eye Care Programs
- Community based rehabilitation programs
- Nutritional Blindness with reference to Vitamin A deficiency

- Vision 2020: The Right to Sight
- 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
- 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:**

1. GVS Murthy, S K Gupta, D Bachani: The principles and practice of community Ophthalmology, National programme for control of blindness, New Delhi, 2002
2. Newcomb RD, Jolley JL : Public Health and Community Optometry, Charles C ThomasPublisher, Illinois, 1980
3.K Park: Park's Text Book of Preventive and Social Medicine, 19th edition, 4.Banarsidas Bhanot publishers, Jabalpur, 2007

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

## PRACTICE MANAGEMENT

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

**COURSE PLAN**

1. Business Management:
    - Practice establishment and development
    - Stock control and costing
    - Staffing and staff relations
    - Business computerization
2. Accounting Principles
    - Sources of finance
    - Bookkeeping and cash flow
3. Taxation and taxation planning 4.Professionalism and Values
    - Professional values- Integrity, Objectivity, Professional competence and due care,Confidentiality
    - Personal values- ethical or moral values
    - Attitude and behaviour- professional behaviour, treating people equally
    - Code of conduct , professional accountability and responsibility, misconduct
    - Differences between professions and importance of team efforts

- Cultural issues in the healthcare environment

## OCCUPATIONAL OPTOMETRY

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

1. In visual requirements of jobs;
2. In effects of physical, chemical and other hazards on eye and vision;
3. To identify occupational causes of visual and eye problems;
4. To be able to prescribe suitable corrective lenses and eye protective wear and
5. To set visual requirements, standards for different jobs.

**COURSE PLAN:**

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

Act. 2.Electromagnetic Radiation and its effects on Eye

3. Light – Definitions and units, Sources, advantages and disadvantages, standards
4. Color – Definition, Color theory, Color coding, Color defects, Color Vision tests
5. Occupational hazards and preventive/protective methods
6. Task Analysis
7. Industrial Vision Screening – Modified clinical method and Industrial Vision test
8. Vision Standards – Railways, Roadways, Airlines
9. Visual Display Units
10. Contact lens and work

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

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

## MEDICAL LAW AND ETHICS

Legal and ethical considerations are firmly believed to be an integral part of medical practice in planning patient care. Advances in medical sciences, growing sophistication of the

modern society's legal framework, increasing awareness of human rights and changing

moral principles of the community at large, now result in frequent occurrences of healthcare professionals being caught in dilemmas over aspects arising from daily practice.

Medical ethics has developed into a well based discipline which acts as a "bridge" between theoretical bioethics and the bedside. The goal is "to improve the quality of patient care by identifying, analyzing, and attempting to resolve the ethical problems that arise in practice". Doctors are bound by, not just moral obligations, but also by laws and official regulations that form the legal framework to regulate medical practice. Hence, it is now a universal consensus that legal and ethical considerations are inherent and inseparable parts of good medical practice across the whole spectrum.

**COURSE PLAN**

Few of the important and relevant topics that need to focus on are as follows:

1. Medical ethics - Definition - Goal -
Scope 2.Introduction to Code of conduct
3. Basic principles of medical ethics –Confidentiality
4. Malpractice and negligence - Rational and irrational drug therapy
5. Autonomy and informed consent - Right of patients
6. Care of the terminally ill- Euthanasia
7. Organ transplantation
8. Medico legal aspects of medical records –Medico legal case and type- Records and document related to MLC - ownership of medical records - Confidentiality Privilege communication - Release of medical information - Unauthorized disclosure - retention of medical records - other various aspects.
9. Professional Indemnity insurance policy
10. Development of standardized protocol to avoid near miss or sentinel events
11. Obtaining an informed consent.

**CLINICAL OPTOMETRY V (STUDENTSHIP)**

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

**Seventh and Eighth Semester**

The internship time period provides the students the opportunity to continue to develop confidence and increased skill in diagnosis and management. Students will demonstrate competence in beginning, intermediate, and advanced procedures in above areas. Students will participate in advanced and specialized treatment procedures. The student will complete the clinical training by practicing all the skills learned in classroom and clinical instruction. The students are expected to work for minimum 6 hours per day and this may be more depending on the need and the healthcare setting.

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

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

**RESEARCHPROJECT/DISSERTATION**

Team of students will be doing a research project under the guidance of a supervisor ( who could be optometrists/vision sci enti sts/ ophthal mologist). Stud ent will get the e xperienc e of doing a research in systematic approach – identifying the primary question, literature search, identifying the gaps in the literature, identifying the research question, writing up the research proposal, data collection, data analysis, thesis writing and presentation. Project is spread through sixth to eighth semester.

***Skills based outcomes and indicators to be monitored for Optometrist***

**First year:**

- Role play
- Clinical Observations
- Vision Check
- Basic Lensometry

**Second year:**

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

**Third year:**

1. Clinical Observation
2. Hands-on under senior optometrists
3. Case reporting
4. Case discussion
5. Vision screening camps
6. Diagnostic interpretations

**Internship:**

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

| Semester | Procedures | Minimum Number | Comments |
|---|---|---|---|
| I year ( 2nd Semester) **CLINIC - I** | Role Play ( Patient- Optometrist) | 3 cases | |
| | Clinical Observation and Report writing | 6 cases | |
| | Vision Check ( Snellen's Chart) –Distance + Near | 12 cases | |
| | Lensometry (Spherical lenses) | | |
| II year (1st Semester) **CLINIC -II** | History taking<br>- General<br>- Specific<br>- Conditions | 9 cases | Can practice on the following complaints : Blurred Vision , Headache, Pain, redness, Watering, Flashes, Floaters,Blackspots |
| | Lensometry | 100 cases | Simple Sphere, Simple cylinder,Spherocylinder (90, 180, Oblique degrees), Bifocals,PAL |
| | Vision Check ( log MAR) Pinhole acuity | 100 cases | Simulation, especially to show and ask the students to interpret the findings. |
| | Extraocular Motility | 10 cases | |
| | Cover test | 10 cases | Video output Simulation ofvarious conditions |
| | Alternate Cover test | 10 cases | Video output Simulation ofvarious conditions |
| | Hirschberg test | 10 cases | Video output Simulation of various conditions |
| | Modified Krimsky test | 3 cases | Video output Simulation of various conditions |
| | Push up test (Amplitude of | 10 cases | |
| | Accommodation) | (1 case in presbyopic age) | |
| | Push up test ( Near point of Convergence) | 10 cases | |
| | Stereopsis test | 10 cases | |
| | Tear Break up time | 10 cases | |

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| | Amsler's Grid test | 10 cases (simulate) | Simulation of variousconditions |
| | Photostress test | 10 cases ( Normals) | |
| | Color vision test | 10 cases | |
| | Schirmer's test | 10 cases | |
| | Confrontation test | 10 cases | |
| | Slit lamp illumination | 3 cases | |
| | Slit lamp examination | 10 cases | |
| | Finger tension | 10 cases (Normals) | |
| | Schiotz Tonometry | 10 cases (Normals) | |
| | Applanation Tonometry | 10 cases (Normals) | |
| | Negative Relative Accommodation | 10 cases | |
| | Positive Relative Accommodation | 10 cases | |
| | von Herick Grading of Anterior chamber depth | 10 cases | |
| | Accommodative facility(± 2.00 D) | 10 cases | |
| | Corneal Sensitivity test | 10 cases | |
| | IPD | 10 cases | |
| | Proptosis evaluation | 1 demo | Video demonstration of cases |
| | Ptosis evaluation | 1 demo | Video demonstration of cases |
| | Pupillary evaluation -Direct -Consensual -RAPD | 10 cases | |
| | HVID | 10 cases | |
| | Maddox rod (Phoria) | 10 cases | |
| | Negative Fusional vergence | 10 cases | |
| | Positive Fusional Vergence | 10 cases | |
| II year ($2^{nd}$ semester) **CLINIC-III** | Retinoscopy- Static, Dynamic and Cycloplegic Retinoscopy | 25 + 25 +25 cases | Model eye for retinoscopy. |
| | Keratometry | 25 cases | |
| | Subjective Refraction JCC Clock Dial Duochrome Borish Delayed | 25 cases | |

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| | Addition calculation | 25 cases | Give more simulated problems and discuss on it |
| III year (1st semester) **CLINIC IV** | Direct ophthalmoscope | 10 cases ( Normals) | Show slides of variouscommonly seen retinal conditions |
| | Visual Field chart interpretation | 10 cases – discussion | Both kinetic and Static |
| | B scan Interpretation | 10 cases – discussion | |
| | A scan chart Interpretation | 10 cases – discussion | Discussion having different types of wave patterns |
| | Case Analysis | 10 cases | |
| | +90 D lens | 10 cases ( Normals) | Slides of various Cup: Discratios can be shown |
| III year (2nd semester) **CLINIC V** | Gonioscopy | 5 cases ( Normals) | Slides of abnormal angles |
| | Posting in optometry clinics | 5+5+5+5+10 cases | Pediatric/contact lens/Low vision/ Orthoptics/ GOPD |
| | Camps | 4 camps | School screening, Cataract |
| | IDO (on each other) | 10 cases(Normals) | Slides of abnormal fundus |
| | Case Analysis - | 5+ 5+ 5+ 5 cases | Pathology<br>Binocular Vision<br>Clinical Refraction<br>Dispensing optics |
| IVyear **CLINICAL INTERNSHIP** | General OPD (History taking –DO) | 500 cases | Weekly 1 case report submission |
| | Contact Lens | 20 cases ( 5 RGP+ 5 Soft + 5 toric ) | Totally 3 different case reportssubmission at the end of the postings |
| | Opticals | 100 cases | Weekly 1 case report submission |
| | Low Vision care Clinic | 10 cases | Totally 3 different case reports submission at the end of thepostings |
| | Binocular Vision clinic | 10 cases | Totally 3 different case reports submission at the end of thepostings |

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| | Ophthalmology clini c(Common eye conditions) | 50 cases | Totally 3 different case reportssubmission at the end of the postings |
| | Camps | 10 camps | Camp report submission |

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