



**YENEPOYA**

(DEEMED TO BE UNIVERSITY)

Recognized under Sec 3(A) of the UGC Act 1956

Accredited by NAAC with 'A' Grade

## **YENEPOYA (DEEMED TO BE UNIVERSITY)**

**Deralakatte, Mangaluru -575018**

### **REGULATIONS AND CURRICULUM GOVERNING**

### **UNDERGRADUATE PROGRAM**

### **B.Sc OPTOMETRY**

**(REVISED CURRICULUM – AMENDED UP TO 2020)**

**ATTESTED**

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Ref: No. Y/REG/ACA/38-ACM/2020

14.05.2020

**NOTIFICATION – 38-ACM/12 /2020 dtd. 14.05.2020**

Sub: Revised curriculum of the existing B.Sc. (Tech) programmes and Starting of additional programmes under the Faculty of Allied and Healthcare Professions

Ref: Resolution of the Academic council at its 38<sup>th</sup> meeting held on 27.04.2020, vide agenda - 23

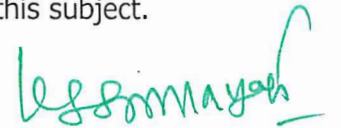
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The Academic Council at its 38<sup>th</sup> meeting held on 27.04.2020 and subsequently the Board of Management at its 49<sup>th</sup> meeting held on 30.04.2020 have resolved to approve the revised curricula and regulations of existing 08 B.Sc. Technology Programmes (Anaesthesia & O.T. Technology, Renal Dialysis Technology, Respiratory Care Technology, Medical Laboratory Technology, Medical Imaging Technology, Cardio Vascular Technology, Perfusion Technology, Optometry Technology) and starting of 04 new programmes under the Faculty of Allied & Healthcare Professions

1. B.Sc. in Physician Assistant
2. B.Sc. in Clinical Psychology
3. B.Sc. in Emergency Medicine Technology
4. B.Sc. in Neuro Science Technology

All these programmes shall follow Choice Based Credit System.

This notification will supersede all the earlier notifications issued on this subject.



**REGISTRAR**  
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CC to:

1. Dean, Faculty of Allied and Healthcare Professions
2. Controller of Examinations
3. File copy

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**Yenepoya (Deemed to be) University,  
Regulations & programme curriculum for  
B.Sc. Optometry under Choice Based Credit System.**

## **1. Preamble**

Health care sector has become one of the largest employment generation sectors in India and abroad. Rapidly changing and expanding horizon of the health care sector demands formal training programs in all its allied areas. Advanced complex instrumentation & equipment require technologists not only to operate but also to care & maintain these instruments and equipment. These technologists should possess a strong scientific foundation to be able to perform these tasks at a much higher level than the traditionally trained technicians of the past used to perform. The students who are trained in the technological aspects of medical care with a good scientific foundation will be in a position to competently assist the Physician or Surgeon. Hence to prepare the students to meet the demands of the healthcare sector and in accordance with Ministry of Human Resource Development (HRD), Govt. of India education system, Choice based Credit system is introduced from the academic year 2020- 21 onwards.

BSc Optometry is undergraduate program in the field of health care concerned with the examination, diagnosis and management of the disorders of the optical system of the eye.

Optometrists play an important multidimensional role in the functioning of eye clinics and hospitals. The program is envisaged to develop a multipurpose paramedical ophthalmic manpower competent in providing service as an Optician, Optometrist, refractionist and Ophthalmic Assistant to the community in urban, semi-urban and rural settings in private, semi- Governmental and Governmental sectors.

- They test for refractive errors, prescribe and dispense optical corrections and low vision aids;
- They assist in the diagnosis and management of disorders of binocular vision;
- They assist the ophthalmologist in managing various ocular disease in the out-patient, in-patient departments
- They assist in conduct of community eye health programs.

The importance of optometrists has been increasing steadily owing to the rapid advances in instrumentation in the diagnosis and management of ophthalmological conditions. In India, the high prevalence of ocular conditions like cataract, glaucoma, refractive errors and diabetic retinopathy require a pro-active community approach in alignment with the National Program for Control of Blindness.

Several institutes in India, conduct certificate programs, diploma, graduate and post-graduate programs in optometry. These programs are regulated by Universities and paramedical boards. Whereas, the certificate and diploma programs offer training at the basic level, both theoretical and practical, the graduate and post-graduate degrees have advanced training of the students in all aspects of optometry.

Choice based Credit System is a flexible system of learning. The distinguishing features of CBCS are following:

- It permits students to learn at their own pace.
- Choose Electives from a wide range of Elective courses offered by the other departments/university.
- Undergo additional courses acquire more than the required number of credits.
- Adopt an Inter-disciplinary and Intra-disciplinary approach in learning.
- Make best use of the available expertise of the faculty across the departments or disciplines.
- Has an inbuilt evaluation system to assess the analytical and creative skills of students in addition to the conventional domain knowledge assessment pattern.

## **2. Programme Outcome:**

Upon successful completion of the undergraduate course, students will have developed a broad knowledge in the field of evaluation, diagnosis and management of different conditions of the eye.

In particular they will be:

PO 1: Able to Practice Independently

PO 2: Able to Perform Detailed evaluation of refractive errors

PO 3: Able to provide Prescription of optical corrections including spectacles, contact lenses and prisms

PO4: Able to Diagnose common ocular disorders and their management

PO 5: Able to know Application, use and maintenance of common ophthalmic equipment, instruments and lenses.

PO 6: Able to perform Diagnosis and orthoptic management of common disorders of binocular vision

PO 7: Able to Perform Counselling of patients for common ophthalmic conditions

## **Expected skill to be acquired by the end of the programme:**

PO 8: Skill in diagnosis, treatment planning and management of visual defects & impairments and in supporting the managements of ocular conditions.

PO 9: Work independently or in concurrence with eye care and other health care professionals

PO 10: To effectively participate in implementation of national health programs and other public health projects.

### 3. Duration of the Programme:

The duration of the programme shall extend over 8 semesters (three academic years with one year internship) each semester comprising minimum of 15 weeks with the minimum of 90 actual working days of instruction in each semester. The successful completion of the Undergraduate program, along with internship as applicable will lead to Bachelor's degree in Optometry (B.Sc Optometry).

### 4. Semester:

An academic year shall consist of two semesters;

Odd Semester 1 <sup>st</sup> , 3 <sup>rd</sup> , 5 <sup>th</sup> & 7 <sup>th</sup>	July/August to December/January
Even semester 2 <sup>nd</sup> , 4 <sup>th</sup> , 6 <sup>th</sup> & 8 <sup>th</sup>	January/February to June/July

### 5. Medium of Instructions:

The medium of instruction and examination shall be English.

### 6. Eligibility for admission:

To be eligible for admission in B. Sc Optometry, a candidate should have passed two-years Pre University examination/ Pre Degree examination/ two years after ten years of schooling or its equivalent as recognized by the Yenepoya (Deemed to be) University with Physics, Chemistry and Biology as principal courses of study.

Candidate needs to secure 40% or above marks in the qualifying examination to be eligible for admission. For SC/ST/OBC candidates minimum marks required in the qualifying exam is 35% marks.

### 7. Semester System and Choice Based Credit System:

The semester system accelerates the teaching-learning process. The credit-based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice-based credit system provides a cafeteria 'type approach in which the students can take courses of their choice, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning.

## 8. Definition of Key words:

- a. **Academic Year:** Two consecutive (one odd + one even) semesters constitute one academic year.
- b. **Choice Based Credit System:** The CBCS provides choice for students to select from the prescribed courses (Core, Ability Enhancement, Skill enhancement, Self-learning, Discipline Specific courses).
- c. **Course:** Usually referred to, as “papers” is a component of a programme. The courses shall define learning objectives and learning outcomes. A course shall comprise lectures/ tutorials/ laboratory work/ field work/ outreach activities/ project work/ vocational training/viva/ seminars/ term papers/assignments/ presentations/ self-study etc. or a combination of some of these.
- d. **Credits:** Credit defines the quantum of contents/syllabus prescribed for a course and determines the number of hours of instruction required per week. Thus, normally in each of the courses, credits will be assigned on the basis of the number of lectures/tutorial laboratory work and other forms of learning required, to complete the course contents in a 15-20week schedule: One credit =1 hour of lecture per week/ two hours of Laboratory or practical/three hours of clinical rotation, field work/posting. All courses need not carry the same credits.

	<b>Lecture - L</b>	<b>Tutorial - T</b>	<b>Practical - P</b>	<b>Clinical Training/ Rotation CT/CR</b>
1 Credit	1 Hour	1 Hour	2 Hours	3-5 Hours

- e. **Programme:** An educational program leading to award of a degree, diploma or certificate.
- f. **Grade Point:** It is a numerical weight allotted to each letter grade on a 10-point scale.
- g. **Credit Point:** It is the product of grade point and number of credits for a course.
- h. **Cumulative Grade Point Average (CGPA):** It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the

total credits of all courses in all the semesters. It is expressed up to two decimal places.

- i. **Letter Grade:** It is an index of the performance of students in a said course. Grades are denoted by letters: O,A+, A, B+, B, C, P, F,AB.
- j. **Semester Grade Point Average (SGPA):** It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.
- k. **Transcript or Grade Card or Certificate:** Based on the grades earned, a grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the course details (code, title, number of credits, grade secured) along with SGPA of that semester.
- l. **Semester System and Choice Based Credit System:** The semester system accelerates the teaching-learning process. The credit-based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice-based credit system provides a cafeteria 'type approach in which the students can take courses of their choice, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning.

## 9. Types of Courses

Courses in a programme may be of three kinds:

- Core Course
- Ability Enhancement Compulsory Course (Foundation course)
- Elective Course

**9.1 Core Course:** A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. This is the course which is to be compulsorily studied by a student as a core requirement to complete the program of study in a said discipline.

**9.2 Ability Enhancement Compulsory Courses (AECC):** Ability enhancement compulsory courses (AECC) are the courses based upon the content that leads to knowledge enhancement. Example:

1. Environmental science
2. English/ MIL communication



These are mandatory for all disciplines.

### 9.3 Elective Course (EC):

9.3.1 Generic elective

9.3.2 Skill enhancement course

9.3.3 Self-learning courses (SWAYAM/MOOC)

9.3.4 Discipline Specific Elective courses

**9.3.1 Generic elective:** An Elective Course chosen from pool of courses which are unrelated from unrelated discipline/subject with intention to seek exposure beyond disciplines of choice. The purpose of this is to offer the students the option to explore disciplines of interest beyond the choices they make in core and discipline specific elective courses.

**9.3.2: Skill enhancement course:** SEC courses are value-based and/or skill- based and are aimed at providing hands-on-training, competencies and skills. These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge.

**9.3.3: Self – learning course:** with respect to- UGC (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2021. New Delhi, the 25th March, 2021. Vide No.F.1-100/2016 (MOOCs/e-content)

The List of MOOCS (Massive open online courses) and SWAYAM (Study webs of active learning for young aspiring minds) will be finalized by the faculty of allied health professions as per subject to time-to-time UGC notification and will be submitted to the academic council of the DU. Yenepoya (Deemed to be university) shall adopt the regulation of UGC governing MOOCS/ SWAYAM courses as amended from time to time.

The college/ department will designate course coordinator/facilitator to guide the students throughout the course to facilitate the completion of the chosen course.

#### 9.3.3.1 Evaluation and Certification of MOOCs:

Evaluation will be based on predefined norms and parameters and announced in the overview of the Course at the time of offering the course. Formative continuous online assessments and end of course proctored exams shall be completed by the student.

The Yenepoya (Deemed to be) University incorporate the marks/grade obtained by the student, as communicated by the Host Institution through the PI of the SWAYAM course in the marks sheet of the student that counts for final award of the degree by the University.

### **9.3.3.2 Credit Mobility of MOOCs:**

The Yenepoya(Deemed to be) University will give the equivalent credit weightage to the students for the credits earned through online learning courses through SWAYAM platform in the credit plan of the program.

In case a student fails to complete the MOOCs course He/ She may be allowed to complete the course requirements by registering for another course online in subsequent semester or opt for a course offered at this Yenepoya (Deemed to be) University.

## **10 Assigning Credit Hours per Course**

While there is flexibility for the departments in allocation of credits to various courses offered, the general formula shall be:

- Every Core course shall be restricted to a maximum of 4 credits.
- The elective course offered by the Yenepoya (Deemed to be) University shall be restricted to a maximum of 2 credits.
- A candidate shall compulsorily complete total Twelve Credits of Elective courses
- These courses shall be selected either from the Generic Electives, Skill enhancement courses offered by Yenepoya (Deemed to be) university or from the SWAYAM/MOOC/NPTEL courses notified by the UGC time to time and enlisted by the faculty of Allied Health Care Professions. A Candidate shall have freedom to choose the courses of once own choice and at their own pace from the external online platform (SWAYAM/MOOC) or a mix of courses offered by Yenepoya (Deemed to be) University but, require to complete before appearing the Sixth semester end examination.
- A candidate who is desirous to add more credits shall be permitted to do so during the academic duration. Extra credits earned by a candidate shall be included in the marks card on submission of course completion certificate. However, it shall not be considered for awarding the Grade in the UG programme.
- The credits assigned to the course is indicated as L:T:P format. For example, for a 4credit course format could be: 4:0:0 or 1:2:1 or 3:1:0 or 0:0:4etc.

## **11 Assigning Total Credits for a Programme:**

The UGC, in its notification No.F.1-1/2015 (Sec.) dated 10/4/15 has provided a set of “Model curricula and syllabi for CBCS programmes. In conformation with this notification, at Yenepoya (Deemed to be University), for UG programs with duration of 3years study period or 6 semesters, the total credits shall be a maximum of 140 credits and for the UG programme with duration of 4 years study period or 8 semesters, the total credits shall be a maximum of 161credits.

## 12 CBCS Program Coding System

The coding system shall be in the consonance with the system followed by the office of the controller of examination. Presently the following coding pattern is followed.

12.1 First two letters describe the faculty name followed by level of programme (UG – 01; PG – 02) and two letters represent the programme.

12.2 Course code shall have prefix denoting semester number followed by an alphabet of respective type of courses such as C = Core, AECC= Ability Enhancement Compulsory, GE=Generic Elective, SE= Skill Enhancement, SL = Self -Learning, P=Practical followed by numbers denoting number of courses taught-

1st SEM: 1C1, 1C2, 1C3, 1AECC1, 1AECC2, GE1/SE1/SL1 1P1 etc.

2nd SEM: 2C1, 2C2, 2AECC1, 2AECC2, GE2/SE2/SL2, 2P1, etc.

3rd SEM: 3C1, 3C2, 3AECC1, 3AECC2, GE3/SE3/SL3, 3P1, 3P2 etc.

4th SEM: 4C1, 4C2, 4C3, 4P1, 4P2, GE4/SE4/SL4 etc.

5th SEM: 5C1, 5C2, 5GE1/5SE1, 5P1, 5P2, 5P3, GE5/SE5/SL5 etc.

6th SEM: 6C1, 6C2, 6GE1/6SE1, 6P1, 6P2, 6P, GE6/SE6/SL6 etc.

7th SEM: 7C1

8th SEM: 8C1

## 13 Attendance:

13.1 Each course (theory, practical, clinical etc.) shall be treated as an independent unit for the purpose of attendance. Candidates having minimum 80% attendance in each of the Courses can only qualify to appear for the Semester End Examination. The Candidates with less than 80% of attendance shall be required to repeat that Course by attending the semester.

13.2 There shall be no provision for condonation of shortage of attendance.

13.3 For SWAYAM/MOOC/NPTEL it shall be as per the regulations governing the courses of implementing authority.

13.4 The HOD/Course Coordinator through the Dean of Faculties shall announce the names of the candidates who will not be eligible to take the Semester End-Examinations (SEE) in the various courses and send a copy of the same to the Controller of Examinations (COE) Office. Registrations of such candidates for those courses shall be treated as cancelled.

## 14 Scheme of examination

- 14.1 Evaluation of a course shall be done based on continuous internal assessment (CIA) mode followed by semester end university examination (SEE) for each course.
- 14.2 The components of CIA (Continuous Internal Assessment) may include 2 internal assessment tests, assignments and assessment of conduct/discipline.
- 14.3 The marks for CIA shall be 40% and SEE shall be 60%.
- 14.4 There shall be no minimum marks for CIA for a pass, but the minimum marks for pass per course shall be 50% CIA and SEE added together.
- 14.5 There shall be examinations at the end of each semester ordinarily during December/January for odd (1<sup>st</sup> & 3<sup>rd</sup>) semesters and during June/July for even (2<sup>nd</sup> & 4<sup>th</sup>) semesters. The SEE for 5<sup>th</sup> & 6<sup>th</sup> Semester will be held during December/Jan and June/July of each year.
- 14.6 The SEE duration shall be three hours.
- 14.7 The question paper pattern shall be decided by the Board of Studies (BOS) of the respective departments.

### Internal assessment format per course (distribution of marks)

Internal Assessment Components	Maximum Marks
Two IA tests	20
Assignment	10
Conduct/discipline	10
<b>Total Marks</b>	<b>40</b>

First Internal Assessment shall be held in the 6<sup>th</sup> week of the semester and the second internal examination will be held one month before the semester end university examination.

### Question Paper Pattern for Core course SEE

Type of question	SUBJECTS HAVING MAXIMUM MARKS = 60				Duration
	Number of questions	To be Answered	Marks for each question	Total	180 minutes
LONG ESSAY TYPE	02	01	10	10	180 minutes
SHORT ESSAY TYPE	10	08	05	40	
SHORT ANSWERS	07	05	02	10	
<b>Total</b>				<b>60</b>	

## Question Paper Pattern for AECC SEE

Type of question	SUBJECTS HAVING MAXIMUM MARKS = 40				Duration
	Number of questions	To be Answered	Marks for each question	Total	
LONG ESSAY TYPE	02	01	10	10	90 minutes
SHORT ESSAY TYPE	05	03	05	15	
SHORT ANSWERS	07	05	03	15	
<b>Total</b>				<b>40</b>	

### Practical examination

SI.NO	Components	Marks
1	Spotters	20
2	Case scenario/Stations	20
3	Viva Voce	20
Total Marks		60

### PARTICULARS OF PRACTICAL, VIVA-VOCE

- Practical examination will be aimed at examination of clinical skills and competence of the candidates for undertaking independent work as a specialist.
- Viva- Voce examination shall aim at assessing depth of knowledge, logical reasoning, confidence & oral communication skills.
- OSCE/OSPE- shall have minimum of 4 stations.

## 15 Evaluation of Answer Scripts

15.1 Each theory examination shall have single evaluation. There shall be provision for re-evaluation on a payment of a fee. An external examiner shall value the paper, if the difference is more than 15% of previous marks the answer script shall be sent for third evaluation. In such an event, the average of the best two out of the three scores will be taken as the final score.

15.2 Practical examination shall be jointly conducted and evaluated by one internal examiner and one external examiner.

## 16 Classification of Successful candidates:

The results of successful candidates at the end of each semester shall be declared in terms of Grade Point Average (GPA) and Alpha-Sign Grade. The results at the end of the sixth semester shall be classified on the basis of the Cumulative Grade Point Average (CGPA) obtained in all the six semesters and the corresponding overall alpha sign grade.

### 16.1 Letter Grades and Grade Points:

16.1.1 The Deemed to be University would be following the absolute grading system, where the marks are compounded to grades based on pre-determined class intervals.

16.1.2 The UGC recommended 10-point grading system with the following letter grades are given below:

Letter Grade	Grade Point
O (Outstanding)	10
A+ (Excellent)	9
A (Very Good)	8
B+ (Good)	7
B(Above Average)	6
C (Average)	5
P (Pass)	4
F (Fail)/ RA (Reappear)	0
Ab (Absent)	0
Not Eligible (NC) detained	0

16.1.3 A student obtaining Grade RA/ Ab shall be considered failed and will be required to reappear in the end semester examination.

### 16.2 The Semester Grade Point Average (SGPA)

The performance of a student in a semester is indicated by a number called 'Semester Grade Point Average' (SGPA). The SGPA is the weighted average of the grade points obtained in all the courses by the student during the semester.

For example, if a student takes five (Theory/Practical) in a semester with credits C1, C2, C3, C4 and C5 and the student's grade points in these courses are G1, G2, G3, G4 and G5, respectively, and then students' SGPA is equal to:

$$\text{SGPA} = \frac{C1G1 + C2G2 + C3G3 + C4G4 + C5G5}{C1 + C2 + C3 + C4 + C5}$$

The SGPA is calculated to two decimal points. It should be noted that, the SGPA for any semester shall take into consideration the F and ABS grade awarded in that semester. For example if a student has a F or ABS grade in program 4, the SGPA shall then be computed as:

$$\text{SGPA} = \frac{C1G1 + C2G2 + C3G3 + C4 * \text{ZERO} + C5G5}{C1 + C2 + C3 + C4 + C5}$$

### 16.3 Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the VI semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all VI semesters and their courses. The CGPA shall reflect the failed status in case of F grade(s), till the course(s) is/are passed. When the program(s) is/are passed by obtaining a pass grade on subsequent examination(s) the CGPA shall only reflect the new grade and not the fail grades earned earlier. The CGPA is calculated as:

$$\text{CGPA} = \frac{C1S1 + C2S2 + C3S3 + C4S4 + C5S5 + C6S6}{C1 + C2 + C3 + C4 + C5 + C6}$$

where C1, C2, C3,.... is the total number of credits for semester I,II,III,.... and S1, S2, S3.... is the SGPA of semester I,II,III,....

#### Calculation of GPA & CGPA: An example (1st semester)

Program Code	Course	Credits (a)	Grade Obtained	Credit Value (b)	Grade Points (axb)
	Course 1	4	B	8	32
	Course 2	4	B	8	32
	Course 3	4	O	10	40
	Course 4	2	C	7	14
	Course 5	2	A	9	18
	Total	16	-	-	136

1st Semester GPA = Total Grade Points / Total Credits = 136 / 16 = 8.5 2nd Semester

GPA = 7 with respect to 18 Credits

Then 1st Year CGPA = (8.5 x 16) + (7 x 18) / 16 + 18 = 7.7

## **17 Declaration of Class**

The class shall be awarded on the basis of Cumulative marks scored in all the Courses

First Class with Distinction= Aggregate Marks 75% and above

First Class = Aggregate Marks 60 to 74.9%

Second Class = Aggregate Marks 50 to 59.9%

### **17.1 Promotion Criteria**

- The students are allowed to carry over any number of courses till sixth semester. But student is eligible to appear for the End semester exam of sixth semester if he/she has cleared all the Courses both Core and AECC of first, second, third & fourth semesters. If student has any pending course of first to fourth semesters, he/she is not eligible to appear for the end semester exam of the sixth semester. However, Fifth semester courses are allowed to club with sixth semester end examination. But, all the Core courses and AECC Courses of first to fourth semester should be completed to be eligible for 6th end semester exam.
- Candidate should also complete 12 credits of elective course to be eligible for the 6<sup>th</sup>(in case of 3year program) end Semester Examination.
- Candidate should clear all Courses (Core, AECC & Elective courses) of all the semester, to be eligible to start the one year of mandatory internship.
- A fail in any one Course will mean the candidate has to reappear for the exam in that Course only.
- A candidate who passes the semester examinations in parts is eligible for only CGPA and letter grade but not for Class/ ranking/award/medal from the University.

## **18 Internship**

A candidate has to mandatorily complete 1 year (2 semesters) of internship. The total credits per semester is 18 and for two semesters it is 36.



The internship time period provides the candidate the opportunity to develop confidence and increased skill in simulation and treatment delivery. Candidate will demonstrate competence in basic and intermediate procedures and will observe the advanced and specialized treatment procedures. The candidate will complete the clinical training by practicing all the skills learned in classroom and clinical instruction. The candidate is expected to work for minimum 8 hours per day and this may be more depending on the need and the healthcare setting.

### 18.1 Eligibility

A candidate should have passed in all the courses (Core, AECC and Electives) amounting to 126 number of credits before entering in to internship.

## 19 Eligibility for the award of Degree

A candidate shall have passed in all the Courses of all six semesters and should have successfully completed one year of mandatory internship (02 semesters) as required for the programme.

## 20 Maximum Period for Completion of Programme:

A candidate shall complete Six semesters (Three Years) programme within Six years from the date of admission. Hence, the maximum period for completion of the programme is seven years.

## 21 Minimum for a pass:

21.1 A candidate shall be declared to have passed the UG programme if he/she secures at least CGPA of 4.0 (Course Alpha-Sign Grade P) in the aggregate of both internal assessment and semester end examination marks.

21.2 The candidates who pass all the semester examinations in the first attempts in Three years are eligible for ranks provided they secure at least a CGPA of 8.0 (at least Alpha-Sign Grade A).

21.3 The results of the candidates who have passed the sixth semester examination but not passed the lower semester examinations shall be declared as NCL (Not Completed Lower semester examinations). Such candidates shall be eligible for the degree only after completion of all the lower semester examinations.

21.4 A candidate who passes the semester examinations in parts is eligible for only CGPA and Alpha-Sign Grade but not for ranking.

21.5 There shall be no minimum in respect of internal assessment and viva-voce marks.

## 22 Re-Entry after Break of the study:

22.1 Candidates admitted to a program abstaining for more than 3 months must seek readmission into the appropriate semester.

22.2 The candidate shall follow the syllabus in vogue (currently approved/is being followed) for the program.

22.3 All re-admissions of candidates are subject to the approval of the University.

## 23. Program Structure

Semester I

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	Anatomy	40	60	100	4	-	-	4
2	Core	Physiology	40	60	100	4	-	-	4
3	Core	Biochemistry	40	60	100	4	-	-	4
4	Core	Physical Optics	40	60	100	2	1	2	4
5	AECC	English & Communication	10	40	50	2	-	-	2
6	AECC	Constitution of India	10	40	50	2	-	-	2
Total					500				20

Note: Of the total available 36 hours per week for teaching learning processes, 21 hours per week is dedicated to Core and AECC courses. Remaining Hours are available for Electives/Value added courses/Extracurricular activities etc.

## Semester II

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	General pathology	40	60	100	4	-	-	4
2	Core	Microbiology	40	60	100	4	-	-	4
3	Core	Geometrical Optics	40	60	100	2	1	2	4
4	AECC	Environmental Studies	10	40	50	2	-	-	2
5	AECC	Health Care	10	40	50	2			2
6	AECC	Medical Ethics	10	40	50	1	-	-	1
7	AECC	Sociology	10	40	50	1			1
Total					600				19

Note: Of the total available 36 hours per week for teaching learning processes, 19 hours per week is dedicated to Core and AECC courses. Remaining Hours are available for Electives/Value added courses/Extracurricular activities etc.

## Semester III

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	Ocular Pathology & Microbiology	40	60	100	3	-	-	3
2	Core	General Pharmacology	40	60	100	4	-	-	4
3	Core	Ocular Pharmacology	40	60	100	2	-	-	2
4	Core	Ocular Anatomy & Physiology	40	60	100	3	-	-	3
5	Core	Optometric Instruments	40	60	100	3	1	-	4
6	Core	Clinical Optometry I	40	60	100	-	-	6	3
7	AECC	Kannada	10	40	50	2	-	-	2
Total					650				21

Note: Of the total available 36 hours per week for teaching learning processes, 24 hours per week is dedicated to Core and AECC courses. Remaining Hours are available for Electives/Value added courses/Extracurricular activities etc.

Semester IV

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	Optometric & Dispensing Optics	40	60	100	4	-	-	4
2	Core	Visual Optics	40	60	100	3	1	-	4
3	Core	Ocular Disease I	40	60	100	4	-	-	4
4	Core	Clinical Optometry II	40	60	100	-	-	6	3
5	AECC	Human Rights and Gender Equity	10	40	50	2	-	-	2
6	AECC	Biostatistics	10	40	50	2	-	-	2
Total					500				19

Note: Of the total available 36 hours per week for teaching learning processes, 22 hours per week is dedicated to Core and AECC courses. Remaining Hours are available for Electives/Value added courses/Extracurricular activities etc.

Semester V

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	Contact Lens I	40	60	100	4	-	-	4
2	Core	Binocular Vision I	40	60	100	3	-	-	3
3	Core	Ocular Disease II	40	60	100	4	-	-	4
4	Core	Community & Occupational Optometry	40	60	100	3	1	-	4
5	Core	Clinical Optometry III	40	60	100	-	-	6	3
Total					500				18

Note: Of the total available 36 hours per week for teaching learning processes, 21 hours per week is dedicated to Core and AECC courses. Remaining Hours are available for Electives/Value added courses/Extracurricular activities etc.

## Semester VI

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	Contact Lens II	40	60	100	3	-	-	3
2	Core	Binocular Vision II	40	60	100	3	-	-	3
3	Core	Low Vision	40	60	100	2	1	-	3
4	Core	Paediatric & Geriatric Optometry	40	60	100	3	-	-	3
5	Core	Clinical Optometry IV	40	60	100	-	-	8	4
Total					500				16

Note: Of the total available 36 hours per week for teaching learning processes, 20 hours per week is dedicated to Core and AECC courses. Remaining Hours are available for Electives/Value added courses/Extracurricular activities etc.

## Semester VII

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per day			Credits
			IA	SEE		L	T	P	
1	Core	Internship I	40	60	100	-	-	6	1
Total					100				18

## Semester VIII

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per day			Credits
			IA	SEE		L	T	P	
1	Core	Internship II	40	60	100	-	-	6	1
Total					100				18

<b>Total credit</b>		<b>113</b>
<b>Elective</b>		<b>12</b>
<b>Internship</b>		<b>36</b>
<b>Total Credit of the program</b>		<b>161</b>

# **SEMESTER I**

## **ANATOMY**

**Course: Core**

**Credits: 04**

**Number of hours: 60**

**Course objectives:**

- Identify and locate each of the body systems to apply anatomical knowledge to perform minor technical procedural skills.
- Know the normal disposition of the structures in the body while clinically examining a patient and while conducting clinical procedures.
- Describe the functions of each body system
- Discuss the interrelationship of systems in maintaining homeostasis.
- Know the anatomical basis of disease and injury

**COURSE CONTENT:**

**Unit 1: Introduction: Human body as a whole**

**2 Hours**

Definition of anatomy and its divisions. Terms of location, positions and planes. Cell and its organelles.

Epithelium: definition, classification, describe with examples, function. Glands: classification, describe serous & mucous glands with examples. Basic tissues: classification with examples

Demonstration: Histology of types of epithelium. Histology of serous, mucous & mixed salivary gland.

**Unit 2: Locomotion and support**

**12 hours**

Bone: classification, names of bone cells, parts of long bone, microscopy of compact bone, names of all bones, vertebral column, inter-vertebral disc, fontanelles of fetal skull.

Joints: classification of joints with examples, synovial joint (in detail for radiology).  
Muscular system: classification of muscular tissue & histology, names of muscles of the body.

Demonstration: Bones & joints. Histology of compact bone (TS & LS). Demonstration of all muscles of the body. Histology of skeletal, smooth & cardiac muscle (TS & LS). Histology of the 3 types of cartilage. Demo of all bones showing parts, radiographs of normal.

### **Unit 3: Cardiovascular system**

**8 hours**

Heart: size, location, chambers, exterior & interior, blood supply of heart. Systemic & pulmonary circulation, branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery, peripheral pulse, inferior vena cava, portal vein, Porto-systemic anastomosis, great saphenous vein, Dural venous sinuses. Lymphatic system: cisterna chyli & thoracic duct, histology of lymphatic tissues, names of regional lymphatics, axillary and inguinal lymph nodes in brief

Demonstration of heart and vessels in the body. Histology of large artery, medium sized artery & vein, large vein. Histology of lymph node, spleen, tonsil & thymus. Normal chest radiograph showing heart shadows. Normal angiograms

### **Unit 4: Gastro-intestinal system**

**8 hours**

Parts of GIT, oral cavity, lip, tongue (with histology), tonsil, dentition, pharynx, salivary glands, Waldeyer's ring, oesophagus, stomach, small and large intestine, liver, gall bladder, pancreas, radiographs of abdomen

Demonstration of parts of gastro intestinal system. Normal radiographs of gastro intestinal system. Histology of gastro intestinal system.

### **Unit 5: Respiratory system**

**4 hours**

Parts of RS, nose, nasal cavity, larynx, trachea, lungs, broncho-pulmonary segments, histology of trachea, lung and pleura, names of paranasal air sinuses.

Demonstration of parts of respiratory System Normal radiographs of chest. -Histology of lung and trachea

**Unit 6 Peritoneum****1 hour**

Description in brief. Demonstration of reflections.

**Unit 7 Urinary system****2 hours**

Kidney, ureter, urinary bladder, male and female urethra. Histology of kidney, ureter and urinary bladder

Demonstration of parts of urinary system. Histology of kidney, ureter, urinary bladder. Radiographs of abdomen-IVP, retrograde cystogram.

**Unit 8 Reproductive system****2 hours**

Parts of male reproductive system, testis, vas deferens, epididymis, prostate (gross & histology). Parts of female reproductive system, uterus, fallopian tubes, ovary (gross & histology). Mammary gland: gross

Demonstration of section of male and female pelvis with organs in situ. Histology of testis, vas deferens, epididymis, prostate, uterus, fallopian tube, ovary. Radiographs of pelvis, hysterosalpingogram.

**Unit 9 Endocrine glands****2 hours**

Endocrine glands: pituitary gland, thyroid gland, parathyroid gland, suprarenal gland (Gross & Histology).

Demonstration of the glands. Histology of pituitary, thyroid, parathyroid, suprarenal glands.

**Unit 10 Nervous system****12 hours**

Neuron, classification of nervous system, cerebrum, cerebellum, midbrain, pons, medulla oblongata, spinal cord with spinal nerve (gross & histology), meninges, ventricles & cerebrospinal fluid, names of basal nuclei, blood supply of brain, cranial nerves. Sympathetic trunk & names of parasympathetic ganglia

Histology of peripheral nerve & optic nerve. Demonstration of all plexuses and nerves in the body. Demonstration of all parts of brain. Histology of cerebrum, cerebellum, spinal cord.



**Unit 11: Sensory organs****3 hours**

Skin: histology, appendages of skin. Eye: parts of eye & lacrimal apparatus. Extra-ocular muscles & nerve supply. Parts of ear: external, middle and inner ear and contents.

Histology of thin and thick skin. Demonstration and histology of eyeball. Histology of cornea & retina.

**Unit 12: Embryology****4 hours**

Spermatogenesis & oogenesis. Ovulation, fertilization. Fetal circulation. Placenta, Demonstration of models.

**Course Outcome:**

- Demonstrate the structure of various organs in the human body and correlate the structure with the functions to know how both structure and function are modified by disease.
- Identify and locate all the structures of the body.
- Identify the microscopic structures of various tissues and organs in the human body and correlate the structure with the functions for understanding the altered state in various disease processes.
- Understand the basic principles of embryology including major variations, abnormalities and the congenital anomalies involved in development of the organs and systems.

**Recommended Books**

- Chaurasia BD. BD Chaurasia's Human Anatomy. CBS Publishers & Distributors Pvt Ltd.; 2010.
- Sampath Madhyastha, Manipal Manual of Anatomy for Allied Health Sciences, New Delhi: CBS publishers and distributors.
- Waugh A, Grant A. Ross & Wilson Anatomy and physiology in health and illness E-book. Elsevier Health Sciences; 2014 Jun 25.
- Dilly PN. Essentials of Human Embryology. Postgraduate Medical Journal. 1984 Jun;60(704):447.
- Inderbir S. Textbook of human histology with color atlas. New Delhi: Jaypee Brothers Medical Publishers. 2006.

# PHYSIOLOGY

**Course: Core**

**Number of Hours:60 Hours**

## **Course objectives:**

- To broadly understand the physiological structure of each organ system and its physiological functions.
- To understand broadly the clinical abnormalities of organs and its clinical physiological implications

## **COURSE CONTENT:**

### **1. General Physiology**

**2 hours**

Introduction to physiology

Homeostasis: Definition, Positive feedback, negative feedback.

Body Fluid Compartments *Transport mechanisms (brief)*

### **2. Blood**

**7 hours**

Introduction: composition and function of blood.

Blood Cells: types, Normal Count, Red blood cells: function. Erythropoiesis: Definition, Stages, Factors affecting, Hemoglobin: Function, concentration Physiological variation of RBC Count and Hb *Structure of Hb, methods of estimation*

White blood cells: different types, functions, normal count, differential count *Immunity(brief)*

Platelets: origin, normal count, functions *Morphology*

Haemostasis: definition, steps, clotting factors, mechanism of clotting, disorders of clotting, Blood groups: ABO system, Rh system: Rh factor, Rh incompatibility. Blood grouping & typing, cross matching. Blood transfusion: indication, universal donor and recipient concept. Selection criteria of a blood donor, transfusion reactions. *Anticoagulants: classification, examples and uses*

Anemias: definition, Symptoms and signs (brief). Blood indices: color index, MCH, MCV, MCHC (def and Normal Values). ESR and PCV: normal values, definition, determination (methods).

*Morphological and etiological classification of Anemia* Plasma proteins: types and concentration, functions of albumin, globulin, fibrinogen, prothrombin. Blood volume: normal value, determination of blood volume *Regulation of blood volume (brief)*, *Functions of Lymph*

### **3. Muscle Nerve physiology**

**5 hours**

Introduction, Classification and structure of muscle, sarcomere *contractile proteins*

Neuromuscular junction, Transmission across neuromuscular junction. Excitation contraction coupling. Mechanism of muscle contraction, rigor mortis. *Fatigue*

### **4. Cardiovascular system**

**8 hours**

Heart: physiological anatomy, nerve supply. Properties of cardiac muscle Cardiac cycle: definition, systole, diastole, phases, JVP (brief) Cardiac output, stroke volume, EDV (only definitions). Heart sounds, normal heart sounds, mechanism and features, areas of auscultation.

*Intra-ventricular pressure curves, Significance of Heart sounds*

Blood pressure: definition, normal value, clinical measurement of blood pressure, hypotension, hypertension Heart rate: Physiological variations, regulation (brief), radial pulse, Electrocardiogram (ECG): Definition, Normal ECG, Causes of ECG waves, Uses of ECG. Cardiac shock: Definition, Types (brief), Triple response.

### **5. Respiratory system**

**6 hours**

Introduction: Functions of respiratory system, physiological anatomy of respiratory system, respiratory tract Respiratory organs: lungs, alveoli, respiratory membrane Mechanism of breathing: Inspiration and Expiration, muscles involved, Mechanism.

Surfactant: Composition, Function, *intra pulmonary pleural pressure, surface tension*

Transport of oxygen: forms of transport, Oxygen Hemoglobin Curve. Lung volumes and capacities: Spirogram, Definitions and normal Volumes. Regulation of respiration: Nervous and chemical regulation, respiratory Centre, Herring Breurreflexes. Hypoxia: Definition, Classification, Description (in brief). Cyanosis, Asphyxia, Dyspnea, Dysbarism, Artificial Respiration, Apnoea. (Definition Only)

## **6. Digestive System**

**5 hours**

Introduction Physiological anatomy of gastro intestinal tract (All Structures in brief), functions of digestive system. Functions of Saliva Deglutition: definition, stages

Stomach: functions Gastric secretion: composition, function, Phases of secretion Pancreas: Functions (exocrine), pancreatic juice: composition and regulation. Secretin and CCK-PZ

Liver: Functions, Bile secretion, composition, function of bile; Bilirubin metabolism, types of bilirubin, Vandenberg reaction, Jaundice: types, significance. Gall bladder: Functions.

Small intestine: functions, digestion and absorption, movements. (brief) Large intestine: functions, defecation reflex

## **7. Renal System**

**5 hours**

Introduction: Functions of kidneys, composition of urine, nephron, cortical and juxtamedullary nephrons (comparison), Juxta Glomerular Apparatus: structure and function. *Vasa recta*

Mechanism of urine formation GFR: Definition, Normal Values, factors effecting GFR, Measurement (Creatine, Inulin Clearance). Tubular reabsorption, TMG, Tubular secretion (brief).

Mechanism of urine concentration: Counter-current mechanisms, Role of ADH *Diuresis*, *Diuretics*. Micturition, innervations of bladder, cystometrogram.

## **8. Skin and Body temperature**

**1 hour**

Structure and function of Skin *Sweat Glands* Body Temperature: physiological variation. Regulatory mechanisms: Mechanisms Activated by Heat/Cold Role of hypothalamus, and fever.

*Body temperature measurement, hypothermia*

## **9. Endocrine System**

**5 hours**

Introduction: Definition, classification of endocrine glands & their hormones.

Hypothalamic- pituitary Axis Pituitary hormones: anterior and posterior pituitary hormones, Functions of Growth hormone,

Thyroid gland: Thyroid Hormones: physiological function, regulation of secretion, disorders: hypo and hyper secretion of hormone. *Physiological anatomy of Thyroid*

Adrenal cortex: functions of Cortisol and Aldosterone Adrenal medulla: functions of Adrenaline and Noradrenaline. *Physiological anatomy of Adrenal*

Pancreas (Endocrine): Hormones of pancreas. Insulin: functions, regulation of blood glucose level, Diabetes mellitus *Abnormalities of pancreatic hormones (brief)* Regulation of Calcium Metabolism: Hormones involved, actions of PTH, Calcitonin, Vit D3 *Tetany*

## **10. Reproductive system**

**4 hours**

Introduction, Function of reproductive system, Changes during puberty.

*Sex Differentiation*

Male reproductive system: functions of testes Spermatogenesis: Definition, site, stages, factors influencing, Endocrine functions of testes *Sperm, semen*. Androgens: testosterone functions.

Female reproductive system, Menstrual cycle: Definition, changes, ovulation Functions of progesterone and estrogen *Hormonal Regulation* Physiological changes during pregnancy, Lactation(brief), milk ejection reflex

## **11. Nervous system**

**8 hours**

Introduction: Parts of CNS and PNS, Functions of nervous system

Neuron: definition, structure Nerve Fiber: classification, conduction of impulses continuous and saltatory. *Neuroglia*

Synapse: Definition, structure, types, properties (brief). Receptors: definition, classification, properties (brief). Reflex: Definition, Reflex Arc, Examples.

*Babinski's sign. Tone, Posture (definition)*, Spinal cord nerve tracts: Diagram and Functions: Lateral Spino Thalamic Tract, Dorsal Column, Pyramidal Tract. *UMN and LMN lesion, Hemiplegia, Stroke (brief)* Functions of: Cerebral cortex, Cerebellum, Hypothalamus, Basal Ganglia *EEG, Parkinsonism*

Cerebro Spinal Fluid (CSF): site of formation, circulation (brief), functions. *Lumbar puncture*. Autonomic Nervous System: Sympathetic and parasympathetic distribution and functions (brief).

## **12. Special senses**

**4 hours**

Vision: Functions of different parts (brief) Optic Pathway, Dark Adaptation, Color vision. *Structure of eye, Structure of retina.*

Hearing: Function of Middle Ear, Functions of inner ear, mechanism of hearing (brief).

Chemical Senses: Taste: types, receptor, Smell: physiology, receptors.

### **Recommended Books**

1. Guyton (Arthur): Text Book of Physiology. Latest Ed. Prism publishers.
2. Ganong William F: Review of Medical Physiology. Latest Ed. Tata McGraw Hill
3. Chatterjee CC: Human Physiology Latest Ed. Vol-1, Medical Allied Agency. Choudhary Sujith K: Concise Medical Physiology Latest Ed. New Central Book.

# **BIOCHEMISTRY**

**Course: Core**

**Credit: 04**

**Number of hours:60**

## **Course objectives:**

- Understanding the basic principles and procedures in specimen collection, reagent preparation and testing in Clinical laboratory
- Understanding the properties of biomolecules, their function and biochemical process involved in health and disease.
- Understanding the importance of nutrition in health and disease

## **COURSE CONTENT:**

**1. Introduction and scope of Biochemistry** **2 hours**

**2. Specimen collection:** **4 hours**

Pre-analytical variables. Collection of blood. Collection of CSF & other fluids. Urine collection. Use of preservatives. Anticoagulants.

**3. Safety measurements, Conventional and SI units** **2 hours**

**4. Dilutions** **2 hours**

Diluting solutions: e.g. preparation of 0.1 N NaCl from 1 N NaCl & from 2N NaCl etc., preparing working standard from stock standard, body fluid dilutions, reagent dilution techniques, calculating the dilution of a solution, body fluid reagent etc., saturated and supersaturated solutions.

**5. Carbohydrate chemistry** **4 hours**

Classification, Isomerism, General reactions of carbohydrates

**6. Lipids** **4 hours**

Chemistry of fatty acids, triglycerides, cholesterol, phospholipids, lipoproteins, Classification and functions.

**7. Protein chemistry, structure** **4 hours**

**8. Plasma Proteins** **2 hours**

Concentration, biochemical changes in disease, interpretation

**9. Enzymes** **6 hours**

Definition, classification, coenzymes, cofactors, factors effecting enzyme activity, inhibitors, units of measurements, isoenzymes, biological interpretation

**10. Vitamins** **6 hours**

Definition, classification, sources, functions, deficiency disorders

**11. Minerals** **6 hours**

Na, K, Ca, P, Fe, Cu, selenium- sources, daily requirements, availability and properties

**12. Nutrition** **3 hours**

Calorific value, nitrogen balance, respiratory quotient, basal metabolic rate, dietary fibers, nutritional importance of lipids, carbohydrates and proteins, vitamins. nutrition, nutritional support with special emphasis on parental nutrition.

**13. Quality control** **2 hours**

Accuracy, precision. Specificity, sensitivity, limits of error allowable in laboratory, percentage error. Normal values and Interpretations.

**14. Special Investigations** **11 hours**

Serum electrophoresis, immune globulins, drugs: digitoxin, theophylline's, regulation of acid base status, Henderson Hassel Bach equations, buffers of the fluid, pH regulation, disturbance in acid base balance, anion gap, metabolic acidosis, metabolic alkalosis, respiratory acidosis, respiratory alkalosis, basic principles and estimation of blood gases and pH, basic principles and estimation of electrolytes, water balance, sodium regulation, bicarbonate buffers,

**15. Bio Medical waste management** **2 hours**



## **Course outcome**

At the end of the course students must demonstrate an understanding of

- Various biomolecules in our body and their classification
- Sample collection for various tests performed in laboratory
- Preparation of dilutions of chemicals and body fluids.
- Various terms used in quality control
- Biomedical wastes management
- Significance of various special investigations

## **Recommended Books:**

1. Varley H. Practical clinical biochemistry. Practical clinical biochemistry.. 1954.
2. Naithani M, Singh P. Teitz textbook of clinical chemistry & molecular diagnostics. Medical Journal, Armed Forces India. 2006 Apr;62(2):204.
3. Kaplan LA, Pesce AJ, Kazmierczak SC. Clinical chemistry. Theory, analysis, correlation. 2003.
4. Ramakrishna(S) Prasanna(KG), Rajna ® Text book of Medical Biochemistry Latest Ed Orient Longman Bombay –1980
5. Vasudevan (DM) Sreekumari(S) Text book of Biochemistry for Medical students ,Latest Ed
6. Das(Debajyothi) Biochemistry Latest ED Academic, Publishers, Calcutta – 1992
7. Rajagopal G & Ramakrishna - 1983 Practical Biochemistry for Medical Students Oriental Blackswan Pvt. Ltd.
8. Burtis CA and Ashwood ER, Tietz Fundamentals of Clinical chemistry, Harcourt (India) Ltd, 7th Ed, 20154.

## **PHYSICAL OPTICS**

**Course: Core**

**Credits: 02**

**Number of hours: 30**

### **Course objectives:**

- The aim is to achieve knowledge of the fundamentals of physical optics and how they apply to the human eye.
- To equip the students with a thorough knowledge of properties of light.
- To gain exceptional knowledge on different units and measurement of light. To know the functioning and applications of various optical instruments.

### **COURSE CONTENT:**

#### **Unit 1: LIGHT**

**(3 Hours)**

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. Electromagnetic Spectrum, Sources of light, Concepts of frequency, wavelength, amplitude and phase.

#### **Unit 2: POLARIZATION**

**(3 Hours)**

Polarized light; linearly polarized light; and circularly polarized light, Intensity of polarized light; Malus' Law; polarizers and analysers; Methods of Polarization, Producing polarized light; Brewster's angle. Birefringence; ordinary and extra-ordinary rays.

#### **Unit 3: INTERFERENCE**

**(3 Hours)**

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

#### **Unit 4:DIFFRACTION**

**(3 Hours)**

Diffraction, Double slits, multiple slits, gratings. Diffraction by a circular aperture; Airy's disc.

#### **Unit 5:SCATTERING**

**(3 Hours)**

Resolution of an instrument (telescope, for example); Raleigh's criterion. Scattering; Raleigh's scattering; Tyndall effect, Fluorescence and Phosphorescence

#### **Unit 6: LASERS**

**(3 Hours)**

Basics of Lasers—coherence; population in version; Optical Pumping; spontaneous emission.

### **Unit 7: RADIOMETRY**

**(3 Hours)**

Radiometry; solid angle; radiometric units; photopic and scotopic luminous efficiency and efficacy curves; photometric units, Inverse square law of photometry; Lambert's law, Other units of light measurement; retinal illumination

#### **Course Outcome:**

- At the end of this course, students will be able to predict the distribution of light under various conditions.
- Knowledge and understanding to be demonstrated in the area of wave optics,
- Interaction of light on matter, properties of light and units of light measurement.

#### **Recommended Books**

1. Subrahmanyam N, BrijLal, A text book of Optics, S. ChandCo Ltd, New Delhi, India, 2003.
2. Justin Peatross. Michael Ware. Physics of Light and Optics. Brigham Young University. 2015 Edition.
3. Ariel Lipson. Stephen G Lipson. Henry Lipson. Cambridge University Press. South Asian Edition. 2011.

## **ENGLISH AND COMMUNICATION**

**Course: AECC**

**Credit: 02**

**Number of hours: 30**

### **Course Objectives**

The course is designed to enable students to enhance their ability to speak and write English required for effective communication in their professional work. Students will practise their skills in verbal and written English during clinical and classroom experience.

### **Unit 1: PHONETICS**

**(4 Hours)**

- Brief introduction to the history of English Language & Phonetics
- Vowels, Diphthongs, Consonants
- Native pronunciation of English words

### **Unit – 2: Difference between American & British English**

**(2 Hours)**

- Difference with regards to the Vocabulary, Accent, Grammar & Spellings.
- Syllables & Word Stress

### **Unit– 3: Grammatical Skills**

**(10 hours)**

- Verb Tenses
- Appropriate Use of Prepositions
- Articles
- Subject Verb Agreement
- Appropriate usage of Punctuation and Capitalization
- Modals

- Transformation of Sentence structures
- Active Passive Voice
- Reporting skills
- Question Tags
- Homonyms & Homophones
- Degrees of Comparison
- One-word Substitution
- Linkers

#### **Unit – 4: Written Communication Skills**

**(5 Hours)**

- Drafting of formal letters
- Email drafts – Do's and don'ts in professional emails.
- Article and Essay writing
- Notice writing
- Speech writing
- News Report writing
- Dialogue writing

#### **Unit 5: Oral Communication Skills**

**(6 Hours)**

- Way of Communicating when we meet people.  
Face to Face Communication  
Tone of voice  
Body Language
- Small Talk
- Elevator Speech
- Etiquettes of Phone Conversation & Phone role play

- Basics of meeting online
- Video conference role play
- Group discussion
- First Impressions
- Interview Skills: Purpose of an Interview  
Do's & Don'ts of an Interview

### **Unit 6: Presentation Skills**

**(3Hours)**

- Debating
- Speech Relay
- Presentations

### **Course Outcomes**

On completion of the course, the students will be able to

- Apply the concepts and principles of English Language use in professional development such as pronunciation, vocabulary, grammar, paraphrasing, voice modulation, Spelling, pause and silence.
- Apply LSRW (Listening, Speaking, Reading and Writing) Skill in combination to learn, teach, educate and share information, ideas and results.

### **Recommended Books:**

- Raymond Murphy. English Grammar in Use. Cambridge University. 2012.
- David Green. Contemporary English Grammar Structures and Composition. Macmillan Publishers. 2015.

# Constitution of India

**Course: Core**

**Credits: 02**

**Number of hours: 30 hours**

## **Course Objectives**

- State and explain the constitution of India and its Constituent Assembly
- Explain fundamental rights and duties of citizen
- Identify union, state and federalism of India
- Knowledge of electoral process in India.
- State the basic concepts of Human Rights and its functions and authorities in society.

## **COURSE CONTENT:**

### **Unit 1: Indian Constitution 5 hours**

- Meaning and Importance of Constitution
- The Constituent Assembly
- The Preamble
- Salient Features of Constitution

### **Unit 2: Fundamental Rights and Directive Principles 3 hours**

- Meaning and Differences between Fundamental Rights and Directive Principles
- Fundamental Rights
- Rights Information Act Meaning, importance of RTI 2005

### **Unit 3: Union Government 4 hours**

- President of India- Election, Powers and Position
- Prime Minister and council of Ministers
- Parliament – LokSabha, RajyaSabha- Organisations and Powers

### **Unit 4: State Government 4 hours**

- The Governor
- Chief Minister and Council of Ministers
- State Legislature Vidhana Sabha, Vidhana Parishad – organization and Powers

### **Unit 5: Federalism In India 2 hours**

- Meaning Federal and Unitary Features

### **Unit 6: The Judiciary 2 hours**

- The supreme Court – Organization, Jurisdiction and Role

- The High Court – Organization Jurisdiction and Role

**Unit 7: Electoral Process In India** **2 hours**

- Election Commission – Organization, Functions

**Unit 8: Local Governments** **2 hours**

- Rural and Urban – Organisation, Powers and Functions

**Unit 9: Human Rights** **3 hours**

- Human rights – Meaning
- Universal Declaration of Human Rights
- Remedies against Violation of Human Rights in India

**Unit 10: Special constitutional provisions** **3 hours**

- Special Rights created in the constitution for: Dalits, Backwards, women and Children and the Religious and Linguistic Minorities.
- Constitution and Sustainable Development in India.
- Minority Commission in India

**Course Outcome:**

- This course is to keep the students abreast with the knowledge of the Constitution of India.
- To make the students understand the importance of human rights as citizens of India.

**Recommended Books**

- Basu, D.D , Constitution of India, New Delhi Himalaya Publication ; 2001
- Dinesh Shelton, David P Stuart, International Human Rights in Nutshell. Thomas Burgenthel, West Nutshell Publisher; London; 2005.
- ParvathyAppaiah, Constitution of India, Mangalore DivyaDeepa Publication; 2005
- ParvathyAppaiah, Human Rights. DivyaDeepa Publication Mangalore; 2016
- RajRam. M, Constitution of India Himalaya Publication, New Delhi; 1999



## **SEMESTER II**

### **GENERAL PATHOLOGY**

**Course: Core**

**Number of Hours: 60**

**Credits: 4**

#### **Course Objectives:**

- To be able to define the medical terms, define and classify disease and understand the concepts of the disease.
- Able to describe the causes and mechanism of common diseases that occur during the routine work and also changes seen in different individuals and various organs and fluids.
- Able to enumerate the laboratory tests eg: urine, blood, body fluids and its application on various diseases.

#### **COURSE CONTENT:**

**Unit 1: Introduction (8 Hours)**

**Unit 2: Cellular Responses to Stress and Injury (12 Hours)**

- Types of cellular responses to injury
- Cellular adaptations
- In brief cell injury and types of cell injury, intracellular accumulation
- Necrosis and apoptosis (brief)
- Pathologic calcification, hyaline change, pigments

**Unit 3: Acute Inflammation (12 Hours)**

- Definition, cardinal signs and sequence of events in acute inflammation
- List chemical mediators of inflammation, outcomes of acute inflammation, morphological types/patterns of acute inflammation and briefly systemic effects of inflammation
- In brief cutaneous wound healing (primary and secondary) Factors that influence wound healing, complications of wound healing
- Types of chronic inflammation, Granulomatous diseases, briefly about tuberculosis, leprosy and syphilis

**Unit 4: Hemodynamic Disorders, Thromboembolism and Shock (6 Hours)**

- Edema and thrombosis
- Embolism, infarction and shock (in brief)

**Unit 5: Diseases of the Immune System ( 8 Hours)**

- Introduction to immune system
- Hypersensitivity reactions (brief)
- Autoimmune diseases and systemic lupus erythematosus (in brief)
- Acquired immunodeficiency syndrome

**Unit 6: Neoplasia (8 Hours)**

- Nomenclature of neoplasms and characteristics of benign and malignant neoplasms
- Metastasis and spread of tumors
- Etiology of cancer (carcinogenic agents)
- Laboratory diagnosis of cancer, staging grading and prognosis

**Unit 7: Genetic Disorders (2 Hours)**

- Introduction of genetic disease and classification of genetic disorders

**Unit 8: Nutritional Disorders (4 Hours)**

- Common vitamin deficiencies -Fat-soluble vitamins
- Water-soluble vitamins—vitamin B complex

**Course Outcome:**

At the end of the course, the students will be able to

- Understand how body reacts to cellular responses and injuries.
- Have a basic knowledge about various laboratory tests and its application on various disorders.
- Define the medical terms, define and classify disease and understand the concepts of the disease.

**Recommended Books**

- Nayak R, Rai S, Gupta A. Essentials in hematology and clinical pathology. New Delhi: Jaypee Brothers Medical Publishers; 2012.
- Mohan H. Textbook of pathology. 8th ed. New Delhi, India: Jaypee Brothers Medical; 2018

## GENERAL MICROBIOLOGY

**Core: General Microbiology**

**No of Hours: 60**

**Credits: 4**

### **Course Objectives:**

- To become familiar with the foundation concepts of history of Microbiology & General Bacteriology.
- To understand the key concepts in Immunology.
- To gain the knowledge of common bacterial infections.
- To understand and implement biomedical waste management and tackle infections.

### **COURSE CONTENT:**

#### **Unit 1: General Bacteriology**

**8 hours**

Introduction & History of Microbiology, Classification & Morphology of Bacteria, Growth & Nutrition, Culture Media & Methods, Sterilization & Disinfection, Fundamental aspects of antibacterial agents and antimicrobial susceptibility testing.

#### **Unit 2: Immunology**

**11 hours**

Infection, Immunity, Immunization schedule, applications of antigen antibody reactions, Hypersensitivity, Tumor & Transplantation Immunology.

#### **Unit 3: Systematic Bacteriology**

**13 hours**

Common bacterial infections, Mycobacteria, Spirochaetes

#### **Unit – 4: Virology**

**10 hours**

Introduction to virology, viral hepatitis, poliomyelitis, Rabies, Human immune deficiency virus.

#### **Unit 5: Mycology & Parasitology**

**12 hours**

Introduction to mycology, pathogenic yeasts & fungi, Introduction to parasitology, Amoebiasis, Malaria, Helminthic infections.

**Unit 6 : Applied Microbiology**

**6 hours**

Hospital acquired infections, Biomedical waste management.

**Course Outcome:**

At the end of the course, the students will be able to

- Understand how the bacteria grow and how sterilization & disinfection works.
- Have a basic knowledge about Immunization schedules and bacterial infections.
- Define terms in virology, mycology and parasitology.

**Recommended Books**

- Baveja C. Textbook of microbiology. 1st ed. New Delhi: Arya Publications; 2005.

**GEOMETRICAL OPTICS**

**Course: Core**

**Credits: 02**

**Number of hours: 30**

**Course Objectives:**

- The students gain fundamental knowledge and insight into geometrical optics; able to understand and solve problems related to the eye and optical instruments/lenses, their function and correction.
- Knowledge and understanding in the areas of: refraction at single spherical or plane surfaces, thin lenses, thick lenses, aberrations, apertures, thin prisms, mirrors and ophthalmic and optical instruments.

**COURSE CONTENT:**

**Unit 1:LIGHT**

**(5 hours)**

Nature of light– light as electromagnetic oscillation; Ideas of sinusoidal oscillations; Amplitude and phase; speed of light in vacuum and other media; refractive index. Wave fronts: spherical, elliptical and plane; Curvature and vergence; rays; convergence and divergence in terms of rays and vergence; vergence at a distance

**Unit 2: REFRACTION** (5 hours)

Refractive index; its dependence on wavelength. Fermat's and Huygens's Principle: Derivation of laws of reflection and refraction (Snell's law) from these principles

**Unit 3: MIRROR** (5 hours)

Plane mirrors–height of the mirror; rotation of the mirror. Imaging by concave mirror, convex mirror. Reflectivity; transmissivity; Snell's Law, Refraction at a plane surface.

**Unit 4: PRISM** (5 hours)

Glass slab; displacement without deviation; displacement without dispersion

Thick prisms; angle of prism; deviation produced by a prism; refractive index of the Prisms. Prisms; angular dispersion; dispersive power; Abbe's number. Refraction by a spherical surface; sign convention; introduction to spherical aberration using image formed by a spherical surface of a distance object; sag formula, Paraxial approximation; derivation of vergence equation, Vergence at a distance formula; effectivity of a refracting surface

**Unit 5: LENS** (5 hours)

Definition of a lens as a combination of two surfaces; different types of lens shapes. Image formation by a lens by application of vergence at a distance formula; Definitions of front and back vertex powers; equivalent power; first and second principal planes/points; primary and secondary focal planes/points; primary and secondary focal lengths. Newton's formula; linear magnification; angular magnification

**Unit 6: IMAGE FORMATION** (5 hours)

Imaging by a thin convex lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions, Imaging by a thin concave lens; image properties (real/virtual; erect/inverted; magnified/minified) for various object positions, Prentice's Rule.

**Course Outcome:**

At the end of this program, students will be able to predict the basic properties of the images formed on the retina by the optics of the eye. The aim is to make students achieve

knowledge of the fundamentals of geometrical optics and how they apply to the human eye.

### **Recommended Books**

1. Schwartz S.H. Geometrical and Visual Optics: A Clinical Introduction, M Graw-Hill, New York, USA, 2002.
2. Subrahmanyam N, BrijLal, A text book of Optics, S. ChandCo Ltd, New Delhi, India, 2003.
3. Justin Peatross. Michael Ware. Physics of Light and Optics. Brigham Young University. 2015 Edition.

## **ENVIRONMENTAL STUDIES**

**Course: AECC**

**Credit: 02 hours**

**Number of hours: 30 hours**

### **Course Objectives:**

- Students will be able to learn about environment, factors affecting it, environmental ethics and its protection.
- Students will be able to Describe a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- Students will be able to Critically analyze technical subject matter (written or oral) for scientific merit apply learned environmental knowledge and understanding to solve technical /research problems in new contexts

### **COURSE CONTENT**

#### **Unit 1: Multidisciplinary nature of Environmental Studies**

**(1 hour)**

- Multidisciplinary nature of Environmental Studies
- Concept of sustainability and sustainable development

#### **Unit 2: Ecosystems**

**(4 hours)**

- What is an ecosystem? Structure and function of an ecosystem; Energy flow in the ecosystem; Food chains, food webs and ecological succession. Case studies of the following ecosystems:

- a. Forest ecosystem
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
- History of ecosystem ecology
- Ecosystem services

**Unit 3: Natural Resources**

**(5 hours)**

Renewable and Non-renewable resources

- Land resources and land use change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).
- Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.

**Unit 4: Biodiversity and its conservation**

**(6 hours)**

- Levels of biological diversity: genetic, species and ecosystem diversity; Bio geographic zones of India; Biodiversity patterns and global biodiversity hotspots
- India as a mega-biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: ecological, economic, social, ethical, aesthetic and informational value.
- Nature Reserves, tribal populations and rights, Human wildlife conflicts in Indian context

**Unit 5: Environmental Pollution**

**(6 hours)**

Definition

- Cause, effects and control measures of: -

- a. Air pollution
- b. Water pollution
- c. Soil pollution
- d. Light pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards
- Climate change, Greenhouse effect, Global warming, Acid rain, Ozone layer depletion.
- Solid waste Management: control measures of urban and industrial wastes.
- Pollution case studies.

#### **Unit 6 Environmental Policies & Practices**

**(3 hours)**

- Environmental Laws: Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- International Agreements: Montreal protocol, Kyoto protocol, Convention on Biological Diversity (CBD)
- Environmental Impact Assessment
- Carbon footprint
- Sustainable Development Goals

#### **Unit 7: Human communities and the environment**

**(3 hours)**

- Human Population growth – impacts on environment
- Resettlement and rehabilitation of project affected persons: case studies
- Disaster management – floods, earthquake, cyclone and landslides
- Environmental movements: Chipko, Silent Valley, Bishnois of Rajasthan
- Environmental ethics
- Consumerism and Environment



- Environmental communication and public awareness, case studies.

### **Unit 8: Field work**

**(2 hours)**

- Visit to a local area to document environmental assets river/forest/grassland/hill/mountain
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hill slopes, etc.

### **Course Outcomes:**

- Students learn to knowledge on Echo systems, biodiversity and environmental policies and practices.

### **Recommended Books:**

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
3. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
4. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumabai, 1196p
5. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
6. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
7. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
8. Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.

## HEALTH CARE

**Course: AECC**

**Credit: 02**

**Number of Hours: 30**

**Course Objectives:**

### **COURSE CONTENT**

**Introduction to Health: (3 hours)**

- Definition of Health, determinants of Health, Health Indicators of India, Health Team Concept. National Health Policy.
- National Health Programmes (Briefly Objectives and scope) Population of India and Family welfare programme in India

**1. Introduction to Nursing: (3 hours)**

- What is Nursing? Nursing principles. Inter- Personnel relationships.

**2. Bandaging: (3 hours)**

- Basic turns; Bandaging extremities; Triangular Bandages and their application. Nursing Position, Bed making, prone, lateral, dorsal, dorsal re-cumbent, Fowler's positions, comfort measures, Aids and rest and sleep.

**3. Lifting And Transporting Patients: (4 hours)**

Lifting patients up in the bed. Transferring from bed to wheel chair.  
Transferring from bed to stretcher.

**4. Bed Side Management: (4 hours)**

Giving and taking Bed pan, Urinal: Observation of stools, urine. Observation of sputum, understand use and care of catheters, enema giving.

**5. Methods of Giving Nourishment:** Feeding, Tube feeding, drips, transfusion Care of Rubber Goods **(3 hours)**

**6. Vital Parameter Recording:** Recording of body temperature, respiration and pulse,

**7. Asepsis:** **(3 hours)**

Simple aseptic technique, sterilization and disinfection. Surgical Dressing: Observation of dressing procedures

**8. First Aid** **(3 hours)**

**Course Outcomes:**

- Describe the concepts of health, illness and national health policy various welfare programmes in India.
- Explain the concepts of Nursing
- Explain the basic, special needs of the patient, bandaging and first aid for common emergencies
- Explain infection control

**Recommended Books:**

1. Hari S. Essentials of Management for Healthcare Professionals. Productivity Press; 2017 Dec 15.

# **SOCIOLOGY**

**Course: AECC**

**Credit: 01**

**Number of Hours: 15**

## **Course objectives:**

- To develop the abilities of students to analyse the sociological concepts and their relationship with social work practice.
- To understand Indian social problems and its impact on social development.
- To develop skills for social analysis.
- To develop an understanding of emerging issues of social concern and their impact on society.
- To develop basic understanding of health perspectives and their practice in social work

## **Unit 1: Introduction to Sociology**

**(3 hours)**

- Meaning, definitions and scope of sociology.
- Importance of its study with special reference to health care professionals.
- Methods of Sociological investigations - Case study, social survey, questionnaire, interview and opinion poll methods.

## **Unit 2: Society, Family, Community and Socialization**

**(4 hours)**

- Concept of society: Definition and characteristics.
- The family: Meaning, definitions and functions of family.
- Role of family on individual's health and nutrition,
- Meaning, definitions and types of communities: Rural, Urban and Tribal community
- Socialization: Meaning and characteristics, Process of socialization, Agencies of socialization and their role –Family, School, peer group, religion, media.

## **Unit 3: Social Problems, Social Change, Social Planning, Social Work and Social security measures**

**(5 hours)**

- Social Problems: Meaning, characteristics and their influence on health.
- Social Change: Meaning, definitions and characteristics.
- Social Planning: The role of social planning in the improvement of health and rehabilitation
- Social Work -Basic concepts of social work, definitions, objectives, values and basic methods. Role of social worker in health settings.
- Social Security: Social Security schemes for the disadvantaged sections in

the society.

#### **Unit 4: Socio-cultural factors in Health and Disease**

**(3 hours)**

- Health: Concept, definitions and dimensions
- Meaning of social factors and role of social factors in health and disease.
- Culture and its influence on health and disease.

#### **Course outcome:**

- Able to understand the meaning of sociology, its relationship with other disciplines and also to gain knowledge on the sociological methods of investigations
- Able to understand social factors and its role in health and disease
- Able to understand the meaning, importance and agencies of socialization
- Able to understand the concept and role of social groups in health, sickness and rehabilitation
- Able to understand the meaning of family and its role in health, nutrition and sickness among members
- Able to understand the meaning, features and health hazards of rural and urban communities
- Able to understand the concept of culture and health and their relationship
- Able to understand the meaning of social change, factors of social change, social change and stress, social change and health
- Able to understand the meaning of social problems and types of social problems in the society
- Gain knowledge on the social security and social legislation measures for the disabled
- Able to understand the meaning of social work and role of medical social worker

#### **Recommended Books:**

1. Vidya Bhushan, D R Sachdeva, An Introduction to Sociology, Kitabmahal- Allahabad
2. Roshni Jain, An Introduction to Sociology, AITBS publishers - New Delhi, First edition., 2012
3. Krishna Gowda, Sociology for Nurses, CBS Publishers & Distributors Pvt Ltd- New Delhi, Sixth edition., 2010

4. Ram Ahuja, Social problems in India, Prem Rawat for Rawat Publication, third edition., 2014
5. Mohammed Akram, Sociology of Health, PremRawat for Rawat Publication-Jaipur, 2016

## **MEDICAL ETHICS**

**Course: AECC**

**Credit: 01**

**Number of hours: 15**

**Course objectives:**

- To understand the about the ethical importance in medicine
- Knowledge regarding ethical concepts and teaching/learning experience
- Understand the importance of informed consent and ethical issues in health care.

### **COURSE CONTENT**

#### **Introduction**

Medical ethics is a systematic effort to work within the ethos of medicine, which has traditionally been service to sick.

- **Objectives:** Identify underlying ethical issues and problem in medical practice

**Unit 1: Introduction to medical ethics (1 hour)**

What is ethics, what are values and norms, freedom and personal responsibility?

**Unit 2: Definition of medical ethics (2 hour)**

Major principles of medic ethics.

**Unit 3: Perspective of medical ethics (2 hour)**

The Hippocratic oath, The Declaration of Helsinki, The WHO

Declaration of Geneva, International code of Medical Ethics (1993),

Medical Council of India Code of Ethics (2002).

**Unit 4: Ethics of the individual (2 hour)**

Truth and confidentiality, the concept of disease, health and healing, the Rightto health.

**Unit 5: The ethics of human life (2 hour)**

Prenatal sex determination.

**Unit 6: The family and society in medical ethics (2 hour)**

Euthanasia, cancer and terminal care.

**Unit 7: Death and dying (2 hour)**

Use of life-support systems, the right to die with dignity, suicide—the Ethical outlook.

**Unit 8: Professional Ethics**

**(2 hour)**

Contract and confidentiality, malpractice and negligence.

**Course Outcomes:**

- I  
Increasing the awareness and knowledge of students of the value dimensions of interactions with the patients, colleagues, relations and public.
- F  
Fostering the development of skills of analysis, decision making and judgment.
- M  
Making the students aware of the need to respect the rights of the patient.
- D  
Duties and responsibilities of the technologists.

**Recommended Books:**

1. Tsai DF. The WMA medical ethics manual. Journal of Medical Ethics. 2006 Mar 1;32(3):163.

**SEMESTER III**

**OCULAR PATHOLOGY & MICROBIOLOGY**

**Course: Core**

**Credits: 03**

**Number of hours: 45 hours**

**Course Objectives:**

At the end of the program students will acquire knowledge in the following aspects:

- Inflammation and repair aspects.
- Pathology of various parts of the eye and adnexa.
- To understand basic principles of diagnostic ocular Microbiology.

## **COURSE CONTENT:**

- Unit1:** Pathology of the diseases in eyelids & Adnexa (2 hours)
- Unit2:** Pathology of the diseases of Conjunctival diseases (3 hours)
- Unit3:** Pathology of the diseases of Cornea (3 hours)
- Unit4:** Pathology of Crystalline lens disorders (3 hours)
- Unit5:** Pathology of Uveitis. (3 hours)
- Unit6:** Pathology of Glaucoma. (3 hours)
- Unit7:** Pathology of Optic nerve disorders. (3 hours)
- Unit8:** Ocular Bacteriology-Gram positive (staphylococcus aureus, staphylococcus epidermitis, streptococcus, propino bacterium, acitinomyces), bacteria including acid fast bacilli (mycobacterium tuberculosis, mycobacterium leprae). (3 hours)
- Unit9:** Ocular bacteriology- Gram negative bacteria (pseudomonas, haemophilus, brucella, Neisseria, Moracella), common bacterial infections of the eye. (3 hours)
- Unit10:** Virology: classification of virus in ocular disease, rubella, adenovirus, oncogenic virus, HIV, Common viral infections of the eye.(3 hours)
- Unit11:** Fungi: Yeasts, filamentous, common fungal infections of the eye. (3 hours)
- Unit12:** Intracellular parasite: Chlamydia, protozoa (Taxoplasmosis, Acanthamoeba. (3 hours)

### **Course Outcome:**

At the end of the program students will acquire knowledge in the following aspects:

- Pathology of various parts of the eye and adnexa.
- Will understand the pathogenesis of the diseases caused by the organisms in the human body with particular reference to the eye infections and
- Will understand basic principles of diagnostic ocular Microbiology.

### **Recommended Books:**

1. Corton kumar and robins: Pathological Basis of the Disease, 7th Edition, Elsevier, NewDelhi,2004.



## **GENERAL PHARMACOLOGY**

**Course: Core**

**Credits: 04**

**Number of hours: 60 hours**

### **Course objectives:**

- Know the basics of Pharmacology like, sources of drugs, routes of drug administration and general principles
- Describe the principles of pharmacokinetics and pharmacodynamics
- To appreciate various adverse drug reactions
- To have a basic knowledge of drugs affecting various body systems

### **COURSE CONTENT:**

#### **Unit 1: General Pharmacology**

**8 Hours**

- Introduction to Pharmacology
- Routes of drug Administration
- Absorption & Distribution
- Metabolism
- Excretion
- Pharmacodynamics - Mechanism of drug action- receptors
- Factors modifying drug actions
- Adverse drug reactions

#### **Unit 2: Autonomic Nervous System drugs**

**6 Hours**

- Sympathomimetics
- Alpha blockers
- Beta-blockers
- Cholinomimetics
- Anticholinergics
- Skeletal muscle relaxants

#### **Unit 3: Central Nervous System**

**11 Hours**

- Opioid analgesics
- Non-opioid analgesics (Prostaglandins)
- NSAIDs
- Ethyl alcohol
- Sedative hypnotics
- Antiepileptic drugs
- Local anesthetics-1
- Local anesthetics-2
- General anesthetics- I
- G A – II ( PAM)
- CNS stimulants

#### **Unit 4 : Cardio Vascular System Drugs**

**9 Hours**

- Diuretics
- Vasodilators (CCB's, Drugs acting on RAS)
- Antihypertensives
- Antianginal drugs
- Pharmacotherapy of shocks
- Cardiac glycosides
- Cardioplegic drugs
- Antiarrhythmic drugs
- Primary solutions

#### **Unit 5: Blood**

**6 Hours**

- Anaemia, erythropoietin
- Anticoagulants
- Anti platelet drugs
- Fibrinolytics,
- Lipid lowering drugs
- Vit.D and calcium, folic acid, phosphate binders

#### **Unit 6: Endocrines**

**1 Hour**

- Corticosteroids

### **Unit 7: Chemotherapy**

**9 Hours**

- General Principles of Chemotherapy
- Sulfonamides
- Penicillins
- Cephalosporins
- Broad spectrum antibiotics
- Macrolides
- Aminoglycosides
- Chemotherapy of UTI
- Drug Therapy of Tuberculosis

### **Unit 8: Miscellaneous topics**

**10 Hours**

- Antihistamines
- Antiemetics
- Drugs used in bronchial asthma-1
- Drugs used in bronchial asthma-2
- Cough
- Inhalational gases and emergency drugs
- I V fluids
- Metabolic and electrolyte imbalance
- Immunosuppressants
- Antiseptics and disinfectants

### **Course Outcomes:**

At the end of the course, the students will be able to

- Define and describe the principles of pharmacology and pharmacotherapeutics
- Define absorption, distribution, metabolism and excretion of drugs
- Define, identify and describe the adverse drug reactions
- Define and describe the pharmacological actions and therapeutic uses of drugs affecting systems- autonomic nervous system, cardiovascular system, blood, endocrine etc.
- To have a basic knowledge of drugs used in the treatment of various infections
- To have a basic knowledge on miscellaneous drugs

### **Recommended Books:**

- Udaykumar P. Textbook of Pharmacology for Dental and Allied Sciences. Jaypee Brothers Publishers; 2008.

## **OCULAR PHARMACOLOGY**

**Course: Core**

**Credits: 02**

**Number of hours: 30 hours**

### **Course Objectives:**

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

### **COURSE CONTENT**

**Unit 1: Introduction to ocular Pharmacology (2 hour)**

- Ocular preparations, formulations and requirements of an ideal Agent.
- Ocular Pharmacokinetics- Absorption, distribution, metabolism and excretion of drug, Methods of drug administration: Topical (Eye drops, ointment, suspensions, sustained release drugs and drug delivery system) Methods of drug administration: Periocular and intraocular injections. Systemic administrations - Oral, intramuscular, intravenous, subcutaneous.
- Ocular Toxicology - Topical administration (Antibiotics, steroids, anti-glaucoma drugs, anti-allergic drugs and others), systemic administration: Examples- Digitalis, Chloroquine, Chlorpromazine, Thioridazine, Ethambutol, Steroids

**Unit 2: Diagnostic agents:** Fluorescein dye (For ocular surface and Fundus Angiography) Rose Bengal, Lissamine green, Indocyanine green, Trypan blue, Methylene blue. **(2 hour)**

**Unit 3: Drugs and biological agents used in ocular surgery:** General names, Indications, Viscoelastic substances, Anti VEGF, Pilocarpine, Epinephrine etc **(2 hour)**

**Unit 4: Anesthetics used in ophthalmic procedures:** Lignocaine, Bupivacaine, Proparacaine **(2 hour)**

**Unit 7: Anti-glaucoma drugs (2 hour)**

- Angle closure glaucoma: Mechanism of action and side effects.
- Anti-glaucoma drugs for open angle glaucoma -Mechanism of action and side effects.

**Unit 8:** Definition of Accommodative esotropia, Examples of Drugs used in Accommodative esotropia and Side effects. **(2 hour)**

**Unit 9:** Cycloplegic and Mydriatic drugs and Miotics: Examples, indications and contraindications **(2 hour)**

**Unit 10:** Definition of Ocular Myasthenia, Examples of Drugs used in ocular myasthenia and Side effects. **(2 hour)**

**Unit 11:** Pharmacotherapy of ocular infections: **(4 hour)**

- Antibiotics and Anti-chlamydia: General names, indications and side effects.
- Pharmacotherapy of ocular infections: Antiviral drugs: General names, indications and side effects.
- Pharmacotherapy of ocular infections: Antifungal drugs: General names, indications and side effects
- Drugs used in allergic conditions of the eye-General names, indications and side effects
- Drugs used in inflammatory disorders of the eye: Corticosteroids, indications and side effects
- Drugs used in inflammatory disorders of the eye: NSAIDS, indications and side effects
- Drug treatment of degenerative disorders of the eye- General names, indications and side effects. (Band keratopathy, Retinitis pigmentosa, Pterygium etc)
- Immune-modulators in Ophthalmic practice -Examples and indications

**Unit 12:** Wetting agents & tear substitutes **(2 hour)**

**Unit 13:** Vitamins with emphasis on Vitamin A **(2 hour)**

**Unit 14:** Enzymes, Trace elements, antioxidants **(2 hour)**

#### **Course outcome:**

- Knowledge in Basic principle of pharmacokinetics & Pharmacodynamics of Ocular drugs.
- Knowledge in Commonly used ocular drugs, mechanism, indications, contraindications, drug dosage and adverse effects.

#### **Recommended Books:**

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

# OCULAR ANATOMY & PHYSIOLOGY

**Course: Core**

**Credit: 03    Number of Hours: 45**

## **Course Objectives:**

Student will know the anatomy & physiology of the orbit, eyeball and cranial nerves associated with ocular functions

## **COURSE CONTENT:**

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| <b>Unit 1. Central nervous system</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>(2 hours)</b>  |
| <ul style="list-style-type: none"><li>• Spinal cord and brain stem</li><li>• Cerebellum</li><li>• Cerebrum.</li><li>• Visual pathway</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |
| <b>Unit 2. Orbit</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>(2 hours)</b>  |
| <ul style="list-style-type: none"><li>• Eye</li><li>• Sclera</li><li>• Cornea</li><li>• Choroid</li><li>• Ciliary body</li><li>• Iris</li><li>• Retina-structure and functions</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                          |                   |
| <b>Unit 3. Refractory media-</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>(2 hours)</b>  |
| <ul style="list-style-type: none"><li>• Aqueous humor</li><li>• Anterior chamber</li><li>• Posterior chamber</li><li>• Lens</li><li>• Vitreous body</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                     |                   |
| <b>Unit 4: Eyelids</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>(2 hours)</b>  |
| <b>Unit 5: Conjunctiva</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>(2 hours)</b>  |
| <b>Unit 6: Ocular Physiology</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>(35 hours)</b> |
| <ul style="list-style-type: none"><li>• Embryology</li><li>• Extrinsic eye muscles, their actions and control of their movements</li><li>• Coats of the eyeball</li><li>• Crystalline lens and accommodation– presbyopia</li><li>• Vision – general aspects of sensation, Visual acuity</li><li>• Pigments of the eye and photochemistry</li><li>• The visual stimulus, refractive errors</li><li>• Visual perception– Binocular vision, stereoscopic vision, optical illusions</li><li>• Scotopic and Photopic vision, Color vision</li><li>• Ocular, movements, saccades and Pursuits</li></ul> |                   |

**Course Outcome:**

- Knowledge in the anatomy of the orbit, eyeball and cranial nerves associated with ocular functions
- Knowledge in the Physiology of the eyeball and cranial nerves associated with ocular functions

**Recommended books:**

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

## **OPTOMETRIC INSTRUMENTS**

**Course: Core****Credit: 04****Number of hours: 60 hours****Course Objectives:**

Upon completion of the course, the student should be able to gain theoretical knowledge and basic practical skill in handling the Optometric instruments.

**COURSE CONTENT****Unit 1. Refractive instruments(20 hours)**

- Optotypes and MTF, Spatial Frequency
- Test chart standards.
- Choice of test charts
- Trial case lenses
- Refractor(phoropter)head units
- Trial frame design
- Retinoscope– types available
- Adjustment of Retinoscopes- special features
- Objective optometers.
- Infrared optometer devices.
- Projection charts
- Illumination of the consulting room.
- Brightness acuity test
- Vision analyzer
- Pupilometer

- Potential Acuity Meter
- Abberometer

**Unit 2. Ophthalmoscopes and related devices (20 hours)**

- Design of ophthalmoscopes – illumination
- Design of ophthalmoscopes- viewing
- Direct and In-Direct Ophthalmoscopes

**Unit 3: Optometric Instruments (20 hours)**

- Lensometer, Lens gauges or clock
- Slit lamp
- Tonometers
- Keratometer and corneal topography
- Refractometer
- Orthoptic Instruments(Synaptophore)
- Colour Vision Testing Devices
- Fields of Vision and Screening Devices
- Scans
- ERG

**Course Outcome:**

The students gain theoretical knowledge and basic practical skill in handling the Optometric instruments

**Recommended Books:**

1. David Henson: Optometric Instrumentations, Butterworth-Heinemann,UK, 1991



## CLINICAL OPTOMETRY I

**Course: Core**

**Credit: 06**

**Number of hours: 90 hours**

**Course Objectives:**

- Up on completion of the course, the student should be able to gain theoretical knowledge and basic practical skill in handling the Optometric instruments
- The student will be introduced to optical terminology, equipment, and techniques used for treatment.

**COURSE CONTENT:**

<b>Unit 1:</b> Trail Box and its components	<b>(5 hours)</b>
<b>Unit 2:</b> Visual Acuity charts/drum- Identification	<b>(10 hours)</b>
<b>Unit 3:</b> Visual acuity assessment using different charts- both distance and near	<b>(10 hours)</b>
<b>Unit 4:</b> Choice of test charts- geriatric and pediatric	<b>(10 hours)</b>
<b>Unit 5:</b> Objective Retinoscopy	<b>(5 hours)</b>
<b>Unit 6:</b> Direct ophthalmoscopy	<b>(10 hours)</b>
<b>Unit 7:</b> Torch light Examination and Keratometry	<b>(5 hours)</b>
<b>Unit 8:</b> Slit lamp Biomicroscopy	<b>(10 hours)</b>
<b>Unit 9:</b> Lensometry & Hand Neutralization	<b>(10 hours)</b>
<b>Unit 10:</b> Tonometry (Digital & Others)	<b>(5 hours)</b>
<b>Unit 11:</b> Color Vision devices and test procedure	<b>(5 hours)</b>

**Course Outcome:**

- The student gains theoretical knowledge and basic practical skill in handling the basic Optometric instruments

**Recommended Books:**

1. David Henson: Optometric Instrumentations, Butterworth-Heinemann,UK, 1991.

# **KANNADA**

**Course: AECC**

**Credits: 02**

**Number of hours: 30**

## **Course Objectives**

- Enable students to learn alphabet, words and simple sentences in Kannada.
- Enable students to enhance speaking and writing communicative skills in Kannada and learn technical words related to medical science

## **COURSE CONTENT:**

**Unit I:** Kannada Letters (vowels, Consonant)

**Unit II:** Words, Phrases, formation of sentences, Letter Writing, Essay Writing. Treatment related Kannada words (from English to Kannada)

## **Unit III:**

- 1) Possible communication in kannada between Patients and Doctors.
- 2) Advising sentences to the possible questions of patients.
- 3) Some important sentences which enable to communicate with doctors and colleagues.

## **Course Outcome**

- Allied health science students will be able to attend health issues of native Kannada speaking patients more effectively.
- They can also act as a bridge between doctors and patients.

## **Recommended Books**

- Kannada Vyakarana – (8th ,9th and 10th Karnataka government text books)
- HSK, Vyavahika Kannada

## **SEMESTER IV**

### **OPTOMETRIC & DISPENSING OPTICS**

**Course: Core**

**Credit: 04**

**Number of Hours: 60 hours**

#### **Course Objective:**

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

#### **COURSE CONTENT**

**Unit 1:** Prisms—Definition, properties, Refraction through prisms, Thickness difference, Base-apex notation, uses, nomenclature and units, Sign Conventions, Fresnel's prisms, rotary prisms

**(3 hours)**

**Unit 2:** Lenses—Definition, units, terminology used to describe, form of lenses **(3 hours)**

**Unit 3:** Vertex distance and vertex power **(3 hours)**

**Unit 4:** Lens shape, size and types i.e. Spherical, cylindrical and Sphero-cylindrical **(3 hours)**

**Unit 5:** Transpositions –Simple, Toric and Spherical equivalent **(3 hours)**

**Unit 6:** Prismatic effect, centration, decentration and Prentice rule, Prismatic effect of Plano-cylinder and Sphero-cylinder lenses **(3 hours)**

**Unit 7:** Magnification in high plus lenses, Minification in high minus lenses **(3 hours)**

**Unit 8:** Tilt induced power in spectacles(3 hours)

**Unit 9:** Aberration in ophthalmic Lenses. **(3 hours)**

**Unit 10:** Definition and materials (glass, plastic, poly carbonate, triology) Types and characteristics, Properties (Refractive index, Specific gravity, UV cut off, Impact resistance-include drop ball test, Abbe value, Central thickness) **(3 hours)**

**Unit 11:** Best form of Lenses and safety standards for ophthalmic lenses (FDA, ANSI, ISI, Others **(3 hours)**

**Unit 12:** Bifocal design, their manufacturing and uses (Kryptop, Univis D, Executive, Invisible, Occupational) **(2 hours)**

**Unit 13:** Progressive additional lenses, Modified near vision lenses (Designs, advantages,

Limitation) (2 hours)

**Unit 14:** Lens defects- Description and detection & Glazing and Edging (Manual and automatic) (3 hours)

**Unit 15:** Special lenses (•Iseikonic lenses, Recumbent prism, Fresnel prism and lenses, Lenticular & Aspherical lenses, Photochromic and polaroids, Tinted lens, Tints and filters) (2 hours)

**Unit 16:** Classification of frames- materials (cover in detail), colours and temple position, advantage and disadvantage, where to use (2 hours)

**Unit 17:** Special purpose frames (sports, kids, reading) Components of spectacle prescription & interpretation, Transposition, Add and Near power relation. (2 hours)

**Unit 18:** Frame Selection- based on spectacle prescription, professional requirements, age group, face shape (2 hours)

**Unit 19:** Measuring inter-pupillary distance for distance and near, bifocal height (2 hours)

**Unit 20:** Lens & Frame markings, Pupillary centres, bifocal heights, progressive markings and adjustments-facial wrap, Pantoscopic tilt (2 hours)

**Unit 21:** Neutralization – Hand & Lensometer, Axis marking, Prism marking. (2 hours)

**Unit 22:** Faults in spectacles (Lens fitting, Frame fitting, patient complaints, description, detection and correction. (2 hours)

**Unit 23:** Final checking & Dispensing of spectacles to customers, Counselling on wearing & Maintenance of spectacles, Accessories-Bands, Chains, Boxes, Slevets, cleaners, screw driver kit. (2 hours)

**Unit 24:** Spectacle repairs- tools, methods, soldering, riveting, frame adjustments. (2 hours)

### **Course Outcome:**

- Understanding the theory behind spectacle lenses and frames, their materials, types, advantages and disadvantages, calculations involved, when and how to prescribe.
- Understanding development of lenses, particularly of the methods of calculating their power and effect.

### **Recommended Books:**

1. Jalie M: The principles of Ophthalmic Lenses, The Association of Dispensing Opticians, London, 1994.
2. Jalie MO: Ophthalmic lens and Dispensing, 3rd edition, Butterworth–Heinemann, 2008
3. Troy E. Fannin, The odore Grosvenor: Clinical Optics, 2nd edition, Butterworth –

Heinemann, 1996

## VISUAL OPTICS

**Course: Core**

**Credit: 04**

**Number of Hours: 60 hours**

### **Course Objectives:**

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

### **COURSE CONTENT**

**Unit 1:** Optics of Ocular Structure - Cornea and aqueous, Crystalline lens, Vitreous, Schematic and reduced eye. **(5 hours)**

**Unit 2:** Basic aspects of vision- Visual Acuity, Light and Dark Adaptation, Color Vision, Spatial and Temporal Resolution **(5 hours)**

**Unit 3:** Refractive anomalies and their causes-Etiology of refractive anomalies, Contributing variability and their ranges, populating distributions of anomalies. **(10 hours)**

**Unit 4:** Accommodation & Presbyopia- Far and near point of accommodation, Range and amplitude of accommodation, Mechanism of accommodation, Variation of accommodation with age, Presbyopia. **(10 hours)**

**Unit 5:** Convergence: Type, Measurement and Anomalies Relationship between accommodation and convergence-AC/A ratio. **(10 hours)**

**Unit 6:** Objective Refraction (Static& Dynamic)- Streak retinoscopy, Principle, Procedure, difficulties and interpretation of findings, Transposition and spherical equivalent, Dynamic Retinoscopy various methods, Radical retinoscopy and near retinoscopy, Cycloplegic refraction. **(10 hours)**

**Unit 7:** Subjective Refraction - Principle and fogging, Fixed astigmatic dial(Clockdial) Combination of fixed and rotator dial(Fan and block test),J.C.C, Duochrome test, Binocular balancing-alternate occlusion, prism dissociation, dissociate Duochrome balance, Borish dissociated fogging, Binocular refraction-Variou technique. **(10 hours)**

**Course Outcome:**

- Student learns various optical components of eye, types of refractive errors, clinical approach in diagnosis and management of various types of refractive errors.

**Recommended Books:**

1. A H Tunnacliffe: Visual optics, The Association of British Optician, 1987
2. A.G Bennett & RB Rabbets: Clinical Visual optics, 3<sup>rd</sup> edition, Butterworth Heinemann, 1998

**OCULAR DISEASE-I****Course: Core****Credit: 04****Number of hours: 60 hours****Course Objective:**

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

**COURSE CONTENT****Unit 1: Lids and adnexa (10 hours)**

- Applied anatomy
- Congenital anomalies: Ptosis, coloboma, Epicanthus, Distichiasis, Cryptophthalmos
- Oedema of the eyelids
- Inflammatory disorders: Blepharitis, external hordeolum and internal hordeolum, chalazion
- Anomalies in the position of the lashes and lid margin: Trichiasis, ectropion, entropion, symblepharon, blepharophimosis, lagophthalmos, blepharospasm & ptosis.
- Tumors: Papillomas, Xanthelasma, Haemangioma, basal cell carcinoma, squamous cell carcinoma, sebaceous gland melanoma

**Unit 2: Lacrimal system (10 hours)**

- Applied anatomy and physiology
- Tear film
- Dry eye
- Watering eye (etiology, clinical evaluation)
- Dacryocystitis
- Dacryoadenitis

**Unit 3: Conjunctiva (10 hours)**

- Applied anatomy & Physiology
- Inflammations of conjunctiva: infective conjunctivitis, Bacterial, chlamydial, Viral, Allergic conjunctivitis
- Degenerative conditions: Pinguecula, Pterygium, Concretions
- Symptomatic conditions: Hyperaemia, chemosis, Ecchymosis, Xerosis, Discoloration
- Cysts and tumours.

**Unit 4: Lens****(10 hours)**

- Applied anatomy & physiology
- Classification of cataract
- Congenital and developmental cataract
- Acquired (Senile, traumatic, complicated, metabolic, electric, radiational & Toxic)
- Morphological: Capsular, subcapsular, cortical, supranuclear, nuclear and polar.
- Management of cataract (Non-surgical and surgical measures, preoperative evaluation, types of surgeries)
- Complications of cataract surgery
- Subluxation & Dislocation, coloboma, lenticonus,
- Microspherophakia.

**Unit 5: Cornea & Sclera****(10 hours)**

- Applied anatomy and physiology
- Episcleritis & scleritis
- Congenital anomalies: Megalocornea, cornea plana, congenital cloudy cornea
- Inflammations of the cornea: Topographical classifications: ulcerative keratitis and non-ulcerative. Etiological classifications: Infective, allergic, traumatic, idiopathic
- Degenerations: Classifications, Arcus senilis, Vogt's white limbal girdle, Hassal-henle bodies, Lipoid keratopathy, Band shaped keratopathy, Salzmann's nodular degeneration, Droplet keratopathy, Pellucid marginal degeneration
- Dystrophies: Reis buckler dystrophy, Recurrent corneal erosion syndrome, Granular dystrophy, Lattice dystrophy, Macular dystrophy, Cornea guttata, Fuch's epithelial endothelial dystrophy, Congenital hereditary endothelial dystrophy
- Keratoconus, Keratoglobus
- Corneal edema, Corneal opacity, corneal vascularisation
- Keratoplasty

**Unit 6: Uveal tract****(10 hours)**

- Applied anatomy
- Classification of Uveitis, Etiology & pathology
- Anterior Uveitis, Posterior uveitis, Intermediate uveitis, Endophthalmitis, panophthalmitis
- Tumour of uveal tract (melanoma)
- Clinical examination of uveitis

**Course Outcome:**

- Knowledge on various ocular diseases affecting various parts of the eyes.
- Knowledge on clinical signs and symptoms, cause, pathophysiological mechanism, diagnostic approach, differential diagnosis and management aspects of the ocular diseases.

**Recommended Books:**

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

## **COMMUNITY & OCCUPATIONAL OPTOMETRY**

**Course: Core****Credit: 02****Number of hours: 30 hours****Course Objective:**

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

**COURSE CONTENT:****Unit 1: Public Health Optometry****(15 hours)**

- Concepts and implementation, Stages of diseases.
- Levels of disease prevention and levels of healthcare patterns
- Epidemiology of blindness – Defining blindness and visual impairment
- Eye in primary health care
- Community Eye Care & 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 and in school eye health programmes
- Basics of Tele Optometry and its application in public health
- Introduction to occupational health, Hygiene and safety, international bodies like



ILO,WHO, National bodies etc.

**Unit 2: Occupational Optometry**

**(15 hours)**

- Colour- Definition, Colour theories, Colour coding, colour defects, colour vision test
- Electromagnetic radiation and its effects on eye
- Occupational hazards and preventive/ Protective methods.
- Vision standards- railways, Road ways, Airlines.
- Visual display units
- Computer vision syndrome.

**Course Outcome:**

- Students gain Knowledge in basic sciences of public health optometry with an emphasis on the epidemiology of vision problems especially focused on Indian scenario.
- Students gain Knowledge in Ocular Problems associated with various occupations.

**Recommended 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. NewcombRD, JolleyJL:Public Health and Community Optometry, Charles C Thomas Publisher, Illinois, 1980

## **CLINICAL OPTOMETRY II**

**Course: Core**

**Credit: 03**

**Number of hours: 90 hours**

**Course Objectives:**

- Up on completion of the course, the student should be able to gain theoretical knowledge and basic practical skill in handling the Optometric instruments
- The student will be introduced to optical terminology, equipment, and techniques used for treatment.

**COURSE CONTENT:**

<b>Unit 1:</b> Lensometer and Hand Neutralization	<b>(5hours)</b>
<b>Unit 2:</b> Vertex distance evaluation using stenopaic slit	<b>(10 hour)</b>
<b>Unit 3:</b> Spectacle frame parts	<b>(10 hours)</b>
<b>Unit 4:</b> Measuring IPD Distance in Spectacle	<b>(10 hours)</b>
<b>Unit 5:</b> Objective Retinoscopy	<b>(10 hours)</b>
<b>Unit 6:</b> All Subjective Refraction Methods	<b>(10 hours)</b>
<b>Unit 7:</b> Torch light Examination	<b>(10 hours)</b>
<b>Unit 8:</b> Slit lamp Biomicroscopy (in detail)	<b>(10 hours)</b>
<b>Unit 9:</b> Color Vision devices and test procedure	<b>(10 hours)</b>
<b>Unit 10.</b> Visual Acuity testing using Log Mar	<b>(5 hours)</b>

**Course Outcome:**

- The student gains theoretical knowledge and basic practical skill in handling the basic Optometric instruments related to visual optics, optometric and dispensing optics.

**Recommended Books:**

1. David Henson: Optometric Instrumentations, Butterworth-Heinemann,UK, 1991.

## **HUMAN RIGHTS AND GENDER EQUITY**

**Course: AECC**

**Number of Hours: 30 Hours**

**Credits: 02**

### **Course Objectives:**

- To make the student understand the human rights as citizens of India.

### **COURSE CONTENT:**

#### **Unit 1: Human Rights (5 Hours)**

- Human Rights- Meaning
- Universal declaration of Human rights

#### **Unit 2: Human Rights Advocacy (5 Hours)**

- Global Advocacy of human rights amnesty international and other organizations
- Peoples union for Civil Liberty(PUCL)
- Human Rights Commission in India
- Minority Commission in India
- Remedies against Violation of Human rights in India

#### **Unit 3: Gender Equity (5 Hours)**

- Key Concepts- Gender and sex- Masculinity and Feminity, Patriarchy- Matriarchy, Gender roles and attributes, Gender division or labour, Gender Bias, Gender Stereotypes, Need for Gender Sensitization.

#### **Unit 4: Woman Status in India (5 Hours)**

- Important indicators- Sex Ratio, Education, Health, Nutrition, Maternal and Infant Mortality, Work Participation rate, Political Participation.

#### **Unit 5: Contemporary Women's Issues (5 Hours)**

- Discrimination against Girl child
- Violence against women
- Problems of health and nutrition
- Women's education gender bias in education

- Trafficking in Women
- Globalization and Impact on Women

**Unit 6: State Initiatives on Gender Issues**

**( 5 Hours)**

- Constitutional Rights of Women
- Laws Pertaining to Women
- The National Commission for Women

**Course Outcome:**

- Basic Knowledge of Human Rights and its function and authorities in society and industry women's status, issues and gender equity.

**Recommended Books:**

1. Parvathy Appaiah, Human Rights, Gender Equity and Environmental Studies, Shivam Books publishers, 2012.
2. Parvathy Appaiah, Human Rights, Gender Equity and Environmental Studies, Jai Bharath Prakashan publishers, 2016.
3. Parvathy Appaiah, Human Rights, Gender Equity and Environmental Studies, Jai Bharath Prakashan publishers, 2018-19.

# **BIOSTATISTICS**

**Course: AECC**

**Credit: 02**

**Number of Hours: 30**

## **Course Objectives:**

- Understands statistical terms.
- Possesses knowledge and skill in the use of basic statistical methods.

## **COURSE CONTENT:**

### **Unit 1: Introduction**

**(3 hours)**

- Meaning, definition of statistics.
- Importance of the study of statistics.
- Branches of statistics.
- Statistics and health science including nursing.
- Parameters and estimates.
- Descriptive and inferential statistics.
- Variables and their types.
- Measurement scales

### **Unit 2: Tabulation of Data**

**(3 hours)**

- Raw data, the array, frequency distribution
- Basic principles of graphical representation
- Types of diagrams - histograms, frequency polygons, smooth frequency polygon, cumulative frequency curve, ogive.
- Normal probability curve.

### **Unit 3: Measure of Central Tendency**

**(4 hours)**

- Need for measures of central tendency
- Definition and calculation of mean - ungrouped and grouped
- Meaning, interpretation and calculation of median ungrouped and grouped
- Meaning and calculation of mode.
- Comparison of the mean, and mode.

**Unit 4: Measure of Variability (6 hours)**

- Need for measure of dispersion. The range, the average deviation.
- The variance and standard deviation.
- Calculation of variance and standard deviation ungrouped and grouped.
- Properties and uses of variance

**Unit 5: Probability and Standard Distributions (6 hours)**

- Meaning of probability of standard distribution.
- The Binominal distribution.
- The normal distribution.
- Divergence from normality - skewness, kurtosis.

**Unit 6: Sampling Techniques(5 hours)**

- Need for sampling - Criteria for good samples.
- Various sampling designs.
- Procedures of sampling and sampling designs errors.
- Sampling variation.
- Tests of significance.

**Unit 7: Health Indicator (3 hours)**

- Importance of health Indicator.
- Indicators of population, morbidity, mortality, health services.
- Calculation of rates and rations of health.

**Course Outcomes**

- Gains Knowledge in application of statistics in medical field and research.
- Possesses knowledge and skill in the use of basic statistical methods.

**Recommended Books.**

1. Mahajan BK, Gupta MC. Textbook of preventive and social medicine. Jaypee Brothers; 1995.

## SEMESTER V

### CONTACT LENS-I

**Course: Core**

**Credit: 02**

**Number of hours: 30**

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

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

#### **COURSE CONTENT**

<b>Unit 1.</b> Introduction to Contact lenses	<b>(1 hour)</b>
• Definition	
• Classification / Types	
<b>Unit 2:</b> History of Contact Lenses	<b>(1 hour)</b>
<b>Unit 3:</b> Optics of Contact Lenses	<b>(1 hour)</b>
• Magnification& Visual field	
• Accommodation & Convergence	
• Back& Front Vertex Power / Vertex distance calculation	
<b>Unit 4:</b> Review of Anatomy & Physiology of	<b>(1 hour)</b>
• Tearfilm	
• Cornea	
• Lids & Conjunctiva	
<b>Unit 5:</b> Introduction to CL materials	<b>(1 hour)</b>
• Monomers, Polymers	
<b>Unit 6:</b> Properties of CL materials	<b>(1 hour)</b>
• Physiological (Dk, Ionicity, Water content)	
• Physical (Elasticity, Tensile strength, Rigidity)	
• Optical (Transmission, Refractive index)	
<b>Unit 7:</b> Indications and contraindications	<b>(1 hour)</b>
<b>Unit 8:</b> Parameters/ Designs of Contact Lenses & Terminology	<b>(1 hour)</b>
<b>Unit 9:</b> RGP Contact Lens materials	<b>(1 hour)</b>
<b>Unit 10:</b> Manufacturing Rigid and Soft Contact Lenses– various methods	<b>(1 hour)</b>
<b>Unit 11:</b> Pre-Fitting examination– steps, significance, recording of results	<b>(1 hour)</b>
<b>Unit 12:</b> Correction of Astigmatism with RGP lens	
<b>Unit 13:</b> Types of fit –Steep, Flat, Optimum – on spherical cornea with spherical lenses	

**(1 hour)**

**Unit 14:** Types of fit –Steep, Flat, Optimum – on Toric cornea with spherical lenses

**(1 hour)**

**Unit 15:** Calculation and finalising Contact lens parameters

**(1 hour)**

**Unit 16:** Ordering Rigid Contact Lenses– writing a prescription to the Laboratory

**(1 hour)**

**Unit 17:** Checking and verifying Contact lenses from Laboratory

**(1 hour)**

**Unit18:** Modifications possible with Rigid lenses

**(1 hour)**

**Unit19:** Common Handling Instructions

**(1 hour)**

**Unit 20:** Care and Maintenance of Rigid lenses

**(1 hour)**

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

**Unit 21.**Followup visit examination

**(1 hour)**

**Unit 22.**ComplicationsofRGPlenses

**(1 hour)**

### **Course Outcome:**

- Understanding the basics of contact lenses and performing a contact lens fit for patients.

### **Recommended books:**

1. IACLE modules 1-10
2. Elisabeth A. W. Millis: Medical Contact LensPractice, Butterworth-Heinemann, 2004



## **BINOCULAR VISION-I**

**Course: Core**

**Credit: 02 Credit**

**Number of hours: 30 hours**

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

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

### **COURSE CONTENT**

#### **Unit 1. Binocular Vision and Space perception.**

**(5 hours)**

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

#### **Unit 2: Anatomy of Extra Ocular Muscles(2.5 hours)**

- Recti and Obliques, LPS.
- Innervation & Blood Supply.

#### **Unit 3: Physiology of Ocular movements.**

**(2.5 hours)**

- Center of rotation, Axes of Fick.
- Action of individual muscle.

#### **Unit 4: Laws of ocular motility**

**(2.5 hours)**

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

#### **Unit 5: Uniocular & Binocular movements- fixation, saccadic & pursuits. (2.5 hours)**

- Version & Vergence.

- Fixation & field of fixation
- Unit 6: Near Vision Complex Accommodation (5 hours)**
  - Definition and mechanism (process).
  - Methods of measurement.
  - Stimulus and innervation.
  - Types of accommodation.
  - Anomalies of accommodation– aetiology and management.
- Unit 7: Convergence (5 hours)**
  - Definition and mechanism.
  - Methods of measurement.
  - Types and components of convergence- Tonic, accommodative, fusional, proximal.
  - Anomalies of Convergence– etiology and management.
- Unit 8: Sensory adaptations (2 hours)**
  - Confusion
- Unit 9: Suppression (2 hours)**
  - Investigations
  - Management
  - Blind spot syndrome
- Unit 10: Abnormal Retinal Correspondence (2 hours)**
  - Investigation and management
  - Blind spot syndrome
- Unit 11: Eccentric Fixation (2 hours)**
  - Investigation and management
- Unit 12: Amblyopic (5 hours)**
  - Classification
  - Aetiology
  - Investigation
  - Management

**Course Outcome:**

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

**Recommended Books:**

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

## **OCULAR DISEASE II**

**Course: Core**

**Credit: 04**

**Number of hours: 60 hours**

### **Course Objectives:**

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

- Etiology
- Epidemiology
- Symptoms
- Signs
- Program sequelae of ocular disease
- Diagnostic approach
- Management of the ocular diseases

### **COURSE CONTENT**

#### **Unit 1: Retina and vitreous**

**(10 hours)**

- Applied anatomy
- Congenital and developmental disorders (optic disc: coloboma, drusen, hypoplasia, medullated nerve fibres, persistent hyaloid artery)
- Inflammatory disorders retinitis: Acute purulent, Bacterial, viral, mycotic)
- Retinal vasculitis (Eales's Disease)
- Retinal artery occlusion(CRAO)
- Retinal vein occlusion(ischaemic, non-ischaemic, branch retinal vein occlusion)
- Retinal degenerations: Retinitis pigmentosa, Lattice degenerations.
- Macular Disorders: Solar retinopathy, central serous retinopathy, cystoid macular oedema, Age related macular degeneration.
- Diabetic retinopathy
- Retinal detachment: Rhegmatogenous, tractional, exudative
- Retinoblastoma

#### **Unit 2: Ocular injuries**

**(10 hours)**

- Terminology: closed globe injury(contusion, lamellar laceration),open globe injury (rupture, laceration, penetrating injury & perforating injury)
- Mechanical injuries(extraocular foreign bodies, blunt trauma, perforating injury, sympathetic ophthalmitis)
- Non-mechanical injuries(chemical, thermal, electrical, radiational)
- Clinical approach towards ocular injury patients

### **Unit 3: Clinical neuro-ophthalmology**

**(10 hours)**

- Anatomy and lesions of the visual pathway
- Pupillary reflexes and abnormalities (amaurotic light reflex, efferent pathway defect, wernicke's hemianopic pupil, Marcus Gunn pupil, Argyll Robertson pupil, Adie's tonic pupil)
- Optic neuritis, anterior ischemic optic neuropathy, papilledema
- Cortical blindness
- Nystagmus
- Malingering

### **Unit 4: Glaucoma**

**(10 hours)**

- Applied anatomy and physiology of anterior segment
- Clinical examination
- Definitions and classifications of glaucoma
- Pathogenesis of glaucomatous ocular damage
- Congenital glaucoma
- Primary open angle glaucoma
- Ocular hypertension
- Normal tension glaucoma
- Primary angle closure glaucoma
- Secondary glaucoma
- Management: common medications, laser interventions and surgical techniques.

### **Unit 6: Orbit**

**(10 hours)**

- Applied anatomy
- Proptosis
- Enophthalmos
- Developmental anomalies: craniosynostosis, craniofacial dysostosis, hypertelorism, median facial cleft syndrome
- Orbital inflammations (preseptal cellulitis, orbital cellulitis, orbital periostitis, cavernous sinus thrombosis)
- Grave's ophthalmopathy
- Orbital tumors (dermoids, capillary haemangiomas, optic nerve glioma)
- Orbital blow out fractures
- Orbital trauma
- Approach to a patient with proptosis.

### **Course Outcome:**

- Knowledge on various posterior segment ocular diseases affecting various parts of the eyes.
- Knowledge on clinical signs and symptoms, cause, pathophysiological mechanism, diagnostic approach, differential diagnosis and management aspects of the ocular diseases.

### **Recommended Books:**

1. A K Khurana: Comprehensive Ophthalmology, 4th edition, New Age International (P) Ltd.

## **PEDIATRIC & GERIATRIC OPTOMETRY**

**Course: Core**

**Credit: 02**

**Number of hours: 30 hours**

### **Course Objectives:**

- The Course provides the student with suitable knowledge both in theoretical and practical aspects of ocular health in geriatric and pediatric populations.

### **COURSE CONTENT**

- Unit 1:** History taking in paediatric patients **(2 hours)**
- Unit 2:** Assessment of visual acuity **(2 hours)**
- Unit 3:** Normal appearance, Pathology and structural anomalies (orbit, eyelids, lacrimal system, conjunctiva, cornea, sclera, anterior chamber, uveal tract, pupil, lens, vitreous, fundus) **(2 hours)**
- Unit 4:** Refractive examination **(2 hours)**
- Unit 5:** Determination of binocular status and sensory motor adaptation. **(2 hours)**
- Unit 6:** Compensatory treatment and remedial therapy for myopia, pseudo-myopia, hyperopia, astigmatism, anisometropia, amblyopia **(2 hours)**
- Unit 7:** Remedial and compensatory treatment of strabismus and nystagmus **(2 hours)**
- Unit 8:** Pediatric eye disorders: Cataract, ROP, Retinoblastoma, Neuromuscular conditions (Myotonic dystrophy, Mitochondrial cytopathy and genetics) **(2 hours)**
- Unit 9:** Spectacle dispensing for children **(2 hours)**
- Unit 10:** Paediatric contact lens **(2 hours)**
- Unit 11:** Introduction to geriatric medicine- epidemiology, Need for optometric care, systemic diseases (Hypertension, Atherosclerosis, coronary heart disease, Congestive heart failure, cerebro-vascular disease, diabetic) **(2 hours)**
- Unit 12:** Optometric examination of older adults **(2 hours)**
- Unit 13:** Ocular diseases common in old eye with special reference to cataract, glaucoma, macular disorder, vascular diseases of the eye. **(2 hours)**
- Unit 14:** Contact lens in elderly **(2 hours)**

**Unit 15:** Spectacle dispensing in elderly- Consideration of spectacle lenses and frame.

**(2 hours)**

**Course Outcome:**

- The Course provides the student with suitable knowledge both in theoretical and practical aspects of ocular health in geriatric and pediatric populations.

**Recommended Books:**

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

**CLINICAL OPTOMETRY III**

**Course: Core**

**Credit: 04**

**Number of hours: 120 hours**

**Course Objectives:**

- Upon completion of the course, the student should be able to gain theoretical knowledge and basic practical skill in handling the Contact Lens and Binocular vision test and procedures.
- The student will be introduced to optical terminology, equipment, and techniques used for treatment.

**COURSE CONTENT:**

**Unit 1:** Contact lens (40hours)

- Soft and RGP Insertion and Removal
- Pre fitting Techniques (History, VA testing, HVID, VVID, Keratometry, Schirmer's test and TBUT)
- Soft contact Lens Fitting

**Unit 2:** Binocular Vision (30hours)

- Stereopsis test
- Convergence evaluation tests(NPC)
- Accommodation Evaluation tests(NPA, NRA, PRA, AC/A ratio, Accommodative facility test)
- EOM Test

**Unit 3:** Posterior segment evaluation by slit lamp using 90 D lens. **(10 hours)**

**Unit 4:** Color Vision devices and test procedure **(10 hours)**

**Unit 5:** Vision Therapy Procedures (Brock String, Cat Card, Hart Chart,

Accommodative Flippers)	(10 hours)
<b>Unit 6:</b> Macular Function tests (Amsler, Photostress, Color vision test)	
<b>Unit 7:</b> Perimetry	(10 hours)
<b>Unit 8:</b> Tonometry	(10 hours)

**Course Outcome:**

- The student gains theoretical knowledge and basic practical skill in handling the basic Optometric instruments related to Contact Lens, Binocular vision and Ocular diseases II

**Recommended Books:**

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

**SEMESTER VI**

**CONTACT LENS-II**

**Course: Core**

**Credit: 04**

**Number of hours: 45**

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

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

**COURSE CONTENT**

**Unit 1: SCL Materials & Review of manufacturing techniques (5 hours)**

- Comparison of RGPvs. SCL
- Pre-fitting considerations for SCL
- Fitting philosophies for SCL
- Fit assessment in Soft Contact Lenses: Types of fit– Steep, Flat, Optimum

**Unit 2: Calculation and finalising SCL parameters (5 hours)**

- Disposable lenses
- Advantages and availability

**Unit 3: Soft Toric CL (5 hours)**

- Stabilization techniques
- Parameter selection
- Fitting assessment

**Unit 4: Common Handling Instructions (5 hours)**

- Insertion & Removal Techniques
- Do's and Don't's

**Unit 5: Care and Maintenance of Soft lenses (5 hours)**

- Cleaning agents & Importance
- Rinsing agents & Importance
- Disinfecting agents & importance
- Lubricating & Enzymatic cleaners
- Followup visit examination
- Complications of Soft lenses

**Unit 6: Therapeutic contact lenses (5 hours)**

- Indications
- Fitting consideration

**Unit 7: Specialty fitting (10 hours)**

- Aphakia
- Paediatric
- Postrefractive surgery
- Management of Presbyopia with Contact lenses
- Orthokeratology – Ortho K lenses & Myopia control
- Scleral contact lens.

**Course Outcome:**

- Understanding the basics of contact lenses and performing a contact lens fit for patients.
- Knowledge in Specialty Contact lenses available for different Various Conditions

**Recommended books:**

1. IACLE modules 1-10
2. Elisabeth A. W. Millis: Medical Contact Lens Practice, Butterworth-Heinemann, 2004



## **BINOCULAR VISION II**

**Course: Core**

**Credit: 02 Credit**

**Number of hours: 30 hours**

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

- Demonstrate an in-depth knowledge of the gross anatomy and physiology relating to the extra-ocular muscles.
- Provide a detailed explanation of, and differentiate between the etiology, investigation and management of Strabismic binocular vision anomalies.
- Adapt skills and interpret clinical results following investigation of binocular vision anomalies appropriately and safely.

### **COURSE CONTENT:**

**Unit 1: Classification of neuromuscular Anomalies of the eyes (5 hours)**

**Unit 2: Qualitative and quantitative diagnosis of strabismus (5 hours)**

- History
- Examination and Test
- Diagnosis and management
- Pseudo strabismus

**Unit 3: Classification and ethology, clinical characteristics, tests and management of (5 hours)**

- Comitantes deviation and exodeviation
- A-V Phenomenon
- Cyclo vertical squint, DVD, DHD and Cyclo deviation

**Unit 4: Paralytic strabismus (5 hours)**

- Paralysis of individual extra ocular muscles
- Clinical characteristics, diagnostic test and management

**Unit 5: Special forms of strabismus (5 hours)**

- Duane's retraction syndrome
- Brown's syndrome
- Strabismus fixus
- Fibrosis of extra ocular muscles
- Grave's endocrine Ophthalmopathy
- Cyclic Heterotropia
- Fractures of orbital wall
- Myasthenia Gravis
- Chronic progressive external Ophthalmoplegia

**Unit 6: Nystagmus (5 hours)**

- Types, etiology, clinical characteristics and treatment

- Management of Strabismus
- Nonsurgical - Optical, Pharmacological and Orthoptics
- Surgical Management

**Course Outcome:**

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

**Recommended Books:**

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

**LOW VISION**

**Course: Core**

**Credit: 02**

**Number of hours: 30**

**Course Objectives:**

- Ability to diagnose and manage patients with vision impairment
- Ability to prescribe low vision devices for distance and near.
- Ability to rehabilitate patients with vocational counselling and activities of daily living

**COURSE CONTENT**

**Unit 1: Definition and classifications (10 hours)**

- Common causes of Low vision- corneal, Refractive media and Retina
- Epidemiology of Low vision and Model of low vision service

**Unit 2: Pre- clinical evaluation of Low vision clinic. (5 hours)**

- Psychological impact of Low vision on patients
- History taking in Low vision
- Clinical evaluation of Low vision patient

**Unit 3: Optics of Low vision Aids-Methods of Magnification (10 hours)**

- Types of Low vision Aids, Optical aid, Non-optical aid and electronic Device
- Types of non-optical devices
- Visual field expanders.
- Selection of Low vision aids, Instruction and training, dispensing and prescribing aspects
- Choice of test and aids in various pathological condition

**Unit 4: Visual rehabilitation and counselling (5 hours)**

- Legal aspects of Low vision in India
- Case analysis

**Course Outcome:**

- Ability to diagnose and manage patients with vision impairment
- Ability to prescribe low vision devices for distance and near.
- Ability to rehabilitate patients with vocational counselling and activities of daily living

**Recommended Books:**

1. Ajay kumar Bhootra, Low Vision Aids Practice, Second Edition, Jaypee publishers.

**CLINICAL OPTOMETRYIV**

**Course: Core**

**Credit: 04**

**Number of hours: 120 hours**

**Course Objectives:**

- Up on completion of the course, the student should be able to gain theoretical knowledge and basic practical skill in handling the Contact Lens and Binocular vision test and procedures.
- The student will be introduced to optical terminology, equipment, and techniques used for treatment.

**COURSE CONTENT:**

<b>Unit 1:</b> Contact lens Fitting	(30hours)
• RGP Fitting	
• Soft toric contact Lens Fitting	
<b>Unit 2:</b> Binocular Vision Test Procedures	(30 hours)
• Quantitative evaluation of strabismus	
• Qualitative evaluation of Strabismus	
<b>Unit 3:</b> Low Vision test Procedures	(30 hours)

- Distance Low vision devices
- Near low vision devices
- Non- optical devices

**Course Outcome:**

- The student gains theoretical knowledge and basic practical skill in handling the Contact Lens, Binocular vision anomalies and Visually impaired patients.

**Recommended Books:**

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

**INTERNSHIP (SEMESTER VII & VIII)**

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.

**Internship guideline**

The internship span: One year consisting of two semesters (7<sup>th</sup> & 8<sup>th</sup> Semester with 6 hours of practice a day, totalling to 1500 hours)

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.

Internship postings can be in the following locations of Ophthalmology OPD:

- Ophthalmology OPD- Refraction Room
- Minor OT
- Perimetry
- Low vision workup Clinic
- Contact Lens Workup Clinic
- Binocular Vision workup clinic
- Ophthalmology Operation Theatre- Assisting Ophthalmologist
- Ophthalmology Consultation Rooms

- Optical

**Project:** Not less than 1000 words. The Project can include a description on speciality areas including a case and an in-depth report of the case.

**Log Book:** should be maintained and submitted to the Clinical Coordinator at the end of the Internship.

**Competency Statements:**

1. Be able to 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
  - d. To impart knowledge on treatment modalities from the perspective of counselling
  - e. To acquire knowledge about the referral guidelines for ocular and systemic conditions.
2. Be able to correct refractive error and provide spectacle prescription
3. Be able to fit, evaluate, prescribe and dispense contact lenses for refractive correction and other ocular conditions
4. Be able to assess the low vision and provide comprehensive low vision care.
5. Be able to do complete binocular vision assessment, manage non-strabismic binocular vision anomalies and refer condition which warrants surgery
6. Be able to assess the visual demands for various occupations and match it to the visual capabilities. Also be able to advice on eye safety wear for various occupations.
7. Have knowledge and skill for early detection of various ocular conditions and pathologies – Refractive error, Strabismus, Cataract, Diabetic retinopathy, Glaucoma etc.
8. Have knowledge regarding organizations of eye banks and preservation of ocular tissues.

**Distribution**

Sl.No.	Procedures	Minimum Number of Cases	Remarks for Logbook
1.	General OPD (History taking)	300 cases	Daily 1 case for Logbook Including total 5 Interesting case reports by the end of internship
3.	Optical	100 cases	Weekly 1 case
4.	Contact Lens	10 cases (5 RGP+ 5 Soft)	Including total 3 different interesting case reports
5.	Low Vision Care Clinic	10 cases	Including total 3 different disease condition case reports
6.	Binocular Vision clinic	10 cases	Including total 3 different disease condition case reports
7.	Eye Camps	Minimum 03 camps	Camp report submission at the end of the Internship

**Exit Examination:** There will be an exit examination at the end of the internship. It is mandatory for all the candidates to attend the internship exit examination and to score minimum 50% in order to receive the Internship completion certificate.