



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 CARDIO VASCULAR TECHNOLOGY

(REVISED CURRICULUM – AMENDED UP TO 2020)

Structure of the program clearly indicating courses, credits/Electives

Ref. Page No. 9, 10, 11, 12, 21-27

ATTESTED

lsp
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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 38th meeting held on 27.04.2020, vide agenda - 23

The Academic Council at its 38th meeting held on 27.04.2020 and subsequently the Board of Management at its 49th 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. Cardiovascular Technology 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 sectors 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.

B. Sc. in Cardiovascular technology (B.Sc-CVT) is a 4-year undergraduate program including internship offered by Yenepoya College of Allied and Health care professionals. This program is designed to provide board-based theoretical knowledge and up-to-date technical training that is relevant to current cardiac clinical practice. The areas in which training is provided include electrocardiography, treadmill stress testing, 24-hour ambulatory ECG monitoring, 24 hour blood pressure monitoring, Echocardiography and cardiac catheterization laboratory technology. The program includes theory classes, practical “hands on” training and periodic evaluations. Candidates successfully completing the program will be adequately equipped to independently provide technical assistance at any advanced cardiac centre

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:

- PO1: Apply knowledge of human cardiovascular system in the management of cardiovascular related disorders.
- PO2: Plan and implement clinical and scientific activities related to the profession of cardiovascular technology.
- PO3: Identify and solve complex problems arising during cardiovascular care of the patients.
- PO4: Utilize modern tools and techniques in the arena of cardiovascular technology for patient compliance.
- PO5: Act efficiently as a leader in various inter-disciplinary and multi-disciplinary health care communities.
- PO6: Apply the knowledge and skills to assess societal and legal issues related to cardiovascular care of the patients.
- PO7: Understand the impact of the cardiovascular technology in societal and environmental contexts to provide innovative solutions.
- PO 8: Imbibe ethical practices and moral values in personal and professional endeavours.
- PO 9: Write, interpret, and communicate effectively and scientifically.
- PO 10: Use modern tools and techniques for the efficient management of cardiovascular diseases.
- PO 11: Tackle future challenges through lifelong learning.

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

A patient's life may depend on the efficiency of the Cardiac Care Technologists.

The course has been designed to teach eligible candidates to:

- PO 12: Understand and acquire knowledge in basic sciences related to cardiovascular diseases.
- PO 13: Develop effective technical skills in the performance of diagnostic tests like ECG, TMT, ECHO , assist during TEE, Stress Echo and therapeutic catheter-based procedures.
- PO 14: Ability to learn the indications, risks, and benefits of these procedures and to develop a comprehensive understanding of the role of these procedures in the management of patients with cardiovascular disease.
- PO 15: Able to identify whether a procedure is appropriate for the patient referred, recognize risks and benefits of planned procedures, provide patients with necessary information to give a valid informed consent to the procedure, and follow patients following the procedure to ensure optimal management of any procedural complications.
- PO16: Gain knowledge of established and evolving biomedical, clinical, epidemiological, and social-behavioral sciences, as well as the application of this knowledge to patient care.
- PO 18: Develop commitment to carrying out professional responsibilities and an adherence to ethical principles.
- PO19: Demonstrate interpersonal and communication skills that result in the effective exchange of information and teaming with patients, their families, and professional associates

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 Cardiovascular Technology (B.Sc. CVT).

4. Semester:

An academic year shall consist of two semesters;

Odd Semester 1 st , 3 rd , 5 th & 7 th	July/August to December/January
Even semester 2 nd , 4 th , 6 th & 8 th	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 Cardiovascular Technology, 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 candidate's 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 and 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.

	Lecture - L	Tutorial - T	Practical - P	Clinical Training/ Rotation CT/CR
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, and 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.

1. 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 are indicated as L: T: P format. For example, for a 4 credit 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 162 credits.

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, 3P2etc.

4th SEM: 4C1, 4C2, 4C3, 4P1, 4P2, GE4/SE4/SL4etc.

5th SEM: 5C1, 5C2, 5GE1/5SE1, 5P1, 5P2, 5P3, GE5/SE5/SL5etc.

6th SEM: 6C1, 6C2, 6GE1/6SE1, 6P1, 6P2, 6P, GE6/SE6/SL6etc.

7th SEM: 7C1 (Internship)

8th SEM: 8C1 (Internship)

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 Two Internal Assessment tests, Assignment and 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 (1st and 3rd) semesters and during June/July for even (2nd and 4th) semesters. The SEE for 5th and 6th Semester will be held during December/January 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
Total Marks	40

First Internal assessment shall be held in the 6th week of the semester and the second Internal Assessment 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	
LONG ESSAY TYPE	02	01	10	10	180 minutes
SHORT ESSAY TYPE	10	08	05	40	
SHORT ANSWERS	07	05	02	10	
Total				60	

Question Paper Pattern for AECC SEE

SUBJECTS HAVING MAXIMUM MARKS = 40					Duration
Type of question	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	
Total				40	

Practical examination

SLNO	Components	Marks
1	Spotters	20
2	Case scenario/Stations	20
3	Viva Voice	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

16.1.3A 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 = $(8.5 \times 16) + (7 \times 18) / 16 + 18 = 7.7$

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 6th (in case of 3 year 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 student 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 credit 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 122 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.

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	Cardiac Anatomy & Physiology	40	60	100	3		2	4
5	Core	Basic ECG	40	60	100	3		2	4
5	AECC	English & Communication	10	40	50	2	-	-	2
6	AECC	Constitution of India	10	40	50	2	-	-	2
Total					600				24

Note: Of the total available 36 hours per week for teaching learning processes, 26 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	Advanced ECG and Holter Monitoring	40	60	100	3		2	4
4.	Core	Cardiac Embryology	40	60	100	3		2	4
6.	AECC	Environmental studies	10	40	50	2	-	-	2
7.	AECC	Health Care	10	40	50	2			2
8.	AECC	Medical Ethics	10	40	50	1	-	-	1
9.	AECC	Sociology	10	40	50	1	-	-	1
Total					600				22

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 III

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	Systemic Pathology	40	60	100	2		2	3
2	Core	Applied Microbiology	40	60	100	2		2	3
3	Core	Pharmacology	40	60	100	4	-	-	4
4	Core	Congenital Heart Disease I	40	60	100	4	-	-	4
5	Core	Physics & Instrumentation	40	60	100	4			4
6	Core	Clinical CVT I	40	60	100	-	-	8	4
7	AECC	Kannada	10	40	50	2	-	-	2
Total					650				24

Note: Of the total available 36 hours per week for teaching learning processes, 30 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	Congenital Heart Disease II	40	60	100	
2	Core	Clinical Cardiology	40	60	100	2	1	2	4
3	Core	Cardiac Stress test & Nuclear Cardiology	40	60	100	3		2	4
4	Core	Basic Cardiac Cath & Hardwares	40	60	100	3	1		4
5	Core	Clinical CVT II		100	100			8	4
6	AECC	Human Rights & Gender Equity	10	40	50	2	-	-	2
7	AECC	Biostatistics	10	40	50	2	-	-	2
Total					600				24

Note: Of the total available 36 hours per week for teaching learning processes, 30 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	Valvular &Aortic Heart Disease	40	60	100	4	-	-	4
2	Core	Applied Echocardiography	40	60	100	3	1	-	4
3	Core	Cardiac Cath & Intervention I	40	60	100	4			4
4	Core	Clinical CVT III	40	60	100			8	4
Total					400				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 VI

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	Ischemic, myopericardial Heart Diseases & Cardiac Masses	40	60	100	4			4
2	Core	Advanced Echocardiography	40	60	100	3	1		4
3	Core	Cardiac Cath & Intervention II	40	60	100	4			4
4	Core	Clinical CVT IV	40	60	100	-	-	8	4
Total					400				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

Total credit		126
Elective		12
Internship		36
Total Credit of the program		174

SEMESTER I

ANATOMY

Course: Core

Number of hours: 60hours

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 I: 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 II: 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 III: 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 IV: 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 V: 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 VI Peritoneum**1 hour**

- Description in brief. Demonstration of reflections.

Unit VII 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 VIII 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 IX 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 X 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 XI: 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 XII: 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 & 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:

Unit I: General Physiology

2 hours

- Introduction to physiology
- Homeostasis: Definition, Positive feedback, negative feedback.
- Body Fluid Compartments Transport mechanisms (brief)

Unit II: 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

Unit III: 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

Unit IV: 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.

Unit V: 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)

Unit VI: 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

Unit VII: Renal System

5 hours

- Introduction: Functions of kidneys, composition of urine, nephron, cortical and juxta-medullary 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, innervation of bladder, cystometrogram.

Unit VIII: 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

Unit IX: 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 D3Tetany

Unit X: 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

Unit XI: Nervous system

8hours

- 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).

Unit XII: 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.

Course Outcome:

- 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

Recommended books:

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

BIOCHEMISTRY

Course: Core

Number of hours: 60hours

Course objective

- To classify various bio molecules like carbohydrates, lipids, proteins, nucleic acids vitamins and minerals
- To know about specimen collection and various other safety measures.
- To learn how to prepare various types of dilutions in the laboratory.
- To know about various terms used in quality control like specificity and sensitivity etc.
- A brief idea about acid base balance and biomedical waste management.

Course Contents

Unit I: Introduction and scope of Biochemistry **2 hours**

Unit II: Specimen collection: **4 hours**

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

Unit III: Safety measurements, Conventional and SI units **2 hours**

Unit IV: 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

Unit V: Carbohydrate chemistry	4 hours
<ul style="list-style-type: none"> • Classification, Isomerism, General reactions of carbohydrates 	
Unit VI: Lipids	4 hours
<ul style="list-style-type: none"> • Chemistry of fatty acids, triglycerides, cholesterol, phospholipids, lipoproteins- • Classification and functions. 	
Unit VII: Protein chemistry, structure	4 hours
Unit VIII: Plasma Proteins	2 hours
<ul style="list-style-type: none"> • Concentration, biochemical changes in disease, interpretation 	
Unit IX: Enzymes	6 hours
<ul style="list-style-type: none"> • Definition, classification, coenzymes, cofactors, factors effecting enzyme activity, inhibitors, units of measurements, isoenzymes, biological interpretation 	
Unit X: Vitamins	6 hours
<ul style="list-style-type: none"> • Definition, classification, sources, functions, deficiency disorders 	
Unit XI: Minerals	6 hours
<ul style="list-style-type: none"> • Na, K, Ca, P, Fe, Cu, selenium- sources, daily requirements, availability and properties 	
Unit XII: Nutrition	3 hours
<ul style="list-style-type: none"> • 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. 	
Unit XIII: Quality control	2 hours
<ul style="list-style-type: none"> • Accuracy, precision. Specificity, sensitivity, limits of error allowable in laboratory, percentage error. Normal values and Interpretations. 	
Unit XIV: Special Investigations	11 hours
<ul style="list-style-type: none"> • Serum electrophoresis, immune globulins, drugs: digitoxin, theophylline's, regulation of acid base status, Henderson Hasselbach 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,

Unit XV: 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:

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

CARDIAC ANATOMY AND PHYSIOLOGY

Course: Core

Number of hours: 30 hours

Course Objectives:

- At the end of the course, students will acquire knowledge in the following aspects
- To understand the normal structure and functioning of the heart.
- To understand the cardiac hemodynamic.
- To have a knowledge on the generation of normal heart sounds and their variations in different disease conditions
- To understand the arterial and venous supply of the heart and body.

Course Content

Unit-1

- Medical Terminology
- Systemic and pulmonary circulation

Unit-2 Cardiac Cycle

- Phases of systole
- Phases of diastole
- Event timings

Unit – 3 Cardiac anatomy

- Endocardium
- Myocardium
- Pericardium

Unit – 4 Valves

- Mitral valve
- Tricuspid valve
- Aortic valve
- Pulmonary valve

Unit - 5 Conduction system of the heart

- SA node
- AV node
- Bundle of His
- Bundle branches
- Purkinje fibers

Unit – 6 Chamber Identification

- Right atrium, right ventricle
- left atrium ,left ventricle

Unit – 7 Normal Anatomical Variants

- Right heart Variants
- Left heart Variants

Unit – 8 Arterial supply of the heart

Unit – 9 Coronary venous anatomy

Unit – 10 Aorta and its branches

Unit – 11 Peripheral circulations

Unit – 12 Vena cava and its branches

Unit – 13 Blood pressure

- Systolic
- Diastolic
- Direct/ indirect measurement
- Brachial artery pressure
- Lower extremity BP

Unit – 14 Introduction to heart sounds and murmurs

- S1,S2,S3,S4 heart sounds
- Diastolic/systolic murmurs
- Continuous murmurs

Unit – 15 Cardiogenic Shock

- Definition
- Causes

Course Outcomes:

- Normal structure and functioning of the heart & Cardiac hemodynamic
- Have knowledge on the generation of normal heart sounds and their variations in different disease conditions.
- Understand the arterial and venous supply of the heart and body.

Recommended Books:

1. Chaurasia BD. BD Chaurasia's Human Anatomy. CBS Publishers & Distributors PVT Ltd.; 2010.
2. Sampath Madhyastha Manipal Manual of Anatomy for Allied Health Sciences ,New Delhi :CBS publishers & distributors

BASIC ECG

Course: Core

Number of hours: 45 hours

Course Objectives:

- To have an idea on cardiac electrophysiology
- To understand the technical basis of ECG recording
- To gain theoretical knowledge on normal ECG variables.
- To gain theoretical knowledge on the common abnormalities in ECG
- To gain basic practical skill to interpret a given ECG

Course Content:

Unit 1 Conduction system of the heart

- SA node
- AV node
- Bundle of His
- Bundle branches
- Purkinje fibers

Unit 2 Electrophysiology of the heart

- Intracellular potential
- Electrical potential produced by normal cardiac muscle
- Relative and Absolute refractory period

Unit 3 Conventional Electrocardiographic Leads

- Unipolar
- Bipolar
- Lead placement

Unit 5 Electrical axis

- Distribution
- Methods to assess ECG axis

Unit 6 Basic Electrocardiographic deflections

- Standardization

- P wave
- QRS genesis & morphology
- ST segment
- T wave & U wave
- PR interval, PR segment
- QTc interval

Unit 7 Dextrocardia

- True dextrocardia
- Technical dextrocardia

Unit 8 Rhythm

- Sinus rhythm
- Regular & irregular rhythms

Unit 9 Heart rate

- Regular
- Irregular

Unit 11 Chamber hypertrophy

- Left ventricular hypertrophy –Volume/pressure overload
- Right ventricular hypertrophy - Volume/pressure overload
- Bi-ventricular hypertrophy

Unit 12 Intra-ventricular conduction abnormalities

- Bundle branch blocks
- Fascicular block
- Bifascicular & Trifascicular block

Unit 13 AV blocks

- First degree AV Block
- Second degree AV Block
- Third degree AV Block

Unit 14 Myocardial Infarction

- Ischemia, injury, infarction
- ST-T changes
- changes in QRS complex
- localization of MI
- Identification of culprit vessel

Unit 15 Right ventricular MI and Atrial MI

Unit 16 MI associated with bundle branch blocks

Unit 17 Pericarditis

- ECG findings
- Differentiating with MI

Course Outcome:

- The cardiac electrophysiology
- the technical basis of ECG recording
- theoretical knowledge on normal ECG variables & the abnormalities in the ECG
- basic practical skill to interpret a given ECG

References Books:

1. Leo Schamroth ,.Introduction to electrocardiography, Wiley publisher 8th edition 2018
2. Marriott's Practical Electrocardiography, LWW publisher 12th Edition 2013
3. Mervin J Goldman . Principles of Clinical Eelectrocardiograppy, 12th edition

ENGLISH AND COMMUNICATION

Course: AECC

Number of Hours: 30 hours

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 – I: PHONETICS

4 Hours

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

UNIT – II: Difference between American & British English

2 Hours

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

UNIT – III: 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 – IV: 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 – V : 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-VI: Presentation Skills

3 Hours

- 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

Number of hours: 30 hours

Course Objectives:

- 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 I: Indian Constitution

5 hours

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

Unit II: 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 III: Union Government

4 hours

- President of India- Election, Powers and Position
- Prime Minister and council of Ministers
- Parliament – Lok Sabha, Rajya Sabha- Organizations and Powers

Unit IV: State Government

4 hours

- The Governor

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

Unit V: Federalism in India **2 hours**

- Meaning Federal and Unitary Features

Unit VI: The Judiciary **2 hours**

- The supreme Court – Organization, Jurisdiction and Role
- The High Court – Organization Jurisdiction and Role

Unit VII: Electoral Process in India **2 hours**

- Election Commission – Organization, Functions

Unit VIII: Local Governments **2 hours**

- Rural and Urban – Organization, Powers and Functions

Unit IX: Human Rights **3 hours**

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

Unit X: 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 Burgentel, 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 Hours

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 e.g.: urine, blood, body fluids and its application on various diseases.

Course Content:

Unit I: Introduction

8 Hours

Unit II: 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 III: 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 IV: Hemodynamic Disorders, Thromboembolism and Shock **6 Hours**

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

Unit V: 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 VI: 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 VII: Genetic Disorders **2 Hours**

- Introduction of genetic disease and classification of genetic disorders

Unit VIII: 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.

MICROBIOLOGY

Course: core

No of Hours: 60 Hours

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 I: 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 II: Immunology

11 hours

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

UNIT III: Systematic Bacteriology

13 hours

- Common bacterial infections, Mycobacteria, Spirochaetes

UNIT IV: Virology

10 hours

- Introduction to virology, viral hepatitis, poliomyelitis, Rabies, Human immunodeficiency virus.

UNIT V: Mycology & Parasitology**12 hours**

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

UNIT VI: 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

- Baweja C. Textbook of microbiology. 1st ed. New Delhi: Arya Publications; 2005.
- Textbook of Medical Laboratory technology, Ramnik Sood, 4th edition, Jaypee Publications.
- Allied Health Sciences Laboratory Technology

ADVANCED ECG

Core: Course

No of hours: 45 Hours

Course Objective:

- To gain knowledge in Diagnosis of an arrhythmia
- To understand the origin and mechanism associated with arrhythmias.
- To correlate ECG findings to reach a clinical interpretation.
- To gain knowledge and to enable the diagnostic skill in interpretation of any given ECG.
- To evaluate cardiac related symptoms by Holter monitoring and analyzing.

Unit I	Genesis of cardiac arrhythmias	3
	<ul style="list-style-type: none">• Automaticity• Triggered activity• Re-entry mechanism	
Unit II	Premature beats/Bigeminy/Trigeminy	2
	<ul style="list-style-type: none">• Atrial ectopics• Junctional ectopics• Ventricular ectopics	
Unit III	Narrow complex tachycardia	5
	<ul style="list-style-type: none">• Regular/ irregular• Sinus Tachycardia• Junctional Tachycardia• Atrial tachycardia/ PJAT/Low atrial tachycardia	
Unit IV	Atrial fibrillation	3
Unit V	Atrial flutter	2

Unit VI	AVRT:	4
	<ul style="list-style-type: none">• WPW syndrome• LGL syndrome• Anti- dromic/ortho- dromic conduction in AVRT	
Unit VII	AVNRT	2
	<ul style="list-style-type: none">• Typical AVNRT• Atypical AVNRT	
Unit VIII	Approach to narrow complex tachycardia	2
Unit IX	Ventricular tachycardia	4
	<ul style="list-style-type: none">• Diagnosis: algorithms• Ventricular fibrillation• Torsade De Pointes	
Unit X	Approach to broad complex tachycardia	2
	<ul style="list-style-type: none">• VT vs SVT with aberrancy	
Unit XI	Sick sinus syndrome	2
Unit XII	Pacemaker rhythm	1
Unit XIII	ECG in miscellaneous conditions	6
	<ul style="list-style-type: none">• Cardiomyopathies• Myocarditis• Pulmonary thromboembolism• ECG in Electrolyte imbalances	
Unit XIV	Brugada syndrome	1
Unit XV	Ambulatory ECG recording (HOLTER)	3
	<ul style="list-style-type: none">• Indications• Lead system• Analysis and interpretation	

- Indications
- Lead system
- Analysis and interpretation

Course Outcome:

- Diagnosis of an arrhythmia.
- The origin and mechanism associated with arrhythmias.
- To correlate ECG findings to reach a clinical interpretation.
- to enable the diagnostic skill in interpretation of any given ECG
- To evaluate cardiac related symptoms by Holter monitoring and analyzing

References Books:

1. Leo Schamroth,. Introduction to electrocardiography, Wiley publisher 8th edition 2018
2. Marriott's Practical Electrocardiography, LWW publisher 12th Edition 2013
3. Mervin J Goldman. Principles of Clinical Electro cardiograph, 12th edition

CARDIAC EMBRYOLOGY

Core: Course

No of hours: 30 Hours

Course Objective:

- To understand developmental facts of cardiovascular system and fetal circulation
- To describe the embryological development of structures of the heart
- To identify regions of the fetal heart
- To understand the developmental changes relate to definitive cardiac structure and abnormalities
- To relate fetal heart structures to adult counterparts

Course Content

Unit 1	Early development of embryo	5
	<ul style="list-style-type: none">• Mitosis• Meiosis• Oogenesis• Spermatogenesis• Fertilization• Placenta	
Unit 2	Development of the heart	3
	<ul style="list-style-type: none">• Heart tube formation• Cardiac Looping	
Unit 3	Development of sinus venous	2
Unit 4	Arterial formation, absorption of pulmonary veins into left atrium	3
	<ul style="list-style-type: none">• Right atrium• Left atrium• Absorption of Pulmonary veins into left atrium• Inter atrial septum formation	

Unit 5	Formation of cardiac valves	2
	<ul style="list-style-type: none"> • Atrioventricular Valves • Semilunar Valves 	
Unit 6	Ventricular formation	3
	<ul style="list-style-type: none"> • Right Ventricle • Left Ventricle • Interventricular septal formation 	
Unit 7	Formation of great arteries	3
	<ul style="list-style-type: none"> • Fate of truncus atreiosus • Pharyngeal arch arteries 	
Unit 8	Formation of great cardiac veins	3
	<ul style="list-style-type: none"> • Fate of cardinal veins • Fate of vitelline veins • Umbilical veins • Ductus venosus • Superior vena cava • Inferior vena cava 	
Unit 9	Pericardium	2
Unit 10	Coronary artery formation	2
Unit 10	Fetal Circulation	2

Course Outcome:

- understand developmental facts of cardiovascular system and fetal circulation
- describe the embryological development of structures of the heart
- identify regions of the fetal heart
- understand the developmental changes relate to definitive cardiac structure and abnormalities
- relate fetal heart structures to adult counterparts

Reference book:

1. Inder Bir Singh. Human Embryology. Jaypee brothers medical publishers. 10th Edition

ENVIRONMENTAL STUDIES

Core: AECC

No of hours: 30 hours

Core Content:

Unit 1: Multidisciplinary nature of Environmental Studies **3 hours**

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

Unit II: 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 III: 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 IV: Biodiversity and its conservation

6 hours

- Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic 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 V: 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 VI: 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 VII: 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 VIII: Field work (Equal to 5 lecture 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 Outcome

- 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, Clarendon 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.

MEDICAL ETHICS

Course: AECC

Number of hours: 15 hours

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

Unit I: Introduction to medical ethics

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

Unit II: Definition of medical ethics

- Major principles of medic ethics.

Unit III: Perspective of medical ethics

- 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 IV: Ethics of the individual

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

Unit V: The ethics of human life

- Prenatal sex determination.

Unit VI: The family and society in medical ethics

- Euthanasia, cancer and terminal care.

Unit VII: Death and dying

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

Unit VIII: Professional Ethics

- Contract and confidentiality, malpractice and negligence.

Course Outcomes:

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

Recommended Books

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

SOCIOLOGY

Core: AECC

No of hours: 15 hours

Course Objective

- To develop the abilities of students to analyze 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

Course Content:

Unit I: 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 II: 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 III: 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 IV: 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: At the end of the course student will be:

- 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. VidyaBhushan, D R Sachdeva. An Introduction to Sociology, Kitabmahal- Allahabad
2. Roshni Jain, 2012. An Introduction to Sociology, First edition AITBS publishers- New Delhi
3. Krishna Gowda, 2010. Sociology for Nurses, Sixth edition. CBS Publishers & Distributors Pvt Ltd- New Delhi
4. Ram Ahuja .Social problems in India, third edition, 2014. PremRawat for Rawat Publication.
5. Mohammed Akram, Sociology of Health, 2014. PremRawat for Rawat Publication- Jaipur

HEALTH CARE

Core: AECC

No of Hours: 60 Hours

Course Content:

Unit 1: Introduction to Health: 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

Unit 2: Introduction to Nursing: What is Nursing? Nursing principles. Inter- Personnel relationships.

Unit 3: Bandaging: Basic turns; Bandaging extremities; Triangular Bandages and their application.

Unit 4: Nursing Position and Bed making: Positioning patient prone, lateral, dorsal, dorsal re-cumbent, Fowler's positions, comfort measures, Aids and rest and sleep.

Unit 5: Lifting and Transporting Patients: Lifting patients up in the bed. Transferring from bed to wheel chair. Transferring from bed to stretcher.

Unit 6: Bed Side Management: Giving and taking Bed pan, Urinal: Observation of stools, urine. Observation of sputum, understand use and care of catheters, enema giving.

Unit 7: Methods of Giving Nourishment: Feeding, Tube feeding, drips, transfusion Care of Rubber Goods

Unit 8: Vital Parameter Recording: Recording of body temperature, respiration and pulse,

Unit 9: Asepsis: Simple aseptic technique, sterilization and disinfection. Surgical Dressing: Observation of dressing procedures

Unit 10: First Aid.

Course Outcome:

- 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.

Semester III

SYSTEMIC PATHOLOGY

Course: Core

No of hours: 30 Hours

Course Objective:

- To be able to define the medical terms, define and classify disease and understand the concepts of the disease
- To be able to describe the causes and mechanism of common diseases that occur during the routine work and also changes seen in different individual and various organs & fluids
- To be able to enumerate various laboratory tests on various organs and serous cavities. example: body fluids

Core Content:

Unit I: Cardiovascular System:

14 hours

- Atherosclerosis-definition, risk factors, pathogenesis, morphology and complications
- Ischemic heart disease: Myocardial infarction- definition, pathogenesis, morphology and complications
- Hypertension- Benign and malignant hypertension: pathogenesis, pathology and complications
- Aneurysms –Definition, classification, pathology and complications
- Heart Failure-Right and left heart failure: causes, pathophysiology and morphology
- Valvular heart disease – causes, pathology, & complication. Complications of arterial valves
- Rheumatic heart disease and infectious endocarditis-definition, etiopathogenesis, morphology and complications
- Congenital heart disease- Types and atrial septal defect; aneurysms- types and

morphology;cardiomyopathies in brief

- Pericardial effusion – causes, effects and diagnosis Cardiomyopathy – Definition, types, causes, and significance Infective Endocarditis Myocarditis

Unit II: Hematology:

5 hours

- Anemia – definition, morphological types and diagnosis of anemia brief concept about Haemolytic anaemia and polycythaemia.
- Leukocyte disorder – briefly leukemia, leukocytosis, agranulocytosis etc.
- Bleeding disorders – definition, classification, causes, & effects of important types of bleeding disorders. Briefly various laboratory tests used to diagnose bleeding disorders.

Unit III: Respiratory System:

7 hours

- Atelectasis - types, Adult respiratory distress syndrome - causes, Pathogenesis and morphology
- Pulmonary edema- classification, causes and morphology
- Chronic obstructive pulmonary disease- Chronic bronchitis, emphysema, Asthma, bronchiectasis: Definition, etiopathogenesis and morphology
- Restrictive pulmonary diseases- Definition, categories, pathogenesis and morphology
- Pneumoconiosis-types, asbestosis, coal workers pneumoconiosis- etiopathogenesis and morphology
- Pleural effusion – causes, effects and diagnosis
- Pulmonary embolism, infarction, pulmonary Hypertension - Definition, etiopathogenesis and morphology

Unit IV: Renal System:

4 hours

- Clinical manifestations of renal diseases. Briefly causes, mechanisms, effects and laboratory diagnosis of ARF & CRF. Briefly Glomerulonephritis and pyelonephritis

- End stage renal disease – definition, causes, effects and role of dialysis and renal transplantation and its management
- Brief concept about obstructive uropathy

Practical:

30 hours

- Urine examination: physical, chemical, microscopy
- Blood grouping & Rh typing
- Haemoglobin estimation, packed cell volume (PCV), Erythrocyte sedimentation rate(ESR), estimation of bleeding & clotting time
- Charts – Urine chart, ARF, CRF, Acute glomerulonephritis
- Specimens
 - Atherosclerosis
 - Pneumonia
 - Tuberculosis
 - Infarct – lung
 - Contracted kidney
 - Hydronephrosis

Course Outcome:

- Define the medical terms, define and classify disease and understand the concepts of the disease
- Describe the causes and mechanism of common diseases that occur during the routine work and also changes seen in different individual and various organs & fluids
- Enumerate various laboratory tests on various organs and serous cavities. example: body fluids

Recommended Books

2. Essentials in Hematology and Clinical Pathology by Ramadas Nayak and Sharada Rai
3. Histopathology Techniques and its Management by Ramadas Nayak

4. Text book of Pathology Harsh Mohan Jaypee Brothers, New Delhi
5. Practical Pathology P. Chakraborty, Gargi Chakraborty New Central Book Agency, Kolkata
6. Hand-Book of Medical Laboratory Technology CMC Vellore
7. Basic Haematological Techniques Manipal Manual

APPLIED MICROBIOLOGY

Course: Core

No of hours: 30 Hours

Course Objective:

- To understand health care associated infections and antimicrobial resistance
- To acquire knowledge of the principles of sterilization and disinfection in hospital.

Course Content:

UNIT I: Health care associated infections and antimicrobial resistance

Infection & Multidrug resistant organisms

15 hours

- Must know Topics: Definitions of various types of infections, Source of infection, modes of transmission, Drug resistant pathogens- methicillin resistant Staphylococcus aureus
- Desirable to know: Clostridium difficile, Vancomycin resistant enterococci

- **Hospital acquired infections**

Must know Topics: Definitions, criteria for diagnosis in brief and causative agents - catheter related blood stream infections, ventilator associated pneumonia, surgical site infections

- **Microbiology of urinary tract infections**

Must know Topics: Definition, Causative agents, Transmission, Predisposing factors, Pathogenesis, Lab diagnosis in detail significant bacteriuria, catheter related urinary tract infections

- **Healthcare personnel in hospital set up**

Must know Topics: Disease communicable to hospital personnel and preventive measures to combat the spread of these infections by monitoring and control- tuberculosis, HIV, hepatitis B, hepatitis C, salmonella

Desirable to know: Respiratory route (varicella- zoster, respiratory syncytial virus etc), Blood borne transmission (cytomegalovirus, Ebola virus etc), orofaecal route (hepatitis A etc), direct contact

(Herpes simplex virus etc),

- **Microbiological surveillance**

Must know Topics: Definitions, Methods & sampling techniques

Desirable to know: To know the hospital flora and to assess the antimicrobial resistance

- **Opportunistic infections**

Must know Topics: In brief- opportunistic pathogens seen in Immunocompromised patients- Candida, Cryptococcus

Desirable to know: Parasites, viruses & bacteria as opportunistic pathogens

UNIT II: Sterilization and disinfection

15 Hours

- **Sterilization**

Must to Know: Definition, Classification of methods, Principles of Dry heat, Moist heat, Autoclaving in detail- Preparation of materials for Autoclaving: packing of different types of materials, loading, holding time and unloading.

Desirable to Know: Hot air oven

- **Disinfection, antiseptics**

Must to Know: Disinfection of instruments used in patient care: classification, different methods, advantages and disadvantages of the various methods. Disinfection of the patientcare unit. Infection control measures for ICU's.

Desirable to Know: Disinfectant efficacy testing

- **Sterilization – applied aspects**

Must to Know: Rooms: gaseous sterilization, Equipments: classification of the instruments and appropriate methods of sterilization. Central supply department: the zoning and the floorplan for instrument cleaning, High-level disinfecting and sterilizing critical areas.

Desirable to Know: Quality control in CSSD

- **Bacteriological analysis of water**

Must to Know: Different sampling techniques for potable water, RO water, dialysate.

Desirable to Know: Endotoxin testing

PRATICAL:

30 hours

Practicals will be carried out using charts and practical exercises

Principles of autoclaving & quality control of sterilization. 10 hours

- Principles of autoclaving & quality control of sterilization. Definition, Classification of methods, Principles of Dry heat, moist heat,
- In detail autoclaving Preparation of materials for autoclaving: packing of different types of materials, loading, holding time and unloading. Dry heat/Moist heat: Temperature recording charts interpretation, Color change indicators interpretation

- **Disinfection of wards, OT and laboratory** **5 hours**
- Disinfection of instruments used in patient care classification, different methods, advantages and disadvantages of the various methods. Disinfection of the patient care unit. Infection control measures for ICU's
- **Collection of specimen for sterility testing** **5 hours**
- Collection of specimen from outpatient units, inpatient units, minor operation theatre and major operation theatre for sterility testing Air sampling culture plates, interpretation of colony forming units based on air flow rate and sampling time
- **Methods employed for sterility testing & Interpretation of results of sterility testing.**

10 hours

- Rooms: gaseous sterilization, Equipments: classification of the instruments and appropriate methods of sterilization. Central supply department: the four areas and the floor plan for instrument cleaning, high-level disinfecting and sterilizing areas. Interpretation of sterility of hemodialysis water/distilled water/ de ionized water, based on growth of colonies in BHI Agar to be reported as X CFU/ unit

Course Outcome:

- To understand health care associated infections and antimicrobial resistance
- To acquire knowledge of the principles of sterilization and disinfection in hospital.

Recommended Books:

- Anathanarayana & Panikar Medical Microbiology - University Press
- Text book of Medical Microbiology for MLT students – C P Baveja
- Hospital Infection Control Manual, YMCH

GENERAL PHARMACOLOGY

Course: Core

Number of hours: 60 hours

Course objectives:

At the end of the program in Pharmacology the student is expected to:

- 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 I: 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 II: Autonomic Nervous System drugs

6 Hours

- Sympathomimetic
- Alpha blockers
- Beta-blockers

- Cholinomimetics
- Anticholinergics
- Skeletal muscle relaxants

Unit II: 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 IV: Cardio Vascular System Drugs

9 Hours

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

Unit V: Blood

6 Hours

- Anemia, erythropoietin
- Anticoagulants

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

Unit VI: Endocrines

1 Hour

- Corticosteroids

Unit VII: Chemotherapy

9 Hours

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

Unit VIII: 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
- Immuno suppressants
- 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:

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

CONGENITAL HEART DISEASES I

Course: Core

Number of hours: 60 Hours

Course Objectives

- To gain knowledge in depth of various acyanotic congenital heart diseases
- To understand the morphology and classifications of acyanotic congenital heart diseases.
- To understand the hemodynamics of each acyanotic congenital heart disease in detail.
- To understand and develop theoretical and practical skills in cardiac catheterization, Interventional and surgical Management.

Course Content

Unit 1 Approach to Congenital heart diseases by Echocardiography **2**

Unit 2 Cardiac malposition

- Situs abnormalities **2**

Unit 3 Acyanotic Congenital Heart Diseases

- Introduction
- Classification

Unit 4 Atrial Septal Defect **6**

- Definition & Morphology
- Prevalence & Classification
- Pathology
- Pathophysiology
- Clinical findings
- ECG findings & X-Ray Findings
- Echo Findings
- Cardiac Cath
- Associated Anomalies
- Management

Unit 5 Ventricular Septal Defect

6

- Definition & Morphology
- Prevalence & Classification
- Pathology
- Pathophysiology
- Clinical findings
- ECG findings & X-Ray Findings
- Echo Findings
- Cardiac Cath
- Associated Anomalies
- Management

Unit 6 Patent Ductus Arteriosus

6

- Definition & morphology
- Prevalence & classification
- Pathology
- Pathophysiology
- Clinical findings
- ECG & X-ray findings
- Echo findings
- Cardiac Cath
- Associated Lesions
- Management

Unit 7 AV canal defect

6

- Definition & morphology
- Prevalence & classification
- Pathology
- Pathophysiology
- Clinical findings
- ECG & X-ray findings
- Echo findings

- Cardiac Cath
- Associated Lesions
- Management

Unit 8 PAPVC

5

- Definition & Morphology
- Prevalence & Classification
- Pathology
- Pathophysiology
- Clinical findings
- ECG findings & X-Ray Findings
- Echo Findings
- Cardiac Cath
- Associated Anomalies
- Management

Unit 9 AP window

5

- Definition & morphology
- Prevalence & classification
- Pathology
- Pathophysiology
- Clinical findings
- ECG & X-ray findings
- Echo findings
- Cardiac Cath
- Associated Lesions
- Management

Unit 10 Co- arctation of aorta

5

- Definition & morphology
- Prevalence & classification
- pathology
- Pathophysiology

- clinical findings
- ECG findings & X ray findings
- Echo findings
- Cath
- Associated Anomalies
- Management

Unit 11 Introduction to Aortic arch anomalies 4

- Definition & types

Unit 12 Cor-triatrium and Cor-triatrium Dexter 5

- Definition & morphology
- Prevalence & Classification
- Pathophysiology
- Clinical findings
- ECG findings
- Echo findings

Unit 13 Congenital Isolated AS & PS 5

Course Outcome: At the end of the course student would gain knowledge on following aspects

- To gain knowledge in depth of various acyanotic congenital heart diseases
- To understand the morphology and classifications of acyanotic congenital heart diseases.
- To understand the hemodynamics of each acyanotic congenital heart disease in detail.
- To understand and develop theoretical and practical skills in cardiac catheterization, Interventional and surgical Management

Reference books:

1. Myung K Park. Park's Pediatric Cardiology for practitioners. Elsevier India published in 2014
2. J K Perloff. Congenital Heart Disease in Adults. Sonders 3rd Edition
3. Moss and Adams. Heart Disease in Infants & children's 9th edition

PHYSICS AND INSTRUMENTATION

Course: Core

Number of Hours: 60 Hours

Course Objectives:

- To understand basic concepts of ultrasound physics and its applications to patient care.
- To gain knowledge on technical aspects of an echo machine.
- To gain theoretical and practical knowledge on common source of errors and how to overcome it
- To understand the application of 2D and Doppler principles in image Acquisition.
- To understand core concepts of Hemodynamic using Doppler calculations.
- To gain theoretical and practical skill in image acquisition techniques using various control knobs.

Course Content:

Unit 1 Physical Properties of Ultrasound

4

- Introduction
- Physical Principles
- Frequency
- Velocity
- Wavelength
- Amplitude
- Power
- Intensity

Unit 2 Interaction between ultrasound and tissue

4

- Attenuation
- Acoustic Impedance
- Reflection & refraction
- Specular & scattered echoes

Unit 3 Transducers **5**

- Definition
- Piezoelectric Effect
- Components
- Classification and selection of transducers and clinical applications
- Manipulation of US beam
- Near field and far field

Unit 4 Resolution **4**

- Display options
 1. A mode
 2. B mode
 3. M mode
 4. 2D
- Basic Pulse Echo system, Pulse generation

Unit 6 2D Image Optimization **5**

Unit 7 Harmonic imaging **5**

- Definition
- Tissue Harmonic Imaging
- Fundamental Harmonic Imaging

Unit 8 Doppler Echocardiography **8**

- Principles
- Doppler formats: Pulsed wave Doppler and continuous wave Doppler, Aliasing
- Clinical applications of Doppler echocardiography
- Color flow imaging
 - Billiard ball effect, Coianda Effect, Venturi effect ,
- Doppler artifacts

Unit 9 Hemodynamic assessment by Doppler

6

- Blood flow pattern – Laminar, non laminar
- Stroke volume/cardiac output
- Bernoulli's principle
- Continuity equation
- PISA method
- Pressure half time

Unit 10 Knobology

4

Unit 11 2D cardiac chamber examination

5

Unit 12 Biological Effects of ultrasound

4

- Introduction
- Mechanical Index and Thermal Index

Course Outcome: At the end of the course student would gain knowledge on following aspects

- To understand basic concepts of ultrasound physics and its applications to patient care
- To gain knowledge on technical aspects of an echo machine.
- To gain theoretical and practical knowledge on common source of errors and how to overcome it.
- To understand the application of 2D and doppler principles in image Acquisition.
- To understand core concepts of hemodynamics using doppler calculations.
- To gain theoretical and practical skill in image acquisition techniques using various control knobs.

Reference books:

1. Harvey Feigenbaum. Feigenbaum's Echocardiography, Wolters Kluwer India .6th Edition ,2010
2. Jae K OH Tajik. Echo Manual 3rd Edition, 2006
3. Catherine M Otto, Textbook of clinical Echocardiography, Elsevier, 6th Edition 2018
4. Arthur Weyman, Principles and practices of Echocardiography, Lippincott williams and wilkins,

KANNADA

Course: AECC

Number of hours: 60 hours

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:

- Possible communication in kannada between Patients and Doctors.
- Advising sentences to the possible questions of patients.
- 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

CONGENITAL HEART DISEASE II

Course: Core

Number of Hours:60 hours

Course objectives

- To gain knowledge in depth of various Cyanotic congenital heart diseases.
- To understand the morphology and classifications of Cyanotic congenital heart diseases
- To understand the hemodynamics of each Cyanotic congenital heart disease in detail.
- To understand relevant screening and/or diagnostic tests appropriate
- for cardiovascular risk stratification.
- To develop theoretical and practical skills to how to approach Cyanotic congenital heart diseases by echocardiography.
- To understand and develop theoretical and practical skills in cardiac catheterization, Interventional and surgical Management

Course Content:

Unit 1 Cyanotic Congenital Heart Diseases 3

- Introduction
- Classification

Unit 2 Tetralogy of Fallot 5

- Definition & Morphology
- Prevalence & Components
- Pathology
- Pathophysiology
- Clinical findings

- ECG findings & X-Ray Findings
- Echo Findings
- Cardiac Cath
- Associated Anomalies
- Management

Unit 3 Pulmonary Atresia **4**

- TOF with pulmonary atresia
- Pulmonary atresia with intact ventricular septum

Unit 4 Tricuspid Atresia **5**

- Definition & Morphology
- Prevalence & Components
- Pathology
- Pathophysiology
- Clinical findings
- ECG findings & X-Ray Findings
- Echo Findings
- Cardiac Cath
- Associated Anomalies
- Management

Unit 5 Ebstein's anomaly **5**

- Definition & Morphology
- Prevalence & Classification
- Pathology
- Pathophysiology
- Clinical findings
- ECG findings & X-Ray Findings
- Echo Findings

- Cardiac Cath
- Associated Anomalies
- Management

Unit 6 B Trans position of Great Arteries Complete TGA 4

- Definition & Morphology
- Prevalence & Classification
- Pathology
- Pathophysiology
- Clinical findings
- ECG findings & X-Ray Findings
- Echo Findings
- Cardiac Cath
- Associated Anomalies
- Management

Unit 7 Congenitally corrected TGA 5

- Definition & Morphology
- Prevalence & Classification
- Pathology
- Pathophysiology
- Clinical findings
- ECG findings & X-Ray Findings
- Echo Findings
- Cardiac Cath
- Associated Anomalies
- Management

Unit 8 Double Outlet Right Ventricle 5

- Definition & Morphology
- Prevalence & Classification

- Pathophysiology
- Clinical findings
- ECG findings & X-Ray Findings
- Echo Findings
- Cardiac Cath

Unit 9 Truncus arteriosus

5

- Definition & Morphology
- Prevalence & Classification
- Pathophysiology
- Clinical findings
- ECG findings & X-Ray Findings
- Echo Findings

Unit 10 TAPVC

4

- Definition & Morphology
- Prevalence & Classification
- Pathology
- Pathophysiology
- Clinical findings
- ECG findings & X-Ray Findings
- Echo Findings
- Cardiac Cath
- Associated Anomalies
- Management

Unit 11 Admixture physiology

5

- HLHS

- Single ventricle

Unit 12 Miscellaneous Congenital Heart Diseases **6**

- RSOV
- Coronary anomalies
- AV fistulas – Coronary, Pulmonary
- Common Atrium
- DCRV

Unit 13 Palliative Shunts – Basics **4**

Course Outcome: At the end of the course student will gain knowledge about

- Various Cyanotic congenital heart diseases.
- Morphology and classifications of Cyanotic congenital heart diseases
- Hemodynamics of each Cyanotic congenital heart disease in detail.
- Understand relevant screening and/or diagnostic tests appropriate Cardiovascular risk stratification.
- Develop theoretical and practical skills to how to approach Cyanotic congenital heart diseases by echocardiography.
- Understand and develop theoretical and practical skills in cardiac catheterization, Interventional and surgical Management

Reference books:

1. Myung K Park. Park's Pediatric Cardiology for practitioners. Elsevier India published in 2014
2. J K Perloff. Congenital Heart Disease in Adults. Sunders 3rd Edition
3. Moss and Adams. Heart Disease in Infants & children's 9th edition

CLINICAL CARDIOLOGY

Course: Core

No of hours: 30 Hours

Course Objective

- To gain knowledge on the clinical examination of cardiac diseases.
- To understand various cardiac and non cardiac causes of symptoms associated with cardiac diseases.
- To provide proper diagnosis and care for patients with cardiac diseases.
- To understand the grade of severity of cardiovascular diseases based on symptoms.

Course Content

Unit 1 History taking	1
<ul style="list-style-type: none">• NYHA functional class	
Unit 2 Chest pain	2
<ul style="list-style-type: none">• Etiology• Cardiovascular causes• Non-Cardiac causes• Duration, Radiation, Location, Character• Chronic stable angina• Unstable angina	
Unit 3 Physical Examination – I (Symptoms)	4
<ul style="list-style-type: none">• Palpitation: Cardiac and Non-Cardiac – Etiology, Evaluation• Fatigue – Etiology, Evaluation• Syncope: Cardiac and Non-cardiac – causes, Etiology, Evaluation, Unknown causes	

- Dyspnea: Cardiac and non-cardiac – causes, Etiology, Pathogenesis
 - Paroxysmal nocturnal dyspnea
 - Orthopnea
 - Tachypnea

Unit 4 Physical Examination II (Signs)

4

- Hoarseness of voice – Etiology, Evaluation
- Hemoptysis – Etiology, Evaluation
- Cyanosis
 - Definition, Evaluation
 - Types: Peripheral cyanosis, Central cyanosis, Mixed cyanosis, Differential cyanosis
- Squatting
- Pedal Edema – Etiology, Evaluation, Cardiac and non cardiac causes

Unit 5 Arterial pulse

4

- Definition, Genesis
- Pulse wave pattern
- Examination of arterial pulse
- Regularly irregular pulse and Irregularly irregular pulse
- Abnormalities in pulse volume; Pulsus magnus/pulsus tardus / bounding pulse
- Abnormalities in character: Parvus et tardus, collapsing/ water hammer pulse, pulse alternans, dicrotic pulse, bisferience pulse, pulsus paradoxus, pulsus bigeminy, apex pulse deficit

Unit 6 Jugular venous pulse

2

- Waves of JVP in normal and abnormal –conditions

Unit 8 Heart sounds 5

- Normal heart sounds
- Heart murmurs in various disease –conditions

Unit 9 Chest X-ray 4

- Approach to chest x-ray
- Pulmonary arterial flow and venous flow
- Cardiac chamber enlargement

Chest X-ray in heart disease

Unit 10 Medicine Relevant to CVT 4

- Hypertension
- DM
- CKD
- Anemia

Course Outcome

-knowledge on the clinical examination of cardiac diseases.

-To understand various cardiac and noncardiac causes of symptoms associated with cardiac diseases.

-To provide proper diagnosis and care for patients with cardiac diseases.

To understand the grade of severity of cardiovascular diseases based on symptoms.

Recommended Books

1. Braunwald's Heart Disease, A Textbook of cardiovascular medicine, 11th edition, Elsevier, 9 January 2018
2. Hurst's The Heart manual of cardiology ,13th edition Graw - hill education/medical ,16 November 2012
3. 3. Moss and Adams. Heart Disease in Infants & children 9th edition
4. B N Vijaya Raghava Rao, Clinical examination in cardiology, Second edition, Elsevier. 21 march 2017
5. R alagappan, Manual of Practical Medicine, 6th edition, Jaypee brothers, Jan 2018

CARDIAC STRESS TESTS & NUCLEAR CARDIOLOGY

Course: Core

No of hours: 45 Hours

Course Objective

- To understand the various cardiac stress tests and nuclear tests used in diagnostic cardiology.
- To gain practical knowledge in performing various cardiac stress test and nuclear tests.
- To understand the importance of myocardial viability in patients who require cardiac revascularization.
- To gain theoretical and practical knowledge in cardiac monitoring and managing cardiac arrest in emergency situations.

Course Content

Unit 1 Stress Echo -Methodology, indications and contraindications of: 5

- Treadmill Test
- Bicycle Ergometry
- Dobutamine Stress Echo
- Dipyridamole and Adenosine

Unit 2 Exercise testing procedures 5

- Indications and contraindications
- Course preparation
- ECG Recording
- Equipment & protocol

Unit 3 Interpretation of Exercise Stress Test 6

- Categorization of Wall motion & its response to stress & Localization of Coronary artery lesions
- Hemodynamic Response: BP, HR during exercise & ST-T changes Mason Likar modification

Unit 4 Applications of Stress Echocardiography 5

- Stress echo after myocardial infarction, revascularization
- Stress echo in Valvular Heart Disease
- Diastolic Stress echocardiography

Unit 5 Contrast Echocardiography **4**

- Contrast Agents
- Clinical use of contrast echo
- Detection methods: Machine settings, low mechanical index, Doppler imaging
- Contrast Artifacts

Unit 6 Nuclear Cardiology **4**

- PET & SPECT Scan – Basic Knowledge

Unit 7 Cardiac Monitoring **4**

Unit 8 Cardiac Arrest **3**

- Definition, causes

Unit 9 BLS **4**

Unit 10 ACLS **5**

Course Outcome:

- Various cardiac stress tests and nuclear tests used in diagnostic cardiology.
- Practical knowledge in performing various cardiac stress test and nuclear tests.
- The importance of myocardial viability in patients who require cardiac revascularization.
- Theoretical and practical knowledge in cardiac monitoring and managing cardiac arrest in emergency situations.

Recommended Books:

1. Brain Griffin, Manual of cardiovascular medicine, 9th edition

BASICS IN CARDIAC CATH & HARD WARES

Course: Core

Number of hours: 45 hours

Course Objectives:

- To gain knowledge in the various Hardware and instruments used in cardiac catheterization laboratory.
- To understand the X ray production and importance of radiation safety in Cath lab.
- To gain practical knowledge in providing the Hardware during various procedures in Cath lab.
- To understand the emergency medications used in Cath lab and the importance of maintaining Cath lab sterility.

Course Content

Unit 1	X-ray theory	4
	<ul style="list-style-type: none">• Electric and electromagnetic energy• Electromagnetic radiation• Quantum theory and X-ray photons• X-ray tube• X-ray production• Characteristic of radiation• Radiation dose and exposure, Safety and protocols	
Unit 2	Medical asepsis	2
	<ul style="list-style-type: none">• Maintaining Sterility• Personnel protective equipment's	
Unit 3	Hardware	4
	<ul style="list-style-type: none">• Diagnostic hardware<ul style="list-style-type: none">▪ Introducer set▪ Diagnostic catheter▪ Wires and accessories• Interventional hardware	

- Guiding catheters
- Guide wires

Unit 4	Contrast media	2
	<ul style="list-style-type: none"> • ionic and non-ionic • contrast related complications • contrast nephropathy • anaphylitic reaction 	
Unit 5	Coronary balloons	4
	<ul style="list-style-type: none"> • Compliant and noncompliant • Cutting balloon catheter • Drug balloons 	
Unit 6	Coronary stents	5
	<ul style="list-style-type: none"> • Materials • structure • covered stents • balloons Stent system -bare metal stent, drug eluting stent 	
Unit 7	Basic Concept of Pacemaker	4
	<ul style="list-style-type: none"> • Introduction Overview • Pacemaker Circuits , Mode • Pacing Leads • Electrical aspects of Pacing • Power Source, Connection • PG Circuits 	
Unit 8	Devices for peripheral procedures	4
	<ul style="list-style-type: none"> • EPD • Peripheral stent • Peripheral balloons • Peripheral catheters 	

Unit 9	Introduction to cardiac Cath procedures	2
	<ul style="list-style-type: none">• Guidelines for diagnostic cath• Premedication, anesthesia and sedation	
Unit 10	Vascular access	3
	<ul style="list-style-type: none">• Umbilical approach• Femoral approach• Subclavian approach• Radial approach• Internal jugular approach	
Unit 11	Cardiac Pharmacology	6
	<ul style="list-style-type: none">• Inotropic agents• Beta blockers• Calcium channel blockers• Bronchodilators• Diuretics• Narcotics• Thrombolytics• Nitrates• Vasodilators• Antiplatelets• Steroids	
Unit 12	Temporary pacemakers	2
	<ul style="list-style-type: none">• Indication• components• Procedures• pacing methods• lead testing• trouble shootings• Complication	

Unit 13 Permanent Pacemakers**3**

- Introduction
- Cardiac hemodynamics
- Basic components
- Classifications (NBG code)
- Indications
- Lead thresholds
- Factors affecting threshold

Course Outcome: At the end of the course student would gain knowledge & understand about

- Various Hardware and instruments used in cardiac catheterization laboratory.
- X ray production and importance of radiation safety in Cath lab.
- Practical knowledge in providing the Hardware during various procedures in Cath lab.
- Emergency medications used in Cath lab and the importance of maintaining Cath lab sterility.

Reference books:

1. William Grossman and Baim's Cardiac Catheterization, Angiography & Intervention, 8th edition Wolters Kluwer ,
2. Eric J Topol, Textbook of Interventional Cardiology, Elsevier , 8th edition
3. Morton J Kern. The Catheterization Handbook 6th edition Elsevier 2015
4. Spencer B King, Interventional Cardiology 2nd edition

HUMAN RIGHTS AND GENDER EQUITY

Course: AECC

Number of Hours: 30 Hours

Course Objectives:

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

COURSE CONTENT:

Unit I: Human Rights

5 Hours

- Human Rights- Meaning
- Universal declaration of Human rights

Unit II: 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 III: Gender Equity

5 Hours

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

Unit IV: Woman Status in India

5 Hours

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

Unit V: 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 VI: 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:

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

- Parvathy Appaiah, Human Rights, Gender Equity and Environmental Studies, Jai Bharath Prakashan publishers, 2018-19.

BIOSTATISTICS

Course: AECC

Number of Hours: 30hours

Course Objectives:

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

Course Content:

Unit I: 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 II: 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, commulative frequency curve, ogive.
- Normal probability curve.

Unit III: 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 IV: 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 V: Probability and Standard Distributions**6 hours**

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

Unit VI: 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 VII: Health Indicator**3 hours**

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

VALVULAR AND AORTIC HEART DISEASES

Course: Core

Number of hours: 60 hours

Course Objectives:

- To gain knowledge in-depth of various Valvular and aortic heart diseases
- To understand the etiology, morphology and classifications of Valvular and aortic heart diseases.
- To understand the hemodynamics and Pathophysiology of each Valvular and aortic heart diseases in detail.
- To understand relevant screening and / or diagnostic tests with clinical findings appropriate for cardiovascular risk stratification.
- To develop theoretical and practical skills to how to approach Valvular and aortic heart diseases by echocardiography.
- To understand and develop theoretical and practical skills in cardiac catheterization, Interventional and surgical management.

Course Content:

Unit 1 Rheumatic Fever

6

- Prevalence
- Causes
- Pathology
- History
- Major manifestations
- Minor manifestations
- Differential diagnosis

Unit 2 Mitral Stenosis

6

- Causes
- Pathology
- Pathophysiology

- Clinical findings
- ECG findings
- X-Ray Findings
- Echo Findings
- Treatment

Unit 3 Mitral Regurgitation Causes 5

- Pathology
- Pathophysiology
- Carpenter's classification
- Clinical findings
- ECG findings
- X-Ray Findings
- Echo Findings
- Treatment

Unit 4 Aortic Stenosis 5

- Causes
- Pathology
- Pathophysiology
- Clinical findings
- ECG findings
- X-Ray Findings
- Echo Findings
- Treatment

Unit 5 Low flow low gradient in AS 3

- With reduced LVEF
- With preserved LVEF
- DSE in AS

Unit 6 Aortic Regurgitation 5

- Causes
- Pathology
- Pathophysiology
- Clinical findings

- ECG findings
- X-Ray Findings
- Echo Findings
- Treatment

Unit 7 Pulmonary Stenosis

2

- Causes
- Pathology
- Pathophysiology
- Clinical findings
- ECG findings
- X-Ray Findings
- Echo Findings
- Treatment

Unit 8 Pulmonary Regurgitation

2

- Causes
- Pathology
- Pathophysiology
- Clinical findings
- ECG findings
- X-Ray Findings
- Echo Findings
- Treatment

Unit 9 Tricuspid Stenosis

2

- Causes
- Pathology
- Pathophysiology
- Clinical findings
- ECG findings
- X-Ray Findings
- Echo Findings
- Treatment

Unit 10 Tricuspid regurgitation	5
<ul style="list-style-type: none">• Causes• Pathology• Pathophysiology• Clinical findings• ECG findings• X-Ray Findings• Echo Findings• Treatment	
Unit 11 Infective Endocarditis	3
<ul style="list-style-type: none">• Definition & Pathology• Clinical findings• Diagnosis – modified duke’s criteria, ECG, X-ray, Echo• Treatment	
Unit 12 Prosthetic Valves	6
<ul style="list-style-type: none">• Types: mechanical/ bioprosthetic• Indications• Evaluation of prosthetic valve function: clinically/ echocardiographically• Prosthetic valve dysfunction• Stuck valve, pannus, dehiscence etc	
Unit 13 ACC/AHA guidelines for Valvular surgery	2
Unit 14 Diseases of Aorta	8
<ul style="list-style-type: none">• Aortic Atherosclerosis• Aortic aneurysms• Aortic dissection• Sinus of Valsalva Aneurysm• Aortic Trauma	

Course Outcome: At the end of the course, students will acquire knowledge in the following aspects

- Valvular and aortic heart diseases
- understand the etiology, morphology, and classifications of Valvular and aortic heart diseases.
- understand the hemodynamics and Pathophysiology of each Valvular and aortic heart diseases in detail.
- Understand relevant screening and / or diagnostic tests with clinical findings appropriate for cardiovascular risk stratification.
- Develop theoretical and practical skills to how to approach valvular and aortic heart diseases by echocardiography.
- Understand and develop theoretical and practical skills in cardiac catheterization, interventional and surgical management.

Reference:

- Braunwald's Heart Disease, A Textbook of cardiovascular medicine, 11th edition, Elsevier, 9 January 2018
- Brain Griffin, Manual of Cardiovascular medicine, 9th edition

APPLIED ECHOCARDIOGRAPHY

Course: Core

Number of hours :60 hours

Course Objective:

- Develop an understanding of the multi-disciplinary applications of echocardiography in structural heart disease interventions and its role as a vital procedural adjunct.
- Description and understanding of cardiologic problems almost always involves the echocardiographic findings.

Course Content:

UNIT 1 Transthoracic Echo Views	5
<ul style="list-style-type: none">• Adult Echo : Transducer selection, Probe Position• Different views• Image Optimization• Pediatric Echo: .Transducer selection, Probe Position ,Different views & Image Optimization	
UNIT 2 Chamber Quantification	8
<ul style="list-style-type: none">• LV: Systolic function assessment, diastolic function assessment• LA function assessment• Right heart functional assessment	
UNIT 3 Echo in Stenotic lesions	6
<ul style="list-style-type: none">• MS• AS• TS• PS	
UNIT 4 Echo in Regurgitant Lesions	6
<ul style="list-style-type: none">• MR• AR• TR• PR	
UNIT 5 Echo in Pulmonary Artery Hypertension	2

UNIT 6	Echo in congenital heart disease	10
	<ul style="list-style-type: none">• Pre tricuspid shunts• Post tricuspid shunts• Increases pulmonary blood flow• Decreased pulmonary blood flow• Pulmonary venous anomalie straddling/ overriding	
UNIT 7	Echo in Infective Endocarditis	2
UNIT 8	Echo in Ischemic Heart Diseases	4
	<ul style="list-style-type: none">• MI – Acute & Chronic• Detection of wall motion abnormalities• Segmental analysis – 2D Echo• Global LV Function• Doppler evaluation of Systolic and diastolic function• Complications of MI	
UNIT 9	Echo in Cardiomyopathies	6
	<ul style="list-style-type: none">• DCM• RCM• HCM – obstructive / Non-obstructive• LV non compaction• ARVD	
UNIT 10	Echo in cardiac masses and tumors	4
UNIT 11	Echo in pericardial disease	4
	<ul style="list-style-type: none">• Pericardial effusion / Tamponade• Constrictive Pericarditis• Restrictive vs constrictive physiology	

- Aortic aneurysm
- Aortic dissection
- Ruptured Sinus of Valsalva
- Annul aortic Ectasia

Course Outcome : At the end of the course student would gain knowledge on

- Multi-disciplinary applications of echocardiography in structural heart disease interventions and its role as a vital procedural adjunct.
- Cardiologic problems almost always involves the echocardiographic findings.

Reference:

1. Harvey Feigenbaum. Feigenbaum's Echocardiography, Wolters Kluwer India .6th Edition ,2010
2. Jae K OH Tajik. Echo Manual 3rd Edition, 2006
3. Catherine M Otto, Textbook of clinical Echocardiography , Elsevier, 6th Edition 2018
4. Arthur Weyman, Principles and practices of Echocardiography, Lippincott williams and wilkins,

CARDIAC CATH AND INTERVENTION I

Course: Core

Number of hours: 60hours

Course Objective:

- Procedural technique, emergency care in Cath lab, assisting diagnostic and intervention procedures

Course Content:

Unit 1 Coronary vascular system 5

- Coronary artery
- Coronary angio –views
- Coronary anomalies-ALCAPA

Unit 2 Coronary Angiogram 5

- Indications & Contraindications
- Procedure
- Materials used, type and amount of dye used
- Coronary angio views used, Interpretation Complications

Unit 3 Coronary Angioplasty 8

- Primary PCI
- Indications & Contraindications
- Procedure, materials used, type and amount of dye used
- Coronary angio views used, Interpretation
- Complications
- Thrombus suction devices
- SVD, DVD, MVD
- Complex lesions, bifurcation, LMCA, calcific, CTO

Unit 4 Right Heart Catheterization 6

- Introduction and History
- Indications and Contraindications

- Procedure, Materials Used, Catheters – balloon tipped catheters
- Measurement of hemodynamic variables
 - a. Oxygen Content
 - b. Oxygen Consumption
- Cardiac Output measurement
 - a. Fick Method
 - b. Thermo dilution Method
 - c. Die dilution Method
- Detection, Localization and Quantification of Intracardiac Shunts
 - a. Indicator Dilution Method
 - b. Contrast Angiography
 - c. Oximetry Study
- Quantitative assessment of shunts
 - a. Flow ratio (Q_p/Q_s Calculation, Q_{ep} , Q_{es} calculations)
 - b. Shunt flow (Q_p-Q_s Calculation)
 - c. Step UP and Step Down at various levels

Vascular resistance-SVR,PVR Calculation

Unit 5 Left Heart Catheterization 6

- Introduction and History
- Indications and Contraindications, Complications
- Procedure, Materials used, Catheter position
- Oximetry Study – Step up and step down at various levels
- Left Ventricular angiogram
 - Indications, Equipment, Complications
 - Normal LV Angiogram
 - Calculation of LV function
 - Severity assessment of MR, AR and in VSD

Unit 6 Pressure measurements 5

- Errors and corrective measures in pressure measurement
- Right heart pressure waveforms: RAP, RVP, PAP, PCWP
- Left heart pressure waveforms: LAP, LVP, Aortic pressure

- Pressure measurements in various valvular and congenital heart disease

Unit 7 Interventional complications **5**

- Procedure related complications
 - a. Dissection
 - b. Rupture
 - c. Slow flow, no flow
 - d. Puncture site complication
- Material related complication
 - a. Catheter break
 - b. Catheter kink

Unit 8 Strategy for procedure related complications **4**

- Snare kit
- Pericardiocentesis
- Covered stent

Unit 9 FFR (Fractional flow reserve) **4**

- Instrumentation
- Equipment
- Working principle
- Achieving Hyperemia state
- Interpretation
- Pitfalls

Unit 10 IVUS **2**

- Instrumentation
- Equipment
- Working principle
- Plaque distribution imaging
- Interpretation
- Advantages & disadvantages

Unit 11 Rotablation 2

- Instrumentation
- Equipment
- Indications & Contraindications
- Complications

Unit 12 IVC Filter 2

- Indications & Contraindications
- Procedure
- Complications

Unit 13 Single chamber pacemakers 2

- Pacemaker implantation
- Lead testing
- Procedures & Programming parameters
- Pacemaker timing cycle and intervals
- Base-rate behavior and upper rate –behavior
- Magnet function

Unit 14 Dual chamber Pacemakers 2

- Time circuits
- Parameters
- Functioning
- Rate adaptive pacemakers
- Sensors in RAP
- Hysteresis

Unit 15 Pacemaker problems 2

- Acute and chronic complications
- Malfunctioning
- Pre-operative patients

Course Outcome: At the end of the course student will gain knowledge on

- Procedural technique, emergency care in cath lab, assisting diagnostic and intervention procedures

Reference:

1. William Grossman and Bains Cardiac Catherization, Angiography & Intervention, 8Th edition Wolters Kluwer,
2. Eric J Topol, Textbook of Interventional Cardiology, Elsevier, 8th edition
3. Morton J Kern . The Catheterization Handbook 6th edition Elsevier 2015
4. Spencer B King, Interventional Cardiology 2nd edition

SEMESTER VI

ISCHEMIC, MYO-PERICARDIAL HEART DISEASES AND CARDIAC MASSES

Course: Core

Number of hours: 60 hours

Course Objective

- Provide knowledge with a systematic approach to evaluate patients with different heart diseases like Ischemic, Myo - Pericardial heart diseases and Cardiac Masses.
- To acquire knowledge on physiologic principles, Structural and functional abnormalities which govern the function of the heart.
- To understand different etiologies, clinical presentations and types associated with disease states including Ischemic, Myo - Pericardial heart diseases and Cardiac Masses.
- To acquire knowledge on hemodynamic abnormalities associated with disease states including Ischemic, Myo - Pericardial heart diseases and Cardiac Masses.
- To understand the role of relevant screening and / or diagnostic tests appropriate for cardiovascular risk stratification
- To develop theoretical and practical skills to how to approach Ischemic, Myo - Pericardial heart diseases and Cardiac Masses by echocardiography.
- To understand and develop theoretical and practical skills in Cardiac Catheterization, Interventional and surgical management of underlying Pathologies.

Course Content:

Unit 1 Acute Coronary Syndrome

6

- Definition
- STEMI
- NSTEMI
- Etiology
- Pathophysiology of ACS - Ischemic Cascade

- Clinical Presentation - Unstable Angina, Chronic Stable Angina
- Diagnosis – ECG, Cardiac biomarkers, ECHO, Cath Management

Unit 2 Old Myocardial Infarction 6

- Definition
- Pathophysiology
- Clinical Presentation
- Diagnosis – ECG, ECHO
- Management

Unit 3 Detection and Quantitation of Wall Motion Abnormalities 4

- ECHO – Transthoracic and Stress Echo
- Role of other modalities

Unit 4 Complications of Acute Myocardial Infarction 8

- Pericardial Effusion
- Infarct Expansion / Acute remodeling
- Free wall rupture
- Ventricular Thrombus
- Right Ventricular Infarction
- Acute MR
- VSR
- Cardiogenic Shock

Unit 5 Chronic Complications 5

- Left Ventricular Aneurysm
- Left Ventricular Pseudoaneurysm
- Chronic Remodelling
- Mural Thrombus
- MR
- Chronic Ischemic Dysfunction

Unit 6 Dilated cardiomyopathy 5

- Etiologies – idiopathic, familial DCM
- Clinical findings
- Pathophysiology
- ECG, XRAY, ECHO, Cath findings
- Management & Prognosis

Unit 7 Hypertrophic cardiomyopathy 5

- Definition, Genetic basis
- Anatomical Variants
- Physiological Variants : Obstructive vs non obstructive
- Pathophysiology
- Clinical findings
- ECG, XRAY, ECHO findings
- Differential Diagnosis
- Predictors of sudden cardiac death in HCM
- Management & Prognosis

Unit 8 Restrictive cardiomyopathy 5

- Definition
- Classification & Etiology
- Pathophysiology
- Clinical features
- Diagnosis : ECG, ECHO & other modalities
- Infiltrative Cardiomyopathy
- Cardiac Amyloidosis
- Endomyocardial fibrosis
- Sarcoidosis
- Storage disorders: Pompe's disease, Fabry's disease

Unit 9 Other variants in Cardiomyopathy

4

- Peripartum Cardiomyopathy
- LV non compaction
- Arrhythmogenic RV dysplasia
- Takotsubo Cardiomyopathy

Unit 10 Cardiac tumors and masses 5

- Definition
- Primary Cardiac Tumors
- Metastatic cardiac Tumors
- Clinical features
- Diagnosis: ECG, ECHO & other modalities
- Differential Diagnosis

Unit 11 Pericardial disease

7

- Pericardial effusion/ tamponade
- Constrictive Pericarditis
- Absent Pericardium

Course Outcome: At the end of the course student will gain knowledge on:

- Systematic approach to evaluate patients with different heart diseases like Ischemic, Myo - Pericardial heart diseases and Cardiac Masses.
- Physiologic principles, Structural and functional abnormalities which governs the function of the heart.
- Understand different etiologies, clinical presentations and types associated with disease states including Ischemic, Myo - Pericardial heart diseases and Cardiac Masses.
- Acquire knowledge on hemodynamic abnormalities associated with disease states including Ischemic, Myo - Pericardial heart diseases and Cardiac Masses.
- Understand the role of relevant screening and / or diagnostic tests appropriate for cardiovascular risk stratification
- Develop theoretical and practical skills to how to approach Ischemic, Myo - Pericardial heart diseases and Cardiac Masses by echocardiography.
- Understand and develop theoretical and practical skills in Cardiac Catheterization, Interventional and surgical management of underlying Pathologies.

References:

1. Harvey Feigenbaum. Feigenbaum's Echocardiography, Wolters Kluwer India .6th Edition ,2010
2. Jae K OH Tajik. Echo Manual 3rd Edition, 2006
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4. Arthur Weyman, Principles and practices of Echocardiography, Lippincott Williams and Wilkins,

ADVANCED ECHOCARDIOGRAPHY

Course: Core

Number of Hours: 45 hours

Course Objective:

- To understand basic concepts of ultrasound physics of advanced techniques in echocardiography.
- Develop an understanding of the multi-disciplinary applications of advanced techniques in clinical practice over conventional 2D imaging and its role as a vital procedural adjunct.
- To acquire theoretical and practical knowledge of advantages and limitations of each technique in clinical applications.
- To acquire theoretical and practical knowledge on equipment and common source of errors of each technique and develop skills on how to overcome it in clinical applications.
- To understand its role in qualitative and quantitative assessments of various heart diseases according to evidence-based guidelines.
- To understand the utility and prerequisite of each technique in various areas including catheter based interventional techniques and during cardiac surgeries in diagnosis making.

Course Content:

Unit 1 TEE

6

- Introduction
- Indications, Contra indications, Complications
- Equipments used
- TEE Probe – Types, Manipulation and orientation options
- Examination technique; Patient preparation, Probe insertion, Technical problems
- TEE Views and Interpretation

Unit 2 Contrast echocardiography

- Introduction
- Indications & Contraindications
- Ultrasound Contrast Agents
- Applications of Contrast Echo – Shunt lesions, Stress Echo, Myocardial contrast
- Machine settings

Unit 3 Tissue Doppler imaging(TDI) 5

- Tissue annular velocities
- Myocardial strain & Strain rate
- Tissue dyssynchrony imaging

Unit 4 Speckle tracking echocardiography 5

- AFI
- Strain and strain rate
- LV torsion

Unit 5 3D Echocardiography 5

- Introduction
- Indications, Advantages & Limitations
- 3D Echo Transducers and Physics
- Views and Interpretation

Unit 6 Cardiac Dyssynchrony 3

- Definition & etiology Pathophysiology
- Assessment of intra ventricular/ interventricular/ atrioventricular dyssynchrony by echocardiography

Unit 7 Myocardial Perfusion Scan 4

Unit 8 Newer types of ultrasound scanners 5

- Portable

- Laptop
- Handheld
- Palmheld
- Point of care echoes

Unit 9 Intracardiac Echocardiography

4

- Instrumentation & Technique
- Applications & Limitations

Unit 10 Storage and retrieval of echo images

4

Course Outcome: At the end of the course student will gain knowledge on following aspects

- Basic concepts of ultrasound physics of advanced techniques in echocardiography.
- Develop an understanding of the multi-disciplinary applications of advanced techniques in clinical practice over conventional 2D imaging and its role as a vital procedural adjunct.
- acquire theoretical and practical knowledge of advantages and limitations of each technique in clinical applications.
- acquire theoretical and practical knowledge on equipment and common source of errors of each technique and develop skills on how to overcome it in clinical applications.
- understand its role in qualitative and quantitative assessments of various heart diseases according to evidence-based guidelines.
- understand the utility and prerequisite of each technique in various areas including catheter based interventional techniques and during cardiac surgeries in diagnosis making.

References:

1. Harvey Feigenbaum. Feigenbaum's Echocardiography, Wolters Kluwer India .6th Edition ,2010
2. Jae K OH Tajik. Echo Manual 3rd Edition, 2006
3. Catherine M Otto, Textbook of clinical Echocardiography , Elsevier, 6th Edition 2018
4. Arthur Weyman, Principles and practices of Echocardiography, Lippincott williams and wilkins,

CARDIAC CATH AND INTERVENTION II

Course: Core

Number of Hours: 60 hours

Course Objective:

- To gain knowledge in depth of indications and timings of interventional procedures for various heart diseases.
- To understand in detail about equipment, materials, sequential approach for various procedures in cathlab.
- To develop assisting interventionalist during each procedure independently.
- To develop practical skill in how to manage situations during emergencies in cathlab.
- Inumerate the measures to be taken before, after and during the procedures.
- Illustrate the role of ECG, echocardiography, hemodynamic assessment
- during and after the interventional procedures of various diseases.

Course Content:

Unit 1 Valvuloplasties 8

- Indications, Procedure, Materials used, Complications of:
 - BMV
 - BAV
 - BPV
 - BTV

Unit 2 Cath and angiography in CHD 4

- Indications, Procedure, Materials used, Complications of (Acyanotic):
 - ASD
 - VSD

- PDA
- Indications, Procedure, Materials used, Complications of (Cyanotic):
 - TOF
 - TGA
 - ECD

Unit 3 Device and coil closures for CHD 8

- Indications, Procedure, Materials used, Complications of:
 - ASD
 - VSD
 - PDA

Unit 4 Cardiac assist devices 6

- Indications, Procedure, Materials used, Complications of:
 - IABP
 - Impella
 - ECMO

Unit 5 Cardiac resynchronization therapy 4

- Indications & Contraindications
- Patient selection, Materials Used
- Procedure, Cath Views
- Prognosis, post procedural programming and follow up assessment

Unit 6 Implantable cardioverter Defibrillators 4

- Introduction
- Sudden cardiac death
- Indications and Contraindications
- System components and functions
- Implantation and testing procedures
- Device programming for arrhythmia recognition

- Device therapy
- Magnet function
- Management and follow-up
- Surveillance

Unit 7 Introduction to EP study 6

- Indications & Contraindications
Patient selection, Materials Used
Procedure, Cath Views
- Prognosis, Post procedural programming and follow up assessment
Radio Frequency Ablation

Unit 8 Cardiac Cath and intervention in HOCM 6

- Indications & Contraindications
- Procedure, Materials Used, Complications
- Brocken brough phenomena
8.4 PTSMA

Unit 9 Peripheral intervention 8

- Indications & Contraindications
- Procedure, Materials Used, Complications
- Renal stenting
- Carotid stenting
- peripheral vascular stenting

Unit 10 Recent advances in Interventional Cardiology 6

- TAVI
 - a. Indications & Contraindications
 - b. Procedure, materials used, Cath views
 - c. Valves used
 - d. Complications

- e. Role of Echo in TAVI
- Mitra Clip
 - a. Indications & Contraindications, Complications
 - b. Procedure, materials used, Cath views
 - c. Role of Echo in Mitra clip
- Intravascular lithotripsy

Course Outcome:

At the end of the course, students will acquire knowledge in the following aspects

- knowledge in depth of indications and timings of interventional procedures for various heart diseases.
- Understand in detail about equipment, materials, sequential approach for various procedures in Cath lab.
- Develop assisting interventionalist during each procedure independently.
- Develop practical skill in how to manage situations during emergencies in Cath lab.
- Enumerate the measures to be taken before, after and during the procedures.
- Illustrate the role of ECG, echocardiography, hemodynamic assessment during and after the interventional procedures of various diseases.

References:

1. William Grossman and Baims Cardiac Catherization, Angiography & Intervention , 8Th edition Wolters Kluwer ,
2. Eric J Topol, Textbook of Interventional Cardiology, Elseveir , 8th edition
3. Morton J Kern . The Catheterization Handbook 6th edition Elsevier 2015
4. Spencer B King , Interventional Cardiology 2nd edition

Semester VI & Semester VII(Internship)

INTERNSHIP PROGRAM

Description:

One year compulsory Internship during which the students get to hone the skills and knowledge acquired in the three years of rigorous study. During this period, their work is very similar to what is expected of them after the completion of their training. This year ensures their readiness to approach a patient, diagnosis and reporting.

Eligibility:

Candidate who has successfully completed his/her Theory & Practical in all the six semesters of academic programme.

Duration:

One- year compulsory Internship.

Clinical Posting:

The Interns should complete his/her clinical postings in ECG, TMT, ECHO [IP/OP/Bedside/ICU's], and CATH LAB.

Academic Presentation & Student evaluation:

Academic Presentation:

The Interns should present at least 10 academic presentations on topic related to the programme before completing Internship. The topic for presentation will be given to the Intern by the HOD/In-charge faculty

Student Evaluation:

The Intern is strictly evaluated from the first day of his/her Internship period till he/she finishes the course. Evaluation is done on the basis of the performance of the Intern during his/her clinical duties, behavior with faculty, Staffs, students and patients, academic activities,

discipline, time sense etc.

Leave/Vacation:

Twenty (20) days of Casual Leave are permissible for Interns. All interns are deputed in rotation for shift duty/Sunday duty/hospital holiday duty and camp duty. Interns has to seek special prior permission to take leave well in advance at least 10 days before. HOD/In-charge faculty has the right to reject leave in case of emergency shortage of staff. They can apply the leave by a formal application form to the Head through the in charge faculty

Objectives:

- The internship time period provides the students the opportunity to continue to develop confidence and increased skill in simulation and treatment delivery.
- Students will demonstrate competence in beginning and intermediate procedures. Students will observe the 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 8 hours per day and this may be more depending on the need and the healthcare setting.

At the end of the course of the student shall be able to:

- Function as competent entry level cardiovascular technologists.
- Demonstrate the ability to use theoretical knowledge and critical thinking skills in clinical practice.
- Perform and review patient assessment.
- Provide patients care before, during and after the procedures.
- Operate and maintain equipment.
- Understand the various diagnostic and therapeutic modalities based on the patient's history and examination findings.
- Prepare the patient for open heart surgery and the implanting of pacemakers.

- Perform EKG's and setup stress tests and Holter monitoring.
- Demonstrate comprehensive knowledge for using sonography and other types of Non – invasive procedures as well as advanced life support techniques.
- Assist physicians with Cardiac catheterization procedures.
- Demonstrate effective oral and written communication skills.