



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 PERFUSION TECHNOLOGY

(REVISED CURRICULUM – AMENDED UP TO 2020)

Structure of the program clearly indicating courses, credits/Electives

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

ATTESTED

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

14.05.2020

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

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

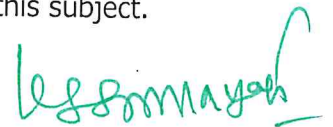
Ref: Resolution of the Academic council at its 38th meeting held on 27.04.2020, vide agenda - 23

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. Perfusion 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.

Cardiac Surgery plays a very important role in treatment of patients, since ancient times and a lot of diseases are recovered by surgery or operation only. After the discovery of Cardiopulmonary bypass (CPB) a technique in which a machine temporarily takes over the function of the heart and lungs during surgery, maintaining the circulation of blood and the oxygen content of the patient's body. The CPB pump itself is often referred to as a heart–lung machine or "the pump". Cardiopulmonary bypass pumps are operated by perfusionist without any agony to the patient. In a cardiac operation theatre, Perfusionist are very important members of the cardiovascular surgical team because they are responsible for running the heart-lung (cardiopulmonary bypass) machine and are responsible for the management of circulatory and respiratory functions of the patient. So along with the skills of doctors and nurses, the skills of the

technologist also matter in a successful patient outcome. Hence, hospital needs a qualified and skilled Perfusionist.

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 cardiovascular and thoracic system.

In particular, they will be:

PO 1: Technically and clinically competent

PO 2: Aware of the importance of quality assurance

PO 3: Aware of the theoretical basis for evidence-based practice

PO 4: Effective members of the multidisciplinary team

PO 5: Prepared to participate in or initiate research into practice

PO 6: Practice as perfusionist independently

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

PO 7: Understand and learn the preparation, operation and maintenance of heart lung machine, ventricular assist device, artificial heart, and other sophisticated instruments and equipment's as directed by Surgeons, healthcare physicians and anesthetics

PO 8: Experts of other life support devices and intra-aortic balloon pump

PO 9: Develop a strong knowledge base in cardiac anatomy, physiology and pathophysiology as well as pharmacology, fetal and neonatal cardiac development and perfusion science.

PO 10: Develop the ability to handle stressful situation, pay great attention to detail, communicate effectively, and be willing to stay abreast of new developments in the profession.

PO 11: Operate the extra corporeal circulation equipment during any medical situation where it is necessary to support or replace the patient cardiopulmonary/circulatory function and ensure the proper management of physiologic functions by monitoring the necessary variables.

PO 12: Monitor the blood flow and other vital signs during open heart surgery and are also responsible for administering intravenous fluid, blood products and aesthetic drugs.

PO 13: They are taught to demonstrate knowledge and practice of basic patient care and to coordinate with other members of the team Protect and uphold the rights of the patient, Ethical and legal issues and responsibilities and to Maintain professional confidentiality.

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 Perfusion Technology (B.Sc. Perfusion Technology).

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. Perfusion 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.

10. Assigning Credit Hours per Course

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

- Every Core course shall be restricted to a maximum of 4 credits.
- The elective course offered by the Yenepoya (Deemed to be) University shall be restricted to a maximum of 2 credits.
- A candidate shall compulsorily complete total Twelve Credits of Elective courses
- These courses shall be selected either from the Generic Electives, Skill enhancement courses offered by Yenepoya (Deemed to be) university or from the SWAYAM/MOOC/NPTEL courses notified by the UGC time to time and enlisted by the faculty of Allied Health Care Professions. A Candidate shall have freedom to choose the courses of once own choice and at their own pace from the external online platform (SWAYAM/MOOC) or a mix of courses offered by Yenepoya (Deemed to be) University but, require to complete before appearing the Sixth semester end examination.
- A candidate who is desirous to add more credits shall be permitted to do so during the academic duration. Extra credits earned by a candidate shall be included in the marks card on submission of course completion certificate. However, it shall not be considered for awarding the Grade in the UG programme.
- The credits assigned to the course 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 158 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, A2ECC2, 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

	SUBJECTS HAVING MAXIMUM MARKS = 60				Duration
Type of question	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

SL.NO	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

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

16.2. The Semester Grade Point Average (SGPA)

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

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

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

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

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

16.3. Cumulative Grade Point Average (CGPA)

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

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

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

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

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

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

GPA = 7 with respect to 18 Credits

Then 1st Year CGPA = $(8.5 \times 16) + (7 \times 18) / 16 + 18 = 7.7$

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 3year program) end Semester Examination.

- Candidate should clear all Courses (Core, AECC & Elective courses) of all the semester, to be eligible to start the one year of mandatory internship.
- A fail in any one Course will mean the 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	1	-	4
5	AECC	English & Communication	10	40	50	2	-	-	2
6	AECC	Constitution of India	10	40	50	2	-	-	2
Total					500				20

Note: Of the total available 36 hours per week for teaching learning processes, 20 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	Introduction To Operation Theatre & Perfusion Technology	40	60	100	3	1	-	4
5	AECC	Environmental Studies	10	40	50	2	-	-	2
6	AECC	Medical Ethics	10	40	50	1	-	-	1
7	AECC	Sociology	10	40	50	1	-	-	1
8	AECC	Health Care	10	40	50	2	-	-	2
Total					500				18

Note: Of the total available 36 hours per week for teaching learning processes, 18 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	General Pharmacology	40	60	100	4	-	-	4
4	Core	Basics of Medical disorder	40	60	100	4	-	-	4
5	Core	Introduction to Perfusion Technology-1	40	60	100	4	-	-	4
6	AECC	Kannada	10	40	50	2	-	-	2
Total					550				20

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

Semester IV

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	Introduction to Perfusion Technology –II	40	60	100	3	-	2	4
2	Core	Medicine Relevant to Perfusion Technology	40	60	100	4	-	-	4
3	Core	Valvular Heart Disorder	40	60	100	4	-	-	4
4	AECC	Human Rights and Gender Equity	10	40	50	2	-	-	2
5	AECC	Biostatistics	10	40	50	2	-	-	2
Total					400				16

Note: Of the total available 36 hours per week for teaching learning processes, 17 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	Clinical Perfusion Technology	40	60	100	4	-	-	4
2	Core	Congenital Heart Disorder	40	60	100	4	-	-	4
3	Core	Applied Perfusion Technology	40	60	100	4	-	-	4
4	Core	Paediatric Perfusion Technology	40	60	100	4	-	-	4
5	Core	Clinical Application of Perfusion Technology-1	40	60	100	-	-	8	4
Total					500				20

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 VI

Sl. No	Category	Course Name	Max Marks		Total Marks	Hours Per week			Credits
			IA	SEE		L	T	P	
1	Core	Advanced Perfusion Technology	40	60	100	4	-	-	4
2	Core	Special Situation in Cardiac Surgery	40	60	100	4	-	-	4
3	Core	Cardiac Life Support	40	60	100	4	-	-	4
4	Core	Clinical Application of Perfusion Technology-2	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		110
Elective		12
Internship		36
Total Credit of the program		158

SEMESTER I

ANATOMY

Course: Core

Credits: 04

Number of hours: 60

Course objectives:

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

Course Content:

Unit 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

Credit: 04

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 D3 Tetany

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

8 hours

- Introduction: Parts of CNS and PNS, Functions of nervous system
- Neuron: definition, structure Nerve Fiber: classification, conduction of impulses continuous and saltatory. Neuroglia
- Synapse: Definition, structure, types, properties (brief). Receptors: definition, classification, properties (brief). Reflex: Definition, Reflex Arc, Examples.
- Babinski's sign. Tone, Posture (definition), Spinal cord nerve tracts: Diagram and Functions: Lateral Spino Thalamic Tract, Dorsal Column, Pyramidal Tract. UMN and LMN lesion, Hemiplegia, Stroke (brief) Functions of: Cerebral cortex, Cerebellum, Hypothalamus, Basal Ganglia EEG, Parkinsonism

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

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.
Choudhary Sujith K: Concise Medical Physiology Latest Ed. New Central Book.

BIOCHEMISTRY

Course: Core

Credit: 04

Number of hours: 60

Course objective

- To classify various biomolecules 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 Content:

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**

- 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, immunoglobulins, 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, 	

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 & PHYSIOLOGY

Course: Core

Credits: 04

Number of hours: 60 hours

Course objectives:

- Understanding about the Cardiac chambers and valves morphology and structures
- Understanding about anatomy & physiology and cardiac hemodynamic.

Course Content:

Unit I: Heart Terminology

5 hours

- Aneurysm
- Angina Pectoris
- Atherosclerosis
- Arrhythmias
- Cardiomyopathy

Unit II: Blood vessels:

5 hours

- Control of blood vessel diameter and blood supply
- Internal respiration & cell nutrition-]

Unit III: Cardiac cycle:

6 hours

- Phases of systole, Phases of diastole, Event timings, Stroke volume or cardiac output

Unit IV: Cardiac anatomy:

5 hours

- Position and structure of the heart.

Unit V: Heart Valves:

5 hours

- Mitral valve, Tricuspid valve, Aortic valve & pulmonary valve

Unit VI: Conduction system of the heart:

5 hours

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

Unit VII: Arterial supply of the heart **6 hours**

- Coronary arteries and its branches

Unit VIII: Chambers: **6 hours**

- Right atrium, Right ventricle, Left atrium & Left ventricle

Unit IX: Aorta of the heart **6 hours**

- Parts and branches of the Aorta

Unit X: Blood pressure: **6 hours**

- Systolic, Diastolic, Direct / indirect measurement, brachial artery measurement & Lower extremity BP

Unit XI: Circulation of the blood **5 hours**

- Pulmonary Circulation, Systemic or general circulation:
Aorta and Portal Circulation

Course Outcomes:

- To state the position of the heart, the size and shape.
- To identify the chambers of the heart and the circulation system
- To state the anatomy of heart valve and the coronary arteries
- To state the properties of cardiac muscle tissue
- To identify the conduction system and the cardiac cycle

Recommended Books:

- Hatchett R, Thompson DR, editors. Cardiac nursing: a comprehensive guide. Churchill Livingstone; 2007.
- Jacobson C, Woods SL, Froelicher ES, Motzer SU, Bridges EJ. Electrocardiography. Cardiac Nursing. Woods SL, Froelicher ES, Motzer SA, Bridges EJ, editors. 5th ed., Philadelphia: Lippincott Williams & Wilkins. 2005:326-424.

ENGLISH AND COMMUNICATION

Course: AECC

Credits: 2

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.

Course Content:

UNIT – I: PHONETIC

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

Credits: 02

Number of hours: 30 hours

Course Objectives:

By the end of this course, a student will

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

Course Content:

Unit 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
<ul style="list-style-type: none">• 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
<ul style="list-style-type: none">• The Governor• Chief Minister and Council of Ministers• State Legislature Vidhana Sabha, Vidhana Parishad – organization and Powers	
Unit V: Federalism in India	2 hours
<ul style="list-style-type: none">• Meaning Federal and Unitary Features	
Unit VI: The Judiciary	2 hours
<ul style="list-style-type: none">• The supreme Court – Organization, Jurisdiction and Role• The High Court – Organization Jurisdiction and Role	
Unit VII: Electoral Process in India	2 hours
<ul style="list-style-type: none">• Election Commission – Organization, Functions	
Unit VIII: Local Governments	2 hours
<ul style="list-style-type: none">• Rural and Urban – Organization, Powers and Functions	
Unit IX: Human Rights	3 hours
<ul style="list-style-type: none">• 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 Burgenthel, West Nutshell Publisher; London; 2005.
- ParvathyAppaiah, Constitution of India, Mangalore DivyaDeepa Publication; 2005
- ParvathyAppaiah, Human Rights. DivyaDeepa Publication Mangalore; 2016
- RajRam. M, Constitution of India Himalaya Publication, New Delhi; 1999

SEMESTER II
GENERAL PATHOLOGY

Course: Core

No of Hours: 60 Hours

Credits: 4

Course Objectives:

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

Credits: 4

Course Objectives:

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

Course Content:

Unit 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, RamnikSood, 4th edition, Jaypee Publications.
- Allied Health Sciences Laboratory Technology

INTRODUCTION TO OPERATION THEATRE &PERFUSION TECHNOLOGY

Course: Core

Credits: 4 Credits

No of hours: 60 Hours

Course Objective:

- To gain basic knowledge about the cardiac operating room with importance to sterility and biomedical waste management.
- To obtain knowledge about equipment's used during cardiac surgery.
- To understand about Heart Lung Machines and its components.
- To know about Intensive care unit for patients.

Core Content:

Unit I: Introduction to the operating room environment & protocols: 10 hours

- General protocols followed in the operating room
- Hand washing
- Unsterile- sub sterile- sterile methods followed in the OR environment
- Handling of Disposables in the OR
- Handling and maintenance of equipment in the OR
- Protocols followed in CCU

Unit II: Introduction to the various components of cardiopulmonary bypass

10 hours

- Cardiopulmonary bypass machine - Cardiopulmonary Bypass Circuit
Blood pump, Suckers and vents
- Tubing's -Size, Type, Maximum flow and drainage.
- Cannulas-Arterial Cannula, Venous Cannula, Cardioplegia Cannula
- Oxygenators-Characteristics of Ideal Oxygenator, Types, Blood flow path through Oxygenators
- Cardio Pulmonary Bypass Filters
- Safety Devices

Unit III: Introduction to the basics of CPB procedures **10 hours**

- Safety checks and setup of the circuit
- Administration of priming fluids
- Priming steps for CPB circuits
- Occlusion setting
- Anticoagulants for CPB
- Weaning off

Unit IV: Basics of electricity & functioning of electro medical equipment **5 hours**

- Electric safety(Earthing) & care of apparatus
- Electricity & electro medical equipments & safe guard's Static electricity

Unit V: Sterilization and Disinfection – material & methods **5 hours**

- Physical Methods- Sunlight, Heat, Vibration, Radiation and Filtration
- Chemical Methods-liquid and Gaseous
- Physiochemical Methods

Unit VI: Intensive coronary unit & recovery room concepts **5 hours**

- Patient care, medical knowledge on equipment and severity of illness

Unit VII: Biomedical waste & its management **5 hours**

- Principles of waste management
- Treatment of hazardous & clinical Wastes

Unit VIII: Patient monitoring **10 hour**

- Central line placement
- Arterial line placement
- Endotracheal intubation
- Positioning of patient
- Intercostal drainage
- Tubes and drains

Course outcomes:

- To state the equipment's in operation theatre and intensive care units
- To know about the patient care in recovery room and OT
- To know about the sterility and waste management in OT & ICU.

Recommended Books:

- Guyton RA, Mora CT, Finlayson DC, Rigatti RL, editors. Cardiopulmonary bypass: principles and techniques of extracorporeal circulation. Springer Science & Business Media; 2012 Dec 6.
- Hegde V, Kulkarni RD, Ajantha GS. Biomedical waste management. Journal of Oral and Maxillofacial Pathology. 2007 Jan 1; 11(1):5.
- Block SS, editor. Disinfection, sterilization, and preservation. Lippincott Williams & Wilkins; 2001

ENVIRONMENTAL STUDIES

Course: AECC

Credits: 2

No of hours: 30 hours

Course Objectives:

- Students will be able to learn about environment, factors affecting it, environmental ethics and its protection
- Students will be able to Describe a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

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

Recommended Books:

- Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
- Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
- Clark R.S., Marine Pollution, Clarendon Press Oxford (TB)
- Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p

- De A.K., Environmental Chemistry, Wiley Eastern Ltd.
- Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
- Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
- Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.

MEDICAL ETHICS

Course: AECC

Credit: 01

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 **1 hour**

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

Responsibility?

Unit II: Definition of medical ethics **2 hours**

- Major principles of medic ethics.

Unit III: Perspective of medical ethics **2 hours**

- 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 **2 hours**

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

Unit V: The ethics of human life **2 hours**

- Prenatal sex determination.

Unit VI: The family and society in medical ethics **2 hours**

- Euthanasia, cancer and terminal care.

Unit VII: Death and dying

2 hours

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

Unit VIII: Professional Ethics

2 hours

- 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

Course: AECC

Credits: 01

No of hours: 15 hours

Course objective:

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

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 Outcomes:

- To develop the abilities of students to analyse the sociological concepts and their relationship with social work practice.
- To understand Indian social problems and its impact on social development.
- To develop skills for social analysis.

- To develop an understanding of emerging issues of social concern and their impact on society.
- To develop basic understanding of health perspectives and their practice in social work

Recommended Books:

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

HEALTH CARE

Course: AECC

Credits: 02

No of Hours: 30 Hours

Course Objective:

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

Course Content:

Unit I: Introduction to Health:

3 hours

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

Unit II: Introduction to Nursing:

3 hours

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

Unit III: Bandaging:

3 hours

- Basic turns; Bandaging extremities; Triangular Bandages and their application.

Unit IV: Nursing Position and Bed making:

3 hours

- Positioning patient prone, lateral, dorsal, dorsal re-cumbent, Fowler's positions, comfort measures, Aids and rest and sleep.

Unit V: Lifting and Transporting Patients:

3 hours

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

Unit VI: Bed Side Management:

3 hours

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

Unit VI: Methods of Giving Nourishment:

3 hours

- Feeding, Tube feeding, drips, transfusion Care of Rubber Goods

Unit VIII: Vital Parameter Recording:

3 hours

- Recording of body temperature, respiration and pulse,

Unit IX: Asepsis:

3 hours

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

Unit 10: First Aid.

3 hours

Course outcomes:

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

Recommended Books:

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

SEMESTER III

SYSTEMIC PATHOLOGY

Course: Core

Credits: 2 Credits

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 outcomes:

- 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:

- Essentials in Hematology and Clinical Pathology by Ramadas Nayak and Sharada Rai
- Histopathology Techniques and its Management by Ramadas Nayak
- Text book of Pathology Harsh Mohan Jaypee Brothers, New Delhi
- Practical Pathology P. Chakraborty, Gargi Chakraborty New Central Book Agency, Kolkata
- Hand-Book of Medical Laboratory Technology CMC Vellore
- Basic Haematological Techniques Manipal Manual

APPLIED MICROBIOLOGY

Course: Core

Credits: 2 Credits

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 floor plan 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

Credits: 04

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)
- Anti-hypertensive
- Antianginal drugs
- Pharmacotherapy of shocks
- Cardiac glycosides
- Cardiologic 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
- Antiemetic
- 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
- Immunosuppressant
- 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.

BASICS OF MEDICAL DISORDERS

Course: Core

Credits: 4 Credits

Number of hours: 60 hours

Course objective:

- To learn about basic concepts of common medical disorders
- To learn about pathophysiology of medical disorders of each system
- To understand about various therapeutic options of medical disorders.

Course Content:

Unit I: The Blood Vessels and Lymphatic

3 hours

- Normal Structure
- Arteriosclerosis
- Vasculitis
- Infectious Arteritis
- Non-Infectious Arteritis

Unit II: Coagulation system

6 hours

- Platelet Disorders- Thrombocytopenia, Thrombophilia
- Coagulation pathway disorders - Von will brands diseases
- Hemophilia
- DIC- Disseminated intravascular coagulation

Unit III: Respiratory System

4 hours

- Pneumonia-classification
- Pleural effusion
- Lung cancer

Unit IV: Central Nervous system**15 hours**

- Automatic nervous system
(Sympathetic & Parasympathetic system)
- Stroke
- Cerebral edema
- Parkinson disease
- Alzheimer disease
- Meningitis
- Encephalitis
- Hemiplegia
- Paraplegia
- Cerebral haemorrhage
- Myasthenia gravis
- Polio myelitis
- Gullian barre syndrome
- Epilepsy

Unit V: Gastro intestinal and Renal System**8 hours**

- Peptic ulcer
- Acute gastroenteritis
- Hepatitis
- Hepatic failure
- Alcoholic liver disease
- Jaundice
- Budd chiari syndrome

Unit VI: Endocrine System**6 hours**

- Hypothyroidism
- Hyperthyroidism
- Hyperkalemia
- Hypocalcaemia

- Cushing's Syndrome
- Addison's syndrome

Unit VII: Tumour's

6 hours

- Tumours and Tumor-like Lesions,
- Benign Tumours and Hamartoma,;
- Intermediate Grade Tumours
- Malignant Tumours
- Cardiac tumors
- CNS tumors
- Stomach Carcinoma
- Renal cell carcinoma
- Hepatic Carcinoma

Unit VIII: Others

10 hours

- DM
- Obesity
- Pregnancy
- Pediatric Patient (neonate/Infant)
- Elderly patient
- Bowel ischemia
- Peptic ulcer disease
- Drowning
- Hanging
- Poisoning and drug over dosing

Course Outcomes:

- To state the disorders related with different organs of the body
- To State the pathophysiology and its treatment options for various diseases

Recommended Books:

- Mohan H. Textbook of pathology. Jaypee Brothers Medical Publishers; 2018 Nov 30.
- Walker BR, Colledge NR. Davidson's principles and practice of medicine e-book. Elsevier Health Sciences; 2013 Dec 6.

INTRODUCTION TO PERFUSION TECHNOLOGY-1

Course: Core

Credits: 4 Credits

No of hours: 60 Hours

Course Objective:

- To learn the history, components, physiology of the cardiopulmonarybypass in detail
- To learn about different diagnostic techniques for diagnosing function of heart
- To understand about various monitoring and equipment used.

Core Content:

Unit 1: History and evolution of Cardiac Surgery & Cardiopulmonary Bypass.

10 hours

- History of cardiac surgery and perfusion
- Dr John Gibbons Heart Lung Machine
- History of Gibbon, Lillehei, Carrel
- Pre CPB surgery
- Cross circulation (Gross Well) technique
- Hypothermic & Non-hypothermic Cardiac Surgery

Unit II: Basic Principles of the following.

15 hours

- Extracorporeal Circulation
- Extracorporeal gas exchange
- Biocompatible Materials used in Perfusion
- Aseptic techniques and Sterility in perfusion.

Unit III: Basics of diagnostic techniques

15 hours

- Chest X-ray

- Electrocardiogram(ECG)
- Echocardiogram(Echo)
- Coronary Angiography
- Nuclear Cardiology
- Laboratory investigations- Arterial blood gas, Venous blood Gas, Renal function test,liver function test, Hemoglobin, Hematocrit, platelet, RBC, WBC, Electrolytes

Unit IV: Basic components used in CPB

10 hours

- Heart lung machine
- Oxygenator
- Arterial Filters
- Heater cooler unit
- Blood Cardioplegia device
- ACT Machine

Unit V: Basics of monitoring

10 hours

- Setting up of ECG machine
- Pressure transducer
- Syringe and peristaltic pumps
- Anesthesia Monitors
- Pulse oximeters
- Temperature probes and Thermoregulatory monitoring
- Defibrillators and Fibrillators
- ACT (Activated Clotting Time)

Course Outcomes:

- To state about the history, components, physiology of the cardiopulmonarybypass.
- Learned about different diagnostic techniques of heart
- Identify various monitoring done for patients and equipment used.

Recommended Books:

- Gravlee GP, editor. Cardiopulmonary bypass: principles and practice. Lippincott Williams & Wilkins; 2008.
- Guyton RA, Mora CT, Finlayson DC, Rigatti RL, editors. Cardiopulmonary bypass: principles and techniques of extracorporeal circulation. Springer Science & Business Media; 2012 Dec 6.
- Gluud C, Gluud LL. Evidence based diagnostics. Bmj. 2005 Mar 24;330 (7493):724-6.

KANNADA

Course: AECC

Credits: 02

Number of hours: 30 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, Vyavarahika Kannada

SEMESTER IV

INTRODUCTION TO PERFUSION TECHNOLOGY - II

Course: Core

Credits: 3 Credits

No of hours: 45 Hours

Course Objective:

- To learn the history, components and physiology of the cardiopulmonarybypass in detail.
- The course helps in understanding about Cardiopulmonary Bypass Techniques andHeart Lung Machine

Core Content:

Unit 1: Oxygenators

5 hours

- History of Oxygenators
- Types of Oxygenators: Disc and Screen Oxygenators, Bubble Oxygenators and Membrane Oxygenator
- Design & function of various Oxygenators

Unit II: Pump

10 hours

- History of Pumps
- Characteristics of an Ideal Pump
- Pulsatile versus non-pulsatile flow
- Occlusive and non-occlusive pumps
- Types of Pumps: Roller pumps, Centrifugal pumps, Peristaltic pumps, Bellow pumps,Sigma motor pumps, Diaphragm pumps and ventricular pumps

Unit III: Element of extracorporeal circulation

5 hours

- Flow meters
- Bubble trap
- Temperature probe
- Regulating devices

Unit IV: Filters

5 hours

- Arterial filters
- Cardiotomy filters
- Gas line filters
- Leucocyte filters

Unit V: Blood components & Blood banking

5 hours

- Blood grouping and Cross Matching
- Packed Red Blood Cell
- Whole blood
- Platelets
- Fresh Frozen Plasma
- Cryoprecipitate

Unit VI: Coagulation system

10 hours

- Platelet Disorders- Thrombocytopenia, Thrombophilia
- Coagulation pathway disorders - Von will brands diseases Hemophilia
- DIC- Disseminated intravascular coagulation
- Fibrinolytic system and its disorder

Unit VII: Connection of the vascular system with extracorporeal circulation

5 hours

- Arterial and venous cannulae.
- Connecting tubes and connectors

- Vents
- Suckers
- Cardioplegia delivery system
- Venous drainage

Course Outcome:

- To state about physiology of the cardiopulmonary bypass
- To state about basic components used in CPB
- To understand about connection of vascular system with extracorporeal circulation.

Recommended Books:

- Gravlee GP, editor. Cardiopulmonary bypass: principles and practice. Lippincott Williams & Wilkins; 2008.
- Kay P, Munsch CM. Techniques in Extracorporeal Circulation 4E CRC Press; 2004 Apr 30.
- Guyton RA, Mora CT, Finlayson DC, Rigatti RL, editors. Cardiopulmonary bypass: principles and techniques of extracorporeal circulation. Springer Science & Business Media; 2012 Dec 6.

MEDICINE RELEVANT TO PERFUSION TECHNOLOGY

Course: Core

Credits: 4 Credits

No of hours: 60 Hours

Course Objective:

- To learn about basic concepts of common medical disorders
- To learn about pathophysiology of medical disorders of each system
- To understand about various therapeutic options of medical disorders.

Course Content:

Unit I: Cardiovascular System

20 hours

- Angina
- Atherosclerosis
- Cardiomyopathy
- Myocarditis and pericarditis
- Heart failure
- Arrhythmias and fibrillation
- Hypertension
- Ischemic heart diseases
- Rheumatic heart disease
- Congenital heart disease
- Aneurysms
- Endo cardiac cushion effect
- Shock-types
- Cardiac Tamponade
- Peripheral vascular disease
- Acute limb ischemia
- Chronic limb ischemia
- Deep vein thrombosis

Unit II: Haematology**10 hours**

- Anaemia
- Bleeding disorders
- Laboratory tests used to diagnose bleeding disorders (in brief)

Unit III: Respiratory System**15 hours**

- Chronic obstructive airway diseases (COPD)
- Concept of obstructive versus restrictive pulmonary disease
- PFT and its interpretation
- Haemothorax
- Pneumothorax
- Pulmonary edema

Unit IV: Mediastinum and disorders**5 hours**

- Types of thoracic incision and their indication
- Mediastinal tumors
- Pericardial effusion
- Haemopericardium

Unit V: Renal System**10 hours**

- ARF & CRF
- End stage renal disease
- Role of dialysis and renal transplantation in its management
- Electrolyte disorders (calcium, sodium potassium magnesium- hypo/hyper)
- Renal calculi
- Haematuria
- Obstructive uropathy
- Urinary tract infection

Course Outcomes:

- To state the disorders related with different organs of the body
- To State the pathophysiology and its treatment options for various diseases

Recommended Books:

- Mohan H. Textbook of pathology. Jaypee Brothers Medical Publishers; 2018 Nov 30.
- Walker BR, Colledge NR. Davidson's principles and practice of medicine e-book. Elsevier Health Sciences; 2013 Dec 6.

VALVULAR HEART DISORDERS

Course: Core

Credits: 4 Credits

No of hours : 60 Hours

Course Objective:

- To understand about valvular heart disorders of the heart.
- To know about the causes and pathophysiology of stenosis and regurgitation of different valves of the heart.
- To understand about management and treatment of the disorder of valves
- To know in detail about the advanced surgical procedure for the treatment of valves.

Core Content:

Unit I	Aortic stenosis <ul style="list-style-type: none">• Causes• Pathophysiology• Investigations• Treatment	5 hours
Unit II	Aortic Regurgitation <ul style="list-style-type: none">• Causes• Pathophysiology• Investigations• Treatment	5 hours
Unit III	Mitral Stenosis <ul style="list-style-type: none">• Causes• Pathophysiology• Investigations• Treatment	5 hours
Unit IV	Mitral Regurgitation	5 hours

	<ul style="list-style-type: none"> • Causes • Pathophysiology • Investigations • Treatment 	
Unit V	Pulmonary Stenosis	5 hours
	<ul style="list-style-type: none"> • Causes • Pathophysiology • Investigations • Treatment 	
Unit VI	Pulmonary Regurgitation	5 hours
	<ul style="list-style-type: none"> • Causes • Pathophysiology • Investigations • Treatment 	
Unit VII	Tricuspid Stenosis	5 hours
	<ul style="list-style-type: none"> • Causes • Pathophysiology • Investigations • Treatment 	
Unit VIII	Tricuspid Regurgitation	5 hours
	<ul style="list-style-type: none"> • Causes • Pathophysiology • Investigations • Treatment 	
Unit IX	Infective Endocarditis	5 hours
	<ul style="list-style-type: none"> • Causes • Pathophysiology • Investigations • Treatment 	

Unit X.**Miscellaneous****15 hours**

- Mechanical Prosthetic Valves
- Stented bio prosthetic valves
- Bentall and mini bentall procedure
- The Ross procedure
- Mitral Valvotomy
- Aortic root replacement
- Aortic root enlargement

Course Outcomes:

- To state the different types of valvular heart diseases
- To identify the cause and pathophysiology of valve
- To state the management and treatment of disorder

Recommended Books:

- Raja SG, editor. Cardiac Surgery: A Complete Guide. Springer Nature; 2020 Feb 11.
- Lilly LS, Braunwald E. Braunwald's heart disease: a textbook of cardiovascular medicine. Elsevier Health Sciences; 2012.
- Fuster V, Harrington RA, Narula J, Eapen ZJ. Hurst's the heart. McGraw-Hill Education; 2017.
- Mann DL. Heart Failure: A Companion to Braunwald's Heart Disease E-book. Elsevier Health Sciences; 2010 Nov 11.

HUMAN RIGHTS AND GENDER EQUITY

Course: AECC

Number of Hours: 30 Hours

Credits: 02

Course Objectives:

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

Course Content:

Unit 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 or labour, Gender Bias, Gender Stereotypes, Need for Gender Sensitization.

Unit IV: Woman Status in India

5 Hours

- Important indicators- Sex Ratio, Education, Health, Nutrition, Material 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

Credit: 02

Number of Hours: 30

Course Objectives:

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

Course Content:

Unit 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.

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

SEMESTER V
CLINICAL PERFUSION TECHNOLOGY

Course: Core

Credits: 4 Credits

No of hours: 60 Hours

Course Objective:

- To learn the history, components and physiology of the Cardiopulmonary bypass in detail.
- The course helps in understanding about Cardiopulmonary Bypass Techniques and Heart Lung Machine.
- To learn about clinical aspects of perfusion technology.

Core Content:

Unit I: Pharmacokinetics and Pharmacodynamics of Cardiopulmonary Bypass 5 hours

- Plasma concentration
- Distribution of Drugs
- Elimination of Drugs

Unit II: Drugs used in Cardiopulmonary Bypass 5 hours

- Vasodilators – Sodium, Nitroprusside, Nitro-glycerin
- Vasoconstrictors – Phenylephrine
- Anti-Arrhythmic – Amiodarone, Magnesium, Lignocaine
- Diuretic – furosemide, Mannitol
- Anticoagulants
- Inhalational agents (Sevoflurane, Isoflurane, Analgesics – Fentanyl, Morphine, Sedatives – Midazolam, Thiopentone, Antiplatelets, Inotropes – Adrenaline, Noradrenaline, Dopamine, Dobutamine, Milrinone, Vasopressin)

Unit III: Cardiopulmonary Bypass Circuit	5 hours
<ul style="list-style-type: none"> • Adult circuit • Paediatric circuit • Neonatal circuit 	
Unit IV: Conduct and monitoring of CPB	5 hours
<ul style="list-style-type: none"> • Initiation and maintenance of CPB • Monitoring of CPB • Anticoagulation during CPB 	
Unit V: Termination of CPB	5 hours
<ul style="list-style-type: none"> • Principle and Methodology • Weaning of CPB 	
Unit VI: Adequacy of perfusion	5 hours
<ul style="list-style-type: none"> • General consideration, • Specific aspects of perfusion • Monitoring other factors which may affect its adequacy 	
Unit VII: Pulsatile perfusion	5 hours
<ul style="list-style-type: none"> • Introduction • Theory and physiology of pulsatile flow • Haemodynamic effect of pulsatile perfusion • Metabolic effects of pulsatile perfusion • haematological effects of pulsatile perfusion 	
Unit VIII: Cannulation techniques during cardiopulmonary bypass	6 hours
<ul style="list-style-type: none"> • Arterial cannulation – Aortic, femoral, iliac • Venous cannulation – SVC, IVC, RA, femoral vein • Cardioplegia cannulation – Antegrade, Retrograde, Ostial 	
Unit IX: Myocardial Protection and Cardioplegia	6 hours
<ul style="list-style-type: none"> ▪ Pre-treatment of the myocardium • Hypothermia • Controlled reperfusion 	

- Crystalloid Cardioplegia – St Thomas solution, Delnido solution, Custodial HTK solution
- Blood cardioplegia delivery device (BCD) –
 - Myocardial protection system (MPS),
 - Cardioplegia reservoir
- Myocardial protection for specific clinical problems
- Complications of cardioplegia
- Non cardioplegic methods during cardiac surgery on CPB

Unit X: Oxygenation

5 hours

- General consideration
- Bubble & membrane oxygenator
(including assessment and comparison of oxygenator function)

Unit XI: Heat Exchanger

3 hours

- Principles, function of heat exchanger & their assessment
- Complications related to heat exchanger and their management

Unit XII: Priming Fluids and Hemodilution

5 hours

- Crystalloids, Ringer Lactate, Normal Saline, PlasmalyteA, Dextrose
- Colloids – Hetastarch, Albumin, FFP
- Additional drugs used in them – Mannitol, Heparin, Bicarbonate

Course Outcomes:

- To state about the history, components, physiology of the Cardiopulmonarybypass.
- Learned about different diagnostic techniques of heart
- Identify various monitoring done for patients and equipment used.

Recommended Books:

- Cardiopulmonary Bypass Principles and practice 3rd edition- Glenn P. Gravlee, M.D,(Editor) Richard F.Davis MD (Editor), Alfred H.Stammers MSA CCP(Editor)

- Techniques in Extracorporeal Circulation 4th Edition- Philip H. Kay MA DM FRCS and Christopher M Munsch ChM FRCS (Editors)
- Cardiopulmonary Bypass Cambridge University- Sunit Ghosh, Florian Falter, Davis J. Cook (Editors)
- Perfusion for Congenital Heart Surgery notes on cardiopulmonary Bypass for a complex Patient Population - Gregory Matte CCP, LP, FPP (editor)
- Drugs for the heart: Expert Consult- Online and Print, 8e Paperback, Lionel H. Opie MDDPhil L DSc FRCP (Author), Bernard J. Gersh Mb ChB DPhil FACC (Author) Publisher

CONGENITAL HEART DISORDERS

Course: Core

Credits: 4 Credits

No of hours: 60 Hours

Course Objective:

- To understand about congenital disorders of the heart.
- To know about the causes and pathophysiology of congenital disorders
- To understand about management and treatment of the congenital disorders of the heart.

Core Content:

Unit I: Overview of human heart

4 hours

- Anatomy
- Physiology
- Cardiac malposition
- Situs abnormalities

Unit II: Atrial Septal defect

3 hours

- Prevalence, Types, Pathology, Signs & Symptoms, Investigations, Treatment & Complications

Unit III: Ventricular Septal defect:

4 hours

- Prevalence, Types, Pathology, Signs & Symptoms, Investigations, Treatment & Complications

Unit IV: Patent Ductus Arteriosus:

4 hours

- Prevalence, Types, Pathology, Signs & Symptoms, Investigations, Treatment & Complications

Unit V: Total Anomalous Pulmonary Venous Connection (TAPVC)

4 hours

- Prevalence, Types, Pathology, Signs & Symptoms, Investigations, Treatment & Complications

Unit VI: Partial Anomalous Pulmonary Venous Connection (PAPVC)

4 hours

- Prevalence, Types, Pathology, Signs & Symptoms, Investigations, Treatment & Complications

Unit VII: Tetralogy of Fallot (TOF)

4 hours

- Prevalence, Types, Pathology, Signs & Symptoms, Investigations, Treatment & Complications

Unit VIII: Coarctation of Aorta

4 hours

- Prevalence, Types, Pathology, Signs & Symptoms, Investigations, Treatment & Complications

Unit IX: Transposition of the great arteries (TGA)

4 hours

- Prevalence, Types, Pathology, Signs & Symptoms, Investigations, Treatment & Complication

Unit X: Hypoplastic left heart syndrome

4 hours

- Prevalence, Types, Pathology, Signs & Symptoms, Investigations, Treatment & Complications

Unit XI: Pulmonary atresia with intact septum

4 hours

- Prevalence, Types, Pathology, Signs & Symptoms, Investigations, Treatment & Complications

Unit XII: Anomalous left coronary artery from the pulmonary artery

4 hours

- Prevalence, Types, Pathology, Signs & Symptoms, Investigations, Treatment & Complications

Unit XIII: Neonatal Ebstein's Anomaly

4 hours

- Prevalence, Types, Pathology, Signs & Symptoms, Investigations, Treatment & Complications

Unit XIV: Persistent Truncus Arteriosus

4 hours

- Prevalence, Types, Pathology, Signs & Symptoms, Investigations, Treatment & Complications

Unit XV: Miscellaneous Disorders

4 hours

- BT (Blalock – Taussing) shunt
- Glenn procedure
- Fontan procedure
- Rastelli procedure
- Arterial switch operation

Course Outcome:

- Acquired knowledge in Cardiac Abnormalities, Cyanotic and Acyanotic Congenital Heart Diseases.
- Identify signs and symptoms of congenital heart disorders
- State about different types of Congenital Surgical procedures.

Recommended Books:

- Perfusion for Congenital Heart Surgery notes on cardiopulmonary Bypass for a complex Patient
Population - Gregory Matte CCP, LP, FPP (editor).
- Perloff's clinical recognition of congenital heart disease,
Sixth edition: Joseph K. Perloff, Ariane J. Marelli
- Congenital Heart Disease, Molecular Genetics, Principles of Diagnosis and treatment ; editors,
Muenke M. Kruszka P.S, Sable C A, Belmont J W

APPLIED PERFUSION TECHNOLOGY

Course: Core

Credits: 4 Credits

No of hours: 60 Hours

Course Objective:

- To provides knowledge about the applied aspects of Cardiopulmonary Bypass
- To learn about pathophysiology of anticoagulation and blood cell trauma of Cardiopulmonary Bypass
- To understand about Systemic Inflammatory Response Syndrome and its effect in various organs

Core Content:

Unit I: Blood cell trauma**5 hours**

- Analysis of forces of fluid motion, effects of physical forces on blood Cell, clinical effect.
- Complications of blood transfusion.

Unit II: Anticoagulation on bypass**10 hours**

- Its monitoring, its reversal and complications.
- Heparinless bypass
- Platelet aggregation and platelet dysfunction
- Coagulopathies due to cardiopulmonary bypass and its management.
- Coagulation management during CPB and its reversal
- Heparin Pharmacology
- Heparin Dosing and Monitoring
- Heparin Resistance
- Alternatives to Unfractionated Heparin
- Heparin-Induced Thrombocytopenia
- Protamine Pharmacology
- Protamine reaction

Unit III: Effect of CPB

10 hours

- Systemic Inflammatory Response Syndrome & its clinical effects.
- Effect of CPB on CNS
- Effect of CPB on Respiratory System
- Effect of CPB on Renal system
- Effect of CPB on Hepatic system
- Effect of CPB on Immune system
- Effect of CPB on Endocrine system

Unit IV: Blood conservation Techniques (Pre- operative, Peri- Operative & Post-Operative)

10 hours

- Hemofiltration during CPB including ultrafiltration (CUF, MUF)
- Retrograde Autologous priming(RAP)
- Cell saver & other methods.

Unit V: Micro emboli

5 hours

- Gaseous and particulate

Unit VI: Filters used during CPB

5 hours

- Arterial filters
- Cardiotomy filters
- Gas line filters
- Leucocyte filters

Unit VII: Micro pore filtration during CPB

5 hours

Unit VIII: Counter pulsation techniques and assist devices

10 hours

IntraAortic Balloon Pump

- Introduction to IABP
- Parts of IABP machine
- Parts of IABP balloon
- Insertion sites
- Different IABP sizes
- Indications
- Steps of insertion and Removal,
- Complications and Contraindications

Ventricular Assist Device

- LVAD
- RVAD
- BIVAD
- Artificial heart

Course Outcome:

- To be able to know about the pathophysiology of CPB
- To state about different benefits and side effects of Cardiopulmonary bypass
- To state and know about the various assist devices used for supporting the patient.

Recommended Books:

- Gravlee GP. Cardiopulmonary bypass principles and practice. Lippincott Williams & Wilkins, 2020 Jun 2.
- Kay P, Munsch CM. Techniques in Extracorporeal Circulation 4E. CRC Press; 2004 Apr 30.
- Goldstein D, Oz M, editors. Cardiac assist devices. Wiley-Blackwell; 2000 Apr 7.

PAEDIATRIC PERFUSION TECHNOLOGY

Course: Core

Credits: 4 Credits

No of hours: 60 Hours

Course Objective:

- To learn about pediatric perfusion techniques in CPB
- To learn about various cardiac assist device used for infants and children.

Course Content:

Unit I: Paediatric Cardiopulmonary Bypass **10 hours**

- Historical aspects
- Difference between infants and adults
- Physiology of cardio pulmonary bypass
- Blood Gas Management
- Initiation of CPB
- Weaning of CPB
- Modified Ultra Filtration

Unit II: Paediatric Extra corporeal circuit **10 hours**

- Prime
- Oxygenators
- Pump
- Tubing
- Cardiotomy circuit
- Cannulas

Unit III: Myocardial Protection for Neonates and infants **5 hours**

- Methods
- Hypothermia

- Cardioplegic drugs

Unit IV: Brain Injury and Neuroprotective Strategies in Paediatric Cardiac Surgery

5 hours

- Neurological injury
- Hypothermic Injury to the brain
- Cerebral Blood Flow

Unit V: Extracorporeal Membrane Oxygenation in Infants and Children

10 hours

- Applications of ECMO
- Pathophysiology
- Patient selection
- Techniques and management
- Components of the ECMO Circuit.
- Weaning
- Complications and its management.

Unit VI: Ventricular Assist Devices for Infants and Children: State of the Art and Future

10 hours

- Indication
- Pathophysiology
- Types and Applications
- complications

Unit VII: Systemic Inflammatory Response Syndrome

10 hours

- Renal response
- Pulmonary response
- Endocrine response

Course outcome:

- To state about ECMO and VAD used for paediatric patients
- To state about Myocardial Protection of paediatric patients undergoing Cardiopulmonary Bypass

Recommended Books:

- Gravlee GP. Cardiopulmonary bypass principles and practice.
Lippincott Williams & Wilkins, 2020 Jun 2.
- Kay P, Munsch CM. Techniques in Extracorporeal Circulation 4E.
CRC Press; 2004 Apr 30.

CLINICAL APPLICATION OF PERFUSION TECHNOLOGY –I

Course: Core

Credits: 8 Credits

No of hours: 120 Hours

Course Objective:

- This course provides knowledge about the practical aspects of Cardiopulmonary Bypass.

Core Content:

Unit 1: Cardiopulmonary Bypass Equipment's:

60 Hours

- Chest X-ray
- ECG
- Echo
- Coronary Angiography
- Nuclear Cardiology, ACT Machine
- Heart lung machine
- Oxygenator
- Heater cooler unit
- Blood Cardioplegia device
- ACT Machine
- Setting up of ECG machine, Pressure transducer, Syringe and peristaltic pumps, Anaesthesia Monitors, Pulse oximeters, Temperature probes and Thermoregulatory monitoring, Defibrillators, Fibrillators, ACT (Activated ClottingTime)
- Design & function of Roller pumps
- Arterial filters
- Cardiotomy filters
- Gas line filters
- Leucocyte filters Types of tubing's used in CPB Heat Exchangers
- Level detector

- Bubble detector
- Pressure sensor
- Pump slave
- Hand cranks
- Pulsatile Perfusion
- Introduction to IABP Indications, steps of insertion and removal, complications and contraindications

Unit II: Cardiopulmonary Bypass Monitoring:

60 Hours

- Laboratory investigations
- Arterial blood gas
- Venous blood gas
- Renal function test
- Liver function test
- Coagulation profile
- Hemoglobin
- Hematocrit
- Platelet
- RBC
- WBC
- Electrolytes

Course Outcome:

- Learned about the various cases observed during clinical postings in operation theatre and intensive care unit and their management with regard to the various equipment used.

Recommended Books:

- Gravlee GP. Cardiopulmonary bypass principles and practice. Lippincott Williams & Wilkins, 2020 Jun 2.

SEMESTER VI
ADVANCED PERFUSION TECHNOLOGY

Course: Core

Credits: 4 Credits

No of hours: 60 Hours

Course Objective:

- To understand about deep hypothermic circulatory arrest in cardiopulmonary CPB.
- To understand about Thoracic Aortic surgeries and its application.
- To know about the recent advance in cardiac surgery.
- To know about the complications, safety and accidents in Cardiopulmonary bypass and their management.

Core Content:

Unit 1: Perfusion techniques for pediatric cardiac surgery **5 hours**

- Conduct and monitoring of CPB
- Maintenance of CPB
- Weaning of CPB

Unit II: Extracorporeal Membrane Oxygenation (ECMO) **10 hours**

- Introduction to ECMO
- Components of ECMO circuits
- Indications and contraindications to ECMO
- Types of ECMO
- Complication of ECMO
- Perfusion for non-cardiac surgery, invasive cardiology and outside the operation suite.

Unit III: Perfusion as a method of Cardiopulmonary Bypass including femoral bypass

5 hours

- Cannulation of the femoral vessels for cardiopulmonary bypass
- Management and Complication of femoral Cannulation

Unit IV: Complications and safety during CPB

5 hours

- Cardiopulmonary Bypass safety
- Organizational aspects of accidents and its cause
- Perfusion management of bypass accidents.

Unit V: Minimally Invasive Cardiac Surgery and the Perfusionist

5 hours

- Benefits of minimally invasive cardiac surgery
- Procedure
- Types of minimally invasive cardiac surgeries
- Perfusion Management of MICS
- Complications and management of MICS

Unit VI: Deep Hypothermic Circulatory Arrest (DHCA)

10 hours

- Steps Taken Before Going on DHCA
- Antegrade & Retrograde Cerebral Perfusion
- Alpha stat management
- Ph stat management
- Non hypothermic cardiac surgeries

Unit VII: Recent advances in Perfusion

5 hours

- Biocompatible coatings
- Minimal extracorporeal circulation
- XVIVO Perfusion System/EVLP
- Ex-Vivo Lung Perfusion

- Steen solution

Unit VIII: Perfusion for Thoracic Aortic Surgery

5 hours

- Surgical repair of thoracic aortic aneurysm and dissection
- Proximal Aortic Operations
- Hypothermic Circulatory Arrest and Cerebral Perfusion Adjunct
- Left sided Heart bypass and selective visceral perfusion
- Technical Details of Aortic Arch Repair Procedures

Unit IX: Experimental perfusion

5 hours

- In-VIVO lung Perfusion
- Langendroff vs working heart perfusion

Unit X: Role of Perfusionist in non-cardiac surgeries

5 hours

- Application in Lung Surgery
- Applications in Neurosurgery
- Applications in Liver surgery
- Applications in Urologic surgery
- Other applications
- Complications

Course Outcome:

- To state about deep hypothermic circulatory arrest in cardiopulmonary CPB.
- To state about Thoracic Aortic surgeries and its application.
- To know about the recent advance in cardiac surgery.
- To state about the complications, safety and accidents in Cardiopulmonary bypass and their management

Recommended Books:

- Gravlee GP. Cardiopulmonary bypass principles and practice. Lippincott Williams & Wilkins, 2020 Jun 2.
- Kay P, Munsch CM. Techniques in Extracorporeal Circulation 4E. CRC Press; 2004 Apr 30.
- Gaffney AM, Wildhirt SM, Griffin MJ, Annich GM, Radomski MW.

SPECIAL SITUATION IN CARDIAC SURGERY

Course: Core

Credits: 4 Credits

No of hours: 60 Hours

Course Objective:

- To learn special situations in cardiac surgery
- To understand about management of CPB in cyanotic patients
- To learn blood conservation techniques.
- To understand about blood material and hematological interactions during cardiac surgery

Core Content

Unit I: Management of CPB in Cyanotic patients

10 hours

- Blood Gas Management
- ABG
- VBG
- Calculation of circulating hematocrit
- Various priming options

Unit II: Blood-material interactions

10 hours

- Rheological effects of blood-material interactions in extracorporeal circulation
- Biocompatibility research on extracorporeal components
- Experimental studies in hemo- and bio incompatibility of artificial surfaces in cardiovascular surgery

Unit III: Hematological and tissue-related reactions

20 hours

- Material and circuit related bio incompatibility of cardiopulmonary bypass in cardiovascular surgery.
- Alterations of the hemostaseologic system under extracorporeal Conditions.
- The systemic inflammatory response and myocardial injury during extracorporeal circulation.
- Cytokine release regarding different perfusion systems and its effect on S100B protein levels
- Smart and blood air interface - a new concept to improve biocompatibility of extracorporeal circuits

Unit IV: Special considerations in Cardiopulmonary Bypass

20 hours

- Blood conservation in cardiac surgery
- Religious objection to blood transfusion
- Medical legal aspects of CPB
- Warm blood Cardioplegia and Normothermic CPB
- Chest Trauma and Emergency CPB
- Emergency Coronary Artery Bypass and CPB

Course Outcomes:

- To state special situations in cardiac surgery
- To know about management of CPB in cyanotic patients.
- To identify blood material and hematological interactions during cardiac surgery

Recommended Books:

- Kay P, Munsch CM. Techniques in Extracorporeal Circulation 4E.
CRC Press; 2004 Apr 30.
- Mongero LB, Beck JR, editors. On bypass: advanced perfusion techniques. Springer Science & Business Media; 2008 Feb 19.

CARDIAC LIFE SUPPORT

Course: Core

Credits: 4 Credits

No of hours: 60 Hours

Course Objective:

- To learn about equipment with knowledge and skills in providing resuscitation to collapsed adult, child and infant in a safe, timely and effective manner

Core Content:

Unit I: Cardiac assist device in clinical settings **5 hours**

- Short term circulatory support
- CADs for extended use
- Pediatric pumps
- Clinical complications
- Drive line infections
- Pump thrombosis
- Gastro intestinal bleeding

Unit II: Mechanical circulatory support **5 hours**

- Intra-Aortic Balloon Pump Counter pulsation
- Axial flow pump
- Internal Ventricular Assist device
- Univentricular or biventricular devices

Unit III: Cardiac assist devices **10 hours**

- General aspects of mechanical support
- Extracorporeal devices
- Intracorporeal devices
- Future devices

Unit IV: Devices used to bridge to transplantation

5 hours

- Thoratec VAD
- Novacor LVAD
- Heart mate
- Totally artificial heart

Unit V: Non-blood contacting Cardiac Assisting Device

5 hours

- Counterpulsation direct cardiac compression sleeve
- Counterpulsation Extra-Aortic Balloon Pump
- Passive periventricular restraint

Unit VI: The Intravascular Oxygenator, IVOX®:

5 hours

Augmentation of Blood – Gas Transfer

Unit VII: Robotic cardiac surgery:

10 hours

- Cardio pulmonary bypass during port –access surgery and robotic surgery:
- endovascular catheter system,
- minimally invasive cardiac surgery
- directs vision
- Micro-incision and video assisted, and robotic operations.

Course Outcome:

- To state and identify Cardiac assist devices and Mechanical circulatory support for cardiac patients.
- To state about Robotic cardiac surgery.

Recommended Books:

- Gravlee GP, editor. Cardiopulmonary bypass: principles and practice. Lippincott Williams & Wilkins; 2008.
- Guyton RA, Mora CT, Finlayson DC, Rigatti RL, editors. Cardiopulmonary bypass: principles and techniques of extracorporeal circulation. Springer Science & Business Media; 2012 Dec 6.

CLINICAL APPLICATION OF PERFUSION TECHNOLOGY –II

Course: Core

Credits: 8 Credits

No of hours: 120 Hours

Course Objective:

- To have knowledge about the practical aspects of Cardiopulmonary Bypass.
- To observe and get knowledge about various equipment's and its application in cardiac surgery
- And to learn about setting up the heart lung machine during cardiopulmonary bypass and managing of patient on cardiopulmonary bypass

Core Content:

- Adult circuit
- Paediatric circuit
- Neonatal circuit
- Arterial cannulation- Aortic, femoral, iliac
- Venous cannulation- SVC, IVC, RA, femoral vein
- Cardioplegia cannulation- Antegrade, Retrograde, Osteal
- Assembling the circuit:
- Priming and Setting occlusion
- Initiation of CPB and Gas management.
- Venting of the Heart and Cardiomy Suction
- Cardioplegia dosage and management
- ABG and ACT management
- Adequacy of Perfusion Pre-CPB checklist Pre weaning off bypass checklist
- St Thomas solution
- Del Nido solution
- Custodiol HTK solution -Histidine-Tryptophan-Ketoglutarate
MPS myocardial protection system

- Cardioplegia reservoir
- Vasodilators- Sodium Nitroprusside, Nitroglycerine,
- Vasoconstrictors- Phenylephrine, Anti Arrhythmics- Amiodarone, Magnesium, Lignocaine Diuretic- Furosemide, Mannitol
- Anticoagulants- Heparin, Low molecular Weight heparin
- Protamine Steroids- Dexamethasone Sodium Bicarbonate
- Potassium Chloride Heparin and its alternatives- Bivalirudin, Argatroban, Adrenaline, Noradrenaline, Dopamine, Dobutamine, Milrinone Vasopressin Levosimendan
- Case scenarios of adult heart disease, congenital heart disease and thoracic vascular disease and lung diseases mentioned in the above units
- Assembling of CPB circuit Initiation of CPB Maintenance of CPB * Weaning of CPB Conventional ultrafiltration CUF * Modified Ultra filtration MUF
- Intra-Aortic Balloon Pump (IABP) in detail Deep Hypothermic Circulatory Arrest (DHCA) Antegrade & Retrograde Cerebral Perfusion

Course outcome:

- Learned about the various cases observed during clinical postings in operation theatre and intensive care unit and their management with regard to the various equipment used.

Recommended Books:

- Gravlee GP. Cardiopulmonary bypass principles and practice. Lippincott Williams & Wilkins, 2020 Jun 2.

SEMESTER VII & SEMESTER VIII (Internship)

Duration

- The internship will span 1 year
- This will include 8 hours of practice a day, totaling to 1500 hours for 1 year.
- 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 clinical 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 postings.
- The students are expected to work for minimum 6 hours per day and this may be more depending on the need and the healthcare setting.

Competency statements

- Maintains patient confidence and protects hospital operations by keeping information confidential.
- Demonstrates discipline by maintaining safe and clean working environment and by complying with procedures, rules, and regulations.
- Be able to practice as perfusionist independently
- Be able to understand and learn the preparation, operation and maintenance of heart lung machine, ventricular assist device, artificial heart, and other sophisticated instruments and equipment's as directed by Surgeons, healthcare physicians and aestheticians.
 - Experts of other life support devices and intra-aortic balloon pump.
- Develop a strong knowledge base in cardiac anatomy, physiology and pathophysiology as well as pharmacology, fetal and neonatal cardiac development and perfusion science.

- Develop the ability to handle stressful situation, pay great attention to detail, communicate effectively, and be willing to stay abreast of new developments in the profession.
- Operate the extra corporeal circulation equipment during any medical situation where it is necessary to support or replace the patient's cardiopulmonary/circulatory function and ensure the proper management of physiologic functions by monitoring the necessary variables.
- Monitor the blood flow and other vital signs during open heart surgery and are also responsible for administering intravenous fluid, blood products and aesthetic drugs.
- They are taught to demonstrate knowledge and practice of basic patient care and to coordinate with other members of the team.
- Protect and uphold the rights of the patient, Ethical and legal issues and responsibilities and to Maintain professional confidentiality.
- Demonstrate professional behavior with peers, patients, and caregivers.
- Demonstrates BLS and ACLS skills by obtaining proper training.