REGULATIONS AND CURRICULUM GOVERNING

B.Sc. PERFUSION TECHNOLOGY PROGRAM

Implemented in Academic Year 2015 - 16

Revised in 2020
Amended from 2020 up to 2024

Name of the Constituent Unit: Yenepoya School of Allied Health Sciences

RABBI ZIDNI 'ILMA

YENEPOYA
(DEEMED TO BE UNIVERSITY)

Deralakatte, Mangalore, Karnataka.

NOTIFICATION FROM THE UNIVERSITY

Sl. No.	ACM with date	BOM/BOS with date	Decisions/Approvals
1.	18th ACM/ 08.10.2014	-	Starting of B.Sc. Perfusion Technology from 2015 – 2016
2.	38th ACM/ 27.04.2020	49th BOM/ 30.04.2020	All the Undergraduate programs offered by the Faculty of Allied and Healthcare Professionals approved for the Credit Based Semester System from the Academic year 2020-21.
3.	61st ACM/ 13.02.2025	-	The amendment in the syllabus of the course "Pathology & Microbiology II" of the B.Sc. Technology Program was Approved.
4.	64th ACM/ 14.08.2025	-	Implementing Ability Enhancement Course "English and Communication" in all B.Sc. Technology Programs under the Faculty of Allied & Healthcare Professions was approved.

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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
PO9: 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 situations, 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. Medium of Instructions:

The medium of instruction and examination shall be English.

5. 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.

6. Definition of Key words:

6.1 Academic Year: Two consecutive (one odd + one even) semesters constitute one academic year.

6.2 Semester systems/Choice Based Credit System: The semester system accelerates the teaching/learning process. The credit base semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice base 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 credit and adopt an interdisciplinary approach to learning.

An academic year shall consist of two semesters:

Odd Semester 1st, 3rd, 5th& 7th	September/October to February/March
Even semester 2nd, 4th, 6th& 8th	March/April to August/September

6.3 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 these. The courses can be of the following types i.e. (Core, Ability Enhancement, Skill enhancement, Value added courses, Multidisciplinary Elective and internship.

6.4 Credit: 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**
1 Credit	1 Hour	1 Hour	2 Hours	3-5 Hours

- The credits assigned to the course is indicated as L:T:P format. For example, for a 4credit course format could be: 4:0:0 or 1:2:1 or 3:1:0 or 0:0:4etc.

6.4.1 Credit hours for different types of courses

6.5 Programme: An educational program leading to award of a degree, diploma or certificate.

The following types of courses/activities constitute the programmes of study. Each of them will require a specific number of hours of teaching/guidance and laboratory/studio/workshop activities, field-based learning/projects, internships, and community engagement and service

a. Lecture courses: Courses involving lectures relating to a field or discipline by an expert or qualified personnel in a field of learning, work/vocation, or professional practice.
b. Tutorial courses: Courses involving problem-solving and discussions relating to a field or discipline under the guidance of qualified personnel in a field of learning, work/vocation, or professional practice.
c. Practicum or Laboratory work: A course requiring students to participate in a project or practical or lab activity that applies previously learned/studied

principles/theory related to the chosen field of learning, work/vocation, or professional practice under the supervision of an expert or qualified individual in the field of learning, work/vocation or professional practice.

d. Seminar: A course requiring students to participate in structured discussion/conversation or debate focused on assigned tasks/readings, current or historical events, or shared experiences guided or led by an expert or qualified personnel in a field of learning, work/vocation, or professional practice.
e. Internship: A course requiring students to participate in a professional activity or work experience, or cooperative education activity with an entity external to the education institution, normally under the supervision of an expert of the given external entity. A key aspect of the internship is induction into actual work situations. Internships involve working with local industry, government or private organizations, business organizations, artists, crafts persons, and similar entities to provide opportunities for students to actively engage in on-site experiential learning.
f. Studio activities: Studio activities involve the engagement of students in creative or artistic activities. Every student is engaged in performing a creative activity to obtain a specific outcome. Studio-based activities involve visual- or aesthetic focused experiential work.

g. Field practice/projects: Courses requiring students to participate in field-based learning/projects generally under the supervision of an expert of the given external entity.
h. Community engagement and service: Courses requiring students to participate in field-based learning/projects generally under the supervision of an expert of the given external entity. The curricular component of 'community engagement and service' will involve activities that would expose students to the socio-economic issues in society so that the theoretical learning can be supplemented by actual life experiences to generate solutions to real-life problems.

Experiential learning activities: Field project work / Day out learning activities etc. are considered as experiential activities

6.6 Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.

6.7 Credit Point: It is the product of grade point and number of credits for a course.

6.8 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, P, F,AB.

6.9 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.

6.10 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.

6.11 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.

6.12 Academic Bank Account: means an individual account with the Academic Bank of Credits opened and operated by a student, to which all academic credits earned by the student from course(s) of study are deposited, recognized, maintained, accumulated, transferred, validated or redeemed for the

purposes of the award of degree/diploma/certificates etc. by an awarding institution.

6.13 Academic Bank of Credits: means the provision for innovative and interchangeable curricular structures to enable creative combinations of Courses or Programmes in Disciplines of study leading to Degree or Diploma or Post Graduate Diploma or Certificate of Study offering multiple entry and multiple exit facilities, while removing rigid curricular boundaries and creating new possibilities of life-long learning.

6.14 Credit-accumulation means the facility created by Academic Bank of Credits in the Academic Bank Account opened by students in order to transfer and consolidate the credits earned by them by undergoing Courses;

6.15 Credit-redemption means the process of commuting the accrued credits in the Academic Bank Account of the students maintained in ABC for the purpose of fulfilling the credits requirements for the award of Degrees or Diplomas or Certificates or Course work for Ph.D. programme etc., by the registered degree-awarding Higher Educational Institutions.

6.16 Credit-transfer: Means the mechanism by which the Registered Higher Educational Institutions can receive or provide prescribed credits to individual Academic Bank Accounts in adherence to the University Grants Commission credit norms for the 'course/s' undertaken by students enrolled in any Registered Higher Education Institution within India

Structure of the Program

The Credit requirements to award degree in Perfusion Technology are as below

Sl. No	Category of Course	Credit
1	Core	126
2	Skill Enhancement Courses (SEC)	12
3	Ability Enhancement Courses (AEC)	08
4	Value Added Courses (VAC)	10
5	Multidisciplinary Elective (ME)	09
Total		**165**

7. Curricular components of the Bsc Perfusion Programme:

Courses in the programme may be the following types:

- Core course
- Skill enhancement course
- Ability enhancement course
- Value added course
- Multidisciplinary Elective
- Internship

7.1 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 the major disciple/subject having focus and degree will be awarded in this discipline. This core course provides opportunity for our students to pursue in depth study of a particular subject or

discipline hence; it is compulsorily studied by a student as a core requirement to complete the program of study in a said discipline.

7.2 Skill enhancement course: SEC courses are aimed at imparting practical skills, hands- on training, competencies etc. to enhance the skill-based knowledge and thus the employability of the students.

7.3**Ability Enhancement Courses (AEC):** These are the courses which aim to provide the students the competency in a modern Indian language (MIL) and in the English language with special emphasis on language and the communication skills. The courses aim at enabling the students to acquire and demonstrate the core linguistic skills, including critical reading and expository and academic skills, that helps students articulate their arguments and present their thinking clearly and coherently and recognize the importance of language as a mediator of knowledge and identity. The courses will also emphasize the development and enhancement of skills such as communication and the ability to participate/ conduct discussion and debate.

7.4 **Value Added Courses (VAC):** These are the courses relating to understanding India, environmental science/ education, Health and Wellness etc.

i. **Constitution of India:** The course aims at enabling the students at acquire and demonstrate the knowledge and understanding of contemporary India with its historical perspective, the basic framework of the goals and policies of National development, and the constitutional obligations with special emphasis on constitutional values and fundamental rights and duties

ii. **Environmental Studies:** The course aims to equip the students with the ability to apply the acquired knowledge, skills, attitudes and values required to take appropriate actions for mitigating the effects of environmental degradation, climate change and pollution, effective waste management, conservation of biological diversity, management of biological resources, forest and wildlife conservation,

and sustainable development and living.

iii. **Human Rights & Gender equity:** The Course emphasis understanding social justice issues and roles of human rights in promoting equitable society including international, national perspective, contemporary issues with this holistic coverage and relevance to today's world.

iv. **Medical Ethics:** The course deals with ethics involving fundamental and moral issues related to decision making while performing professional practice. It guides the students in systematic and rational way of working through dilemmas and determines the best course of action in their field of practice.

7.5 **Multidisciplinary Electives (ME):** These courses are intended to broaden the intellectual experience and form part of liberal arts and science education. Students are not allowed to choose or repeat courses already undergone at the higher secondary level (Twelfth class). The courses relating to any of the broad discipline given below will come under this category.

i. **Natural and Physical Sciences:** Students can choose basic courses from disciplines such as natural science, for example, Biology, Botany, Zoology, Biotechnology, Biochemistry, Chemistry, Physics, Biophysics, Astronomy and Astrophysics, Earth and Environmental sciences, etc.

ii. **Mathematics, Statistics and computer applications:** Courses under this category will facilitate the students to use and apply tools and techniques in their major and minor disciplines. The course may include training in programming software like python among others and application software like STATA, SPSS, TALLY, etc. Basic courses under this category will be helpful; for science and social science in data analysis and the application of quantitative tools.

iii. **Library, Information, and Media Sciences:** Courses from this category will help the students to understand the recent developments in information and

media science (journalism, Mass Media, and Communication)

iv. **Commerce and Management:** Courses include business management, accountancy, financial institutions, Fintech, etc.,

v. **Humanities and Social Sciences:** The courses relating to social sciences, for example, Anthropology, Communication and Media, Economics, History, Linguistics, Political science, Psychology, Social work, Sociology, etc. will enable students to understand the individuals and their social behavior, society and nation. Students be introduced to survey methodology and available large – scale databases for India. The courses under humanities include for example, Archeology, History, Comparative Literature, Arts and Creative Expressions, Creative writing and literature, language(s), philosophy etc., and interdisciplinary courses relating to humanities. The list of courses that can include interdisciplinary subjects such as cognitive science, environmental science, gender studies, global environment and health, international relations, political economy and development, sustainable development, Women's and gender studies, etc. will be useful to understand society.

The Multidisciplinary elective offered by Yenepoya (Deemed to be) University includes:

I. **First Aid and Basic Life Support (BLS):** This Course deals with training the students to be a first responder when there are medical or traumatic emergencies.

II. **Yoga:** The course develops a comprehensive understanding of yoga, including its history, various schools, practices, and their application in daily life, while also recognizing its potential for personal well-being, professional growth, and promoting positive health.

III. **Vermitechnology:** This category of course will help students to gain skills in using worms to convert decomposing food waste into nutrient-

rich fertilizer in simple, inexpensive and energy efficient way.

IV. **Positive Psychology:** The course will enable students to enrich themselves to thrive on the belief that people want to lead meaningful and fulfilling lives, cultivate what is best within them, and enhance their experiences of love, work, and play.

V. **National Service Scheme (NSS):** Students can choose NSS to understand the basic concept of NSS, to identify the needs and problems of the community in which they work and to gain skills in mobilizing community participation.

VI. **Lifestyle Management:** This course will help students to learn to achieve health goals through lifestyle and behavior adjustments by creating healthy habits as well as stress management.

VII. **Youth Red Cross:** The course deals with providing knowledge on Youth Red Cross volunteer ship and identifying the role of youth in humanitarian service. It also enables youth to promote national and international understanding by using international link of the movement.

VIII. **Jeevan Kaushal:** University grant commission identified 4 modules on life skills (Jeevan Kaushal), the skills that required through our life. Jeevan Kaushal courses such as Communication skills, Professional Skills, Leadership and Management skills and Universal Human Values which will help students in developing personal competencies that help to deal with challenges of life effectively thereby realizing his/her infinite potential as a human being.

- **Self – learning courses :** In accordance with the UGC (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2021, New Delhi, dated 25th

March 2021, and reference No.F.1-100/2016 (MOOCs/e-content), students are encouraged to augment their learning experience by opting for Massive Open Online Courses (MOOCs), Study Webs of Active Learning for Young Aspiring Minds (SWAYAM), and Coursera courses as part of the multidisciplinary elective.

- Yenepoya (Deemed to be University) will adhere to UGC regulations governing MOOCs/SWAYAM/Coursera courses, incorporating amendments as communicated by UGC over time. To facilitate the seamless completion of chosen courses, the department will appoint a designated course coordinator. The coordinator will guide and support students throughout the duration of the selected online courses.
- The evaluation process will adhere to predefined norms and parameters, which will be communicated in the course overview at the time of offering
- In Coursera, the assessment is multifaceted and include quizzes or tests at the conclusion of each module, assignments or projects demonstrating the practical application of concepts, active participation in discussion forums, and peer-reviewed assessments. The culmination of each course involves final quizzes or capstone projects tailored to the course's content. Upon successful completion, students receive an online certificate, Yenepoya (Deemed to be University) will integrate the acquired credits into the student's official marks sheet.
- In SWAYAM, Assessment will include formative continuous online assessments and end-of-course proctored exams, all of which are mandatory for successful completion by the student. Yenepoya (Deemed to be University) will integrate the marks or grade achieved by the student, conveyed by the Host Institution through the PI of the SWAYAM course, into the student's official marks sheet. These marks contribute to the final award of the degree conferred by the University.

7.5.1 Evaluation and Certification of Online Courses:

- 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 certificate obtained shall be submitted to the college office which will be communicated to the office of the Controller of Examinations of Yenepoya (Deemed to be University).
- The Yenepoya (Deemed to be) University will give the equivalent credit weightage to the students for the credits earned through online learning courses through MOOCS/Coursera as per the credit plan of the program.

7.5.2 Credit Mobility of Online Courses

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

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

• The elective course offered by the Yenepoya (Deemed to be University) shall be restricted to a maximum of 3 credits.

• A candidate shall compulsorily complete total 9 Credits of Multidisciplinary courses

• These courses shall be selected either from the Generic Electives offered by the Yenepoya (Deemed to be) university or from the SWAYAM/Coursera courses. A Candidate shall have freedom to choose the courses of once own choice and learn at their own pace but, require to complete minimum 3 credits before second semester, 6 credits before fourth semester and 9 credits before sixth semester end examination.

• A candidate who is desirous to add more credits shall be permitted to do so during the academic duration. Extra credit earned by a candidate shall be included in the marks card on submission of course completion certificate. However, it should not be considered for awarding the Grade in the UG programme.

7.6 Internship:

The internship provides the candidate with 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.

8. Structure of the Programme:

Sl. No	Category of Course	Credit
1	Core	126
2	Skill Enhancement Courses (SEC)	12
3	Ability Enhancement Courses (AEC)	08
4	Value Added Courses (VAC)	10
5	Multidisciplinary Elective (ME)	09
Total		**165**

Credit requirements to award degree in BSc Perfusion Technology is 159.

9. Attendance:

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.

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

The HOD/Programme 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.

10. Scheme of Assessment of course and Scheme of examination:

- Evaluation of a course shall be done based on continuous internal assessment (CIA) mode followed by Semester End University Examination (SEE) for each core, SEC, AEC & VAC. The evaluation of Multidisciplinary elective offered by Yenepoya (Deemed to be) University shall be done based on formative assessment.
- The components of CIA (Continuous Internal Assessment) may include sessional tests, Seminar, Assignment/ Social involvement and other activities as determined by the respective speciality.
- The marks for CIA shall be 50% and SEE shall be 50%.
- The minimum marks for CIA shall be 40% and SEE shall be 40% for a pass, but the minimum marks for pass per course shall be 50% CIA and SEE added together.
- There shall be examinations at the end of each semester ordinarily during February/March for odd semesters and during August/September for even semesters.
- The SEE duration shall be 60 minutes for 25 marks paper and 120 minutes for 50 marks paper.
- The various formative assessment method include assignments, reports, Quiz, Group discussion; Open Book Exam, Presentation, Minute paper etc.

10.1 Examination Structure:

The examination structure shall vary depending on the courses, however broadly divided as follows

Examination/Assessment	Core/ SEC/AEC(English)	AEC (Hindi& Kannada)/VAC
Continuous Internal Assessment	50 Marks	25 Marks
Semester End Examination	50 Marks	25 Marks
Total	100 Marks	50 Marks

Multidisciplinary Elective will be assessed through Continuous and Comprehensive Assessment throughout the semester (50 Marks)

10.2 Parameters for CIA

Internal Assessment Components	Core/ SEC/AEC(English)	AEC Hindi& Kannada)/VAC/
IA tests	20	10
Assignment	10	05
Continuous and Comprehensive Assessment	20	10
Total Marks	**50**	**25**

10.3 Assessment Methods

1	Quiz	6	Role Play
2	Group Discussion	7	Peer to Peer Assessment
3	Open Book Exam	8	Mind Mapping
4	Think-Pair-Share	9	Minute paper
5	Presentations	10	Case Study

10.4 Question Paper Pattern for Core course (Internal Assessment &Semester End Examination)

	SUBJECTS HAVING MAXIMUM MARKS = 50				**Duration**
Type of question	**Number of questions**	**To be Answered**	**Marks for each question**	**Total**	
LONG ESSAY TYPE	02	01	10	10	120 minutes
SHORT ESSAY TYPE	07	05	04	20	
SHORT ANSWERS	12	10	02	20	
			Total	**50**	

	MAXIMUM MARKS = 50				**Duration**
PART A					
Type of question	**Number of questions**	**To be Answered**	**Marks for each question**	**Total**	
LONG ESSAY TYPE	02	01	10	10	120 Minutes
SHORT ESSAY TYPE	02	01	05	05	
SHORT ANSWERS	06	05	2	10	

PART B					
LONG ESSAY TYPE	02	01	10	10	
SHORT ESSAY TYPE	02	01	05	05	
SHORT ANSWERS	06	05	2	10	
			Total	**50**	

10.5 Question Paper Pattern for Ability Enhancement Compulsory (AEC) Course

	MAXIMUM MARKS = 25				**Duration**
Type of question	**Number of questions**	**To be Answered**	**Marks for each question**	**Total**	
ESSAY	05	03	05	15	60 minutes
SHORT ANSWERS	07	05	02	10	
			Total	**25**	

10.6 Question Paper Pattern for Value Added (VAC) Course

	SUBJECTS HAVING MAXIMUM MARKS = 25				Duration
Type of question	**Number of questions**	**To be Answered**	**Marks for each question**	**Total**	
ESSAY	05	03	05	15	60 minutes
SHORT ANSWERS	07	05	02	10	
			Total	**25**	

10.7 Practical examination (SEC)

SI.NO	Components	Marks
1	Spotters	10
2	Case scenario/Stations	20
3	Viva Voice	20
Total Marks		50

10.8 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.

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.

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

13.2 Course code shall have prefix denoting semester number followed by an alphabet of respective type of courses such as C = Core, AEC= Ability Enhancement course, ME=Multidisciplinary Elective, SE= Skill Enhancement followed by numbers denoting number of courses taught-

1st SEM: AH01PT1CC1, AH01PT1CC2, AH01PT1CC3, AH01PT1SE1, AH01PT1AE1 etc.

11 Evaluation of Answer Scripts

11.1 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.

11.2 Practical examinations shall be jointly conducted and evaluated by one internal examiner and one external examiner.

12 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.

12.1 Letter Grades and Grade Points:

12.1.1 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.

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

Letter Grade	Marks	Grade Point
O (Outstanding)	90-100	10
A+ (Excellent)	80-89	9
A (Very Good)	70-79	8
B+ (Good)	60-69	7
B (Above Average)	55-59	6
P (Pass)	50-55	5
F (Fail)/ RA (Reappear)	Below 50	0
Ab (Absent)		0

*The Marks with 0.5 shall be rounded up to the next whole number.

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

12.2 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:

C1G1 + C2G2 + C3G3 + C4G4+C5G5

$$SGPA = \frac{}{C1 + C2 + C3 + C4 + C5}$$

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 an F or ABS grade in program 4, the SGPA shall then be computed as:

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

12.3 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:

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

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,..

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

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

1st Semester GPA = Total Grade Points / Total Credits = 136 / 16 = 8.5 2nd Semester GPA = 7 with respect to 18 Credits

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

12.5 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, AEC, SEC & VAC 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, AEC, SEC & VAC of first to fourth semester should be completed to be eligible for sixth semester End Semester Examination.

- Candidate should clear all Courses (Core, AEC, SEC, VAC & ME) of all the semester, to be eligible to start the one year of mandatory internship.

- A fail in any one Course will mean the candidate has to reappear for the exam in that Course only.

- A candidate who passes the semester examinations in parts is eligible for only CGPA and letter grade but not for award/medal from the University.

13 Internship

A candidate has to mandatorily complete 1 year (2 semesters) of internship. The total credits per semester is 20 and for two semesters it is 40.

Eligibility
A candidate should have passed in all the courses (Core, AECC and Electives) amounting to 119 number of credits before entering in to internship.

13.1 Internship guidelines

Each semester of Internship shall be minimum of 20 credits. The credits are calculated based on 1 credit = 3 to 5 hours of practical training. There shall be an exit exam at the end of each semester.

13.2 Components of Exit Exam

SI.No.	Components	Marks
1	Spotters	30
2	Case scenario/Stations	30
3	Viva Voice	40
Total Marks		100

Exit Exam shall be conducted by the College and the marks shall be sent to the COE for needful.

13.2.1 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, i.e., depth of knowledge, logical reasoning, confidence &oral communication skills.
- OSCE/OSPE- shall have minimum of 3 stations.

14 Eligibility for the award of Degree

14.1 Certificate

19.1.1 On successful completion of all the courses (Core, AECC & Elective) of three Academic year comprising of Six semesters with total 119 credits and 1 year of internship (1440 hours) to be eligible for Bachelor of Science in Perfusion Technology

14.2 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.

14.3 Minimum for a pass:

14.3.1 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.

14.3.2 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).

14.3.3 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.

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

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

15 Re-Entry after Break of the study:

15.2Candidates admitted to a program abstaining for more than 3 months must seek readmission into the appropriate semester.

15.3The candidate shall follow the syllabus in vogue (currently approved/is being followed) for the program.

15.4All re-admissions of candidates are subject to the approval of the University.

16 Program Structure

Semester I

Sl. No	Category	Course Code	Course Name	Hours Per week			Credits
				L	T	P	
1	Core	AH01PT1CC1	Human Anatomy & Physiology-I	2	2	-	4
2	Core	AH01PT1CC2	Pathology & Microbiology- I	4	-	-	4
3	Core	AH01PT1CC3	Biochemistry	4	-	-	4
4	Core	AH01PT1CC4	Cardiac Anatomy& Physiology	3	1	-	4
5	AEC	AH01PT1AE1	English	3	-	-	3

6	AEC	AH01PT1AE2	Kannada	2	-	-	2
Total							21

Note: Of the total available 36 hours per week for teaching learning processes, 24 hours per week is dedicated to Core, SEC, AEC& VAC courses. Remaining Hours are available for ME, Co-Curricular and Extracurricular activities, Mentoring.

Semester II

Sl. No	Category	Course Code	Course Name	Hours Per week			Credits
				L	T	P	
1	Core	AH01PT2CC1	Human Anatomy & Physiology-II	2	2	-	4
2	Core	AH01PT2CC2	Pathology & Microbiology- II	4	-	-	4
3	Core	AH01PT2CC3	Introduction To Operation Theatre &Perfusion Technology	3	1	-	4
4	AEC	AH01PT2AE1	English	3	-	-	3
5	VAC	AH01PT2VA1	Constitution of India	2	-	-	2
6	ME	AH01PT2ME1	Multi Disciplinary Elective	3			3
Total							20

Note: Of the total available 36 hours per week for teaching learning processes, 28 hours per week is dedicated to Core and AECC courses. Remaining Hours are available for ME, Co-Curricular and Extracurricular activities, Mentoring.

Semester III

Sl. No	Category	Course Code	Course Name	Hours Per week			Credits
				L	T	P	
1	Core	AH01PT3CC1	Systemic Pathology	3	-	-	3
2	Core	AH01PT3CC2	Applied Microbiology	3	-	-	3
3	Core	AH01PT3CC3	General Pharmacology	4	-	-	4
4	Core	AH01PT3CC4	Basics of Medical Disorders	4	-	-	4
5	Core	AH01PT3CC5	Introduction to Perfusion Technology-I	4	-	-	4
6	VAC	AH01PT3VA1	Human Rights & Gender Equity	2			2
Total							20

Note: Of the total available 36 hours per week for teaching learning processes, 25 hours per week is dedicated to Core and AECC courses. Remaining Hours are available for ME, Co-Curricular and Extracurricular activities, Mentoring.

Semester IV

Sl. No	Category	Course Code	Course Name	Hours Per week			Credits
				L	T	P	
1	Core	AH01PT4CC1	Introduction to Perfusion Technology-I	4	-	-	4
2	Core	AH01PT4CC2	Medicine Relevant to Perfusion Technology	4	-	-	4

3	Core	AH01PT4CC3	Valvular Heart Disorder	4	-	-	4
4	SEC	AH01PT4SE1	Clinical Application of Perfusion Technology-I	-	-	8	4
5	VAC	AH01PT4VA1	Environmental Studies	2	-	-	2
6	ME	AH01PT4ME1	Multi Disciplinary Elective	3			3
Total							21

Note: Of the total available 36 hours per week for teaching learning processes, 27 hours per week is dedicated to Core and AECC courses. Remaining Hours are available for ME, Co-Curricular and Extracurricular activities, Mentoring.

Semester V

Sl. No	**Category**	**Course Code**	**Course Name**	**Hours Per week**			**Credits**
				L	T	P	
1	Core	AH01PT5CC1	Clinical Perfusion Technology	4	-	-	4
2	Core	AH01PT5CC2	Congenital Heart Disorder	4	-	-	4
3	Core	AH01PT5CC3	Applied Perfusion Technology	4	-	-	4
4	Core	AH01PT5CC4	Paediatric Perfusion Technology	4	-	-	4
5	SEC	AH01PT5SE1	Clinical Application of	-	-	8	4

			Perfusion Technology-II				
6	VAC	AH01PT5VA1	Medical Ethics	2	-	-	2
Total							22

Note: Of the total available 36 hours per week for teaching learning processes, 25 hours per week is dedicated to Core and AECC courses. Remaining Hours are available for ME, Co-Curricular and Extracurricular activities, Mentoring.

Semester VI

Sl. No	Category	Course Code	Course Name	Hours Per week			Credits
				L	T	P	
1	Core	AH01PT6CC1	Advanced Perfusion Technology	4	-	-	4
2	Core	AH01PT6CC2	Special Situation in Cardiac Surgery	4	-	-	4
3	Core	AH01PT6CC3	Cardiac Life Support	4	-	-	4
4	SEC	AH01PT6SE1	Clinical Application of Perfusion Technology-III	-	-	8	4
6	VAC	AH01PT6VA1	Biostatistics	2	-	-	2
6	ME	AH01PT6ME1	Multi Disciplinary Elective	3			3
Total							21

Note: Of the total available 36 hours per week for teaching learning processes, 26 hours per week is dedicated to Core and AEC courses. Remaining Hours are available for ME, Co-

Curricular and Extracurricular activities, Mentoring.

SEMESTER VII

Sl. No	Category	Course Code	Course Name	Hours Per day			Credits
				L	T	P	
1	Core	AH01PT7CC1	Internship I	-	-	7	1
Total							20

Semester VIII

Sl. No	Category	Course Code	Course Name	Hours Per day			Credits
				L	T	P	
1	Core	AH01PT8CC2	Internship II	-	-	7	1
Total							20

Award of Bachelor of Science in Perfusion Technology

Total Credit- 165 Credits

SL. No	Course Category	Credits
1	Core	126
2	AEC	08
3	VAC	10
4	SEC	12
5	ME	09

SEMESTER I

HUMAN ANATOMY AND PHYSIOLOGY

PART A- HUMAN ANATOMY

Course: Core

Credits: 04 **Number of hours: 60 hours**

- **Course Outcomes:**

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

  CO1: To identify and locate each of the body systems to apply anatomical knowledge to perform minor technical procedural skills.

  CO2: To know the normal disposition of the structures in the body while clinically examining a patient and while conducting clinical procedures.

  CO3: To know the anatomical basis of disease and injury

  CO4: To discuss the interrelationship of systems in maintaining homeostasis.

  CO5: To describe the structure of each body system

- **COURSE CONTENT:**

Unit	Hrs	a. Content	Must Know	Good to Know	Desirable to	Weightage	Type Of Questions
Unit 1	4hrs	Introduction: Human body as a whole 1.1 Definition of anatomy and its divisions 1.2Terms of location, positions, and planes 1.3 Cell and its organelles. 1.4Epithelium: definition, classification, describe with examples, function. 1.5 Glands: classification, describe serous & mucous glands with examples. 1.6 Basic tissues: classification with examples 1.7Demonstration: Histology of types of epithelium. Histology of serous, mucous & mixed salivary gland.	√			10%	SE & SA
Unit 2	5hrs	Locomotion and support 2.1Bone: 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.	√			15%	LE, SE, SA

Unit	Hrs	a. Content	Must Know	Good to Know	Desirable to	Weightage	Type Of Questions
		2.2 Joints: classification of joints with examples, synovial joint (in detail for radiology). 2.3Muscular system: classification of muscular tissue & histology, names of muscles of the body. 2.4 Demonstration: Bones & joints. Histology of compact bone (TS & LS). Demonstration of all muscles of the body. Histology of skeletal, smooth &cardiac muscle (TS & LS). Histology of the 3 types of cartilage. Demo of all bones showing parts, radiographs of normal.					
Unit 3	5hrs	Cardiovascular system 3.1Heart: size, location, chambers, exterior & interior, blood supply of heart 3.2 Systemic &pulmonary circulation, branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac	√			25%	LE, SE, SA

Unit	Hrs	a. Content	Must Know	Good to Know	Desirable to	Weightage	Type Of Questions
		artery, peripheral pulse, inferior vena cava, portal vein, Porto-systemic anastomosis, great saphenous vein, Dural venous sinuses. 3.3 Lymphatic system: cisterna chyli& thoracic duct, histology of lymphatic tissues, names of regional lymphatics, axillary and inguinal lymph nodes in brief. 3.4 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.					
Unit 4	10hrs	Gastro-intestinal system 4.1 Parts of GIT, oral cavity, lip, tongue, dentition, pharynx, oesophagus, stomach, small and large intestine,liver,gall bladder, pancreas. 4.2 Tonsil, salivary glands extrahepatic biliary apparatus,Waldeyer's ring	√			30%	LE, SE, SA

Unit	Hrs	a. Content	Must Know	Good to Know	Desirable to	Weightage	Type Of Questions
		4.3Demonstration of parts of gastro intestinal system. Normal radiographs of gastro intestinal system. Histology of gastro intestinal system.					
Unit 5	4hrs	Respiratory system 5.1 Parts of RS, nose, nasal cavity, larynx, trachea, lungs, broncho-pulmonary segments, histology of trachea, lung and pleura, names of paranasal air sinuses. 5.2 Demonstration of parts of respiratory System Normal radiographs of chest. - Histology of lung and trachea.	√			15%	LE, SE, SA
Unit 6	2hrs	Embryology 6.1Spermatogenesis & oogenesis. Ovulation, fertilization. Fetal circulation. Placenta, Demonstration of models.		√		5%	SE, SA

- **LE-** Long Essay**, SE-** Short Essay**, SA-** Short Answer

Recommended books:

1. PriyaRanganath, LeelavathyN,Basics in Human Anatomy for BSc Paramedical Courses,Revised and updated edition, The Health
2. Chaurasia BD. Human anatomy. CBS Publisher; 2004.
3. Vishram Singh, Textbook of Anatomy, Revised and updated edition, Elsevier
4. Waugh A, Grant A. , Ross &Wilson Anatomy and physiology in health and illness E-book. Elsevier Health Sciences; 2014 Jun 25.
5. Inderbir S. Textbook of human histology with color atlas. New Delhi: JaypeeBrothersMedical Publishers. 2006.

PART B- PHYSIOLOGY

- **Course Outcomes:**

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

CO1: To demonstrate the understanding of physiological structure of Renal system, endocrine system, Nervous system and special senses.

CO2: To broadly identify the clinical abnormalities of organs and its clinical physiological implications

- **COURSE CONTENT:**

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Questions
Unit 1	2hrs	**General Physiology** 1.1 Introduction to physiology 1.2 Homeostasis: Definition, Positive feedback, negative feedback. PH 1.3 Body Fluid Compartments	√	√		15%	SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Questions
Unit 2	5hrs	**Muscle Nerve physiology** 2.1.1Introduction, Classification and structure of muscle, sarcomere 2.2Neuromuscular junction, Transmission across neuromuscular junction. 2.3 Excitation contraction coupling. Mechanism of muscle contraction, rigor mortis.	√	√		20%	LE, SE, SA
Unit 3	7hrs	**Blood** 3.1 Introduction: composition and function of blood. 3.2 Blood Cells: types, Normal Count 3.3 Red blood cells: function. Erythropoiesis: Definition, Stages, Factors affecting 3.4 Hemoglobin: Function, concentration	√	√		25%	LE, SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Questions
		Physiological variation of RBC Count and Hb 3.5 White blood cells: different types, functions, normal count, differential count 3.6 Platelets: origin, normal count, functions. 3.7 Haemostasis: definition, steps, clotting factors, mechanism of clotting, disorders of clotting 3.8 Blood groups: ABO system, Rh system: Rh factor, Rh incompatibility. 3.9 Blood grouping & typing, cross matching. 3.10 Blood transfusion: indication, universal donor and recipient concept. Selection criteria of a blood donor, transfusion reactions.					

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Questions
		3.11 Anaemias: definition, Symptoms and signs (brief). 3.12 Blood indices: colour index, MCH, MCV, MCHC (def and Normal Values). 3.13 ESR and PCV: normal values, definition, determination (methods). 3.14Plasma proteins: types and concentration, functions of albumin, globulin, fibrinogen, prothrombin. 3.15 Blood volume: normal value, determination of blood volume					
Unit 4	8hrs	**Cardiovascular system** 4.1 Heart: physiological anatomy, nerve supply.	√	√		20%	LE, SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Questions
		4.2Properties of cardiac muscle PH 4.3Cardiac cycle: definition, systole, diastole, phases, JVP(brief) 4.4Cardiac output, stroke volume, EDV (only definitions). 4.5 Heart sounds, normal heart sounds, mechanism and features, areas of auscultation. 4.6 Blood pressure: definition, normal value, clinical measurement of blood pressure, hypotension, hypertension 4.7Heart rate: Physiological variations, regulation (brief), radial pulse 4.8Electrocardiogram (ECG): Definition, Normal ECG, Causes					

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Questions
		of ECG waves, Uses of ECG. 4.9Cardiac shock: Definition, Types (brief), Triple response.					
Unit 5	6hrs	**Respiratory system** 5.1Introduction: Functions of respiratory system, physiological anatomy of respiratory system, respiratory tract 5.2Respiratory organs: lungs, alveoli, respiratory membrane 5.3Mechanism of breathing: Inspiration and Expiration, muscles involved, Mechanism. 5.4Surfactant: Composition, Function, 5.5Transport of oxygen: forms of transport, Oxygen Hemoglobin Curve.	√	√		20%	LE, SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Questions
		5.6Lung volumes and capacities: Spirogram, Definitions and normal Volumes. 5.7Regulation of respiration: Nervous and chemical regulation, respiratory centre, Herring Breur reflexes. 5.8Hypoxia: Def, Classification, Description (in brief). 5.9 Cyanosis, Asphyxia, Dyspnea, Dysbarism, Artificial Respiration, Apnoea.(Definition Only)					

- **LE-** Long Essay**, SE-** Short Essay**, SA-** Short Answer

Recommended Books:

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

PATHOLOGY & MICROBIOLOGY-I

Course: Core

Credits: 4 **No of Hours: 60 Hours**

PART A- PATHOLOGY

Course Outcome:

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

CO1: Explain the blood cells structure, functions & its formation.

CO2: Enumerate the methods of estimating cell counts.

CO3: Demonstrate blood collection by various methods

- **COURSE CONTENT:**

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Type of questions
Unit 1	2 hrs	Introduction to Pathology		√		5%	SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Type of questions
Unit 2	12 hrs	Hematology 2.1. Normal constituents of Blood, their structure and functions. 2.2. Collection of Blood samples. 2.3. Various anticoagulants used in hematology. 2.4. Hemoglobin estimation, different methods and normal values. 2.5. RBC count. 2.6. WBC count. 2.7. Platelet count.	√			35%	LE,SE, SA
Unit 3	10 hrs	Blood Bank 3.1. Introduction to blood banking. 3.2. Blood group system: ABO & Rh system. 3.3. Methods of blood grouping: Forward & Reverse. 3.4. Donor selection criteria. 3.5. Collection and processing of blood for transfusion.	√			30%	LE,SE, SA
Unit 4	6 hrs	Clinical Pathology 4.1. Collection, transport, preservation and processing	√			30%	LE,SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Type of questions
		of various clinical specimens. 4.1.1 Urine. 4.1.2 CSF. 4.1.3 Stool. 4.1.4 Sputum. 4.1.5 Body fluids. 4.1.6 Urine examination-collection and preservation, Physical, chemical and microscopicexamination for abnormal constituents.					

- **LE-** Long Essay**, SE-** Short Essay**, SA-** Short Answer

- **Recommended Books**

1) Makroo RN. Blood Transfusion Reactions. In: Compendium of transfusion medicine.2nd ed. 2009;332-345
2) Dr.RamdasNayak ,text book of Hematology and Clinical pathogy.
3) Godkar PB, Godkar DP. Textbook of medical laboratory technology. Bhalani; 2003.

PART B- MICROBIOLOGY

- **Course Outcome:**

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

CO1: The general criteria for microbial classification, Types of culture medias and methods.

CO2: Identify key concepts of immunology.

CO3: Implement the common sterilization and disinfection methods.

CO4: Outline and practice general biomedical waste management.

- **COURSE CONTENT:**

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of questions
Unit 1	5Hrs	**Introduction** 1.1 Introduction & history of Microbiology 1.2 Classifications of microorganisms & structure of bacteria 1.3 Microscopy and types of microscope	✓			10%	LE, SE
Unit 2	3 Hrs	**Growth & Nutrition** 2.1 Nutrition, growth and multiplication of bacteria, Bacterial Growth Curve 2.2 Culture medias 2.3 Culture methods	✓			10%	LE, SE,SA
Unit 3	4 Hrs	**Sterilization & Disinfection** 3.1 Classification of Sterilization and Disinfection 3.2Sterilization:Differentmethods	✓			30%	LE, SE

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of questions
		of sterilization,Principles and use of equipment's of sterilization- Hot Air oven &Autoclave in detail 3.3 Disinfection: Commonly used chemical disinfectants and their uses					
Unit 4	9 Hrs	**Immunology** 4.1 Immunity-Classification and types 4.2 Antigen 4.3 Antibody 4.4 Antigen antibody reactions 4.5 Hypersensitivity reactions 4.6 Immunization schedule	✓			30%	LE, SE, SA
Unit 5	4 Hrs	**Infection** 5.1 Infection- Definition, types, sources and mode of transmission 5.2 Hospital acquired infections 5.3 Types of infectious diseases- outbreak, endemic, epidemic, pandemic	✓			10%	SE,SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of questions
Unit 6		**Applied Microbiology** 6.1 Biomedical Waste Management: Principles & Practices 6.2 Standard precautions 6.3 Hand hygiene technique and body fluids spill management 6.4 Needle stick injury management-1	✓			10%	SE,SA

- **LE-** Long Essay**, SE-** Short Essay**, SA-** Short Answer

Recommended Books:

1. Baveja CP. Textbook of microbiology. Arya Publications; 2005.
2. Ananthanarayan R. Ananthanarayan and Paniker's textbook of microbiology. Orient Blackswan; 2006.
3. Owen JA, Punt J, Stanford SA, Jones PP, KubyJ.Kuby immunology. Seventh edition, International edition. Basingstoke: Macmillan Higher Education; 2013

BIOCHEMISTRY

Course: Core

Credits: 4 **No of Hours: 60 Hours**

- **Course Outcomes:**

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

CO1: Have knowledge and understanding of procedures of specimen collection,reagent preparationof specimens, performing biochemical tests, interpreting results, and managing biomedical waste effectively.

CO2: Understand the basic procedures in specimen collection, reagent preparation, and testing in a clinical laboratory

CO3: Demonstrate the knowledge of properties of biomolecules and their function.

CO4: Have knowledge of the importance of nutrition in health and diseases.

COURSE CONTENT:

Unit	Hrs	Content	Must	Good to	Desirable to Know	Weightage	Types Of Questions
Unit 1	5hrs	**Introduction to Biochemistry and Clinical Laboratory** **1.1Specimen collection:** Pre analytical, variables, collection of blood, Urine, CSF, and other body fluids, anticoagulants and preservatives **1.2 Dilutions:** Dilution of solutions (Preparation of 0.1 N NaCl from 1 N NaCl), Preparation of percent solutions, Preparing working standard from stock standard, Specimen dilutions, Serial dilutions, and Reagent dilution **1.3 Special investigations:** Normal values, methods, and interpretation of	✓ ✓ ✓ ✓	✓		15%	LE, SA, SE

Unit	Hrs	Content	Must	Good to	Desirable to Know	Weightage	Types Of Questions
		biochemical parameters. Preparation of patients for special investigations, and interfering substances **1.4 Quality control:** Definition, types, IQAS and EQAS, Calculation of mean, standard deviation and percentage of coefficient variation **1.5 Safety measures, Conventional and SI units** **1.6 Bio Medical waste management**					
Unit 2	10hrs	**Carbohydrate and Lipid chemistry** **2.1** Introduction, Definition, Properties of carbohydrates, Classification with suitable examples. **2.1.1** Biomedical importance of carbohydrates. **2.2** Introduction, Definition, Functions, and Classification of Lipids. Definition and Classification of fatty acids, Essential fatty acids with examples.	✓ ✓ ✓			25%	LE, SE,

Unit	Hrs	Content	Must	Good to	Desirable to Know	Weightage	Types Of Questions
Unit 3	5hrs	**Protein chemistry and Plasma Proteins** **3.1** Introduction, Definition, and Classification of amino acids with examples. **3.1.1** Peptides: definition & biologically important peptides with examples **3.1.2** Introduction, Definition, and Classification of Proteins with examples **3.1.3** Functions of amino acids and Proteins **3.2** Introduction, types, functions, and biological reference range of plasma proteins. **3.2.1** Immunoglobulins	✓ ✓ ✓ ✓ ✓ ✓			15%	LE, SE, SA
Unit 4	5hrs	**Enzymes** **4.1** Introduction, Definition, classification with suitable examples, Active site of enzyme, Factors influencing enzyme activity,	✓ ✓			10%	LE,SE,SA

Unit	Hrs	Content	Must	Good to	Desirable to Know	Weightage	Types Of Questions
		4.1.1 Definition of Cofactor, Coenzyme, And isoenzymes with examples.					
Unit 5	10hrs	**Vitamins and Minerals** **5.1** Introduction, Definition, classification, Fat soluble and water-soluble vitamins: Sources, RDA, Biological functions and deficiency disorders. **5.2** Introduction, Definition and classification of macro and micro minerals with examples **5.2.1** Calcium, Phosphorous, iron, Sodium, Potassium: Sources, RDA, Reference ranges, Functions and Disorders of deficiency and excess	✓ ✓ ✓			20%	LE,SE
Unit 6	10hrs	**Nutrition** **6.1** Calorific values of carbohydrates, proteins, and fats **6.2** Nutritional importance of Carbohydrates, lipids, proteins, and Essential amino acids **6.3**SDA: Definition, values for major macronutrients, Significance of SDA **6.4** Basal metabolic rate (BMR): Definition, Reference range of BMR	✓ ✓ ✓ ✓			15%	LE.SA,SE

Unit	Hrs	Content	Must	Good to	Desirable to Know	Weightage	Types Of Questions
		in men and women, Factors affecting BMR **6.5** Dietary fibers: Definition, functions, importance and their daily requirements Balanced diet **6.6** Essential fatty acids: Definition, functions and deficiency manifestations **6.7** Define the classes of protein-energy malnutrition: marasmus and kwashiorkor.	✓ ✓				

Recommended Books

1) Vasudevan DM, Sreekumari S, Vaidyanathan K. Textbook of Biochemistry for medical students. Jaypee Brothers Medical Publishers; 2019 Sep 30.
2) Satyanarayana U and U Chakrapani. 2013. Biochemistry (version 4th ed). 4th ed. New Delhi: Elsevier Health Sciences APAC.

CARDIAC ANATOMY & PHYSIOLOGY

Course: Core

Credits: 4 **No of Hours: 60 Hours**

- **Course Outcomes:**

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

CO 1: State the position of the heart, the size and shape.

CO 2: Identify the chambers of the heart and the circulation system

CO 3: State the anatomy of heart valve and the coronary arteries

CO 4: State the properties of cardiac muscle tissue

CO 5: Identify the conduction system and the cardiac cycle

- **COURSE CONTENT:**

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of questions
Unit 1	5hrs	**Heart Terminology** 1.1 Aneurysm 1.2 Angina Pectoris 1.3 Atherosclerosis 1.4 Arrhythmias 1.5 Cardiomyopathy	✓			15%	LE,SE,SA
Unit 2	5 hrs	**Blood vessels** 2.1 Control of blood vessel diameter and blood supply 2.2 Internal respiration & cell nutrition			✓	5%	SE, SA
Unit 3	6 hrs	**Cardiac cycle** 3.1 Phases of systole, Phases of diastole, Event timings, Stoke volume or cardiac	✓			10%	LE, SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of questions
		output					
Unit 4	5 hrs	**Cardiac Anatomy** 4.1 Position and structure of the heart	✓			10%	LE, SE, SA
Unit 5	5 hrs	**Heart Valves** **5.1** Mitral valve, Tricuspid valve, Aortic valve & pulmonary valve	✓			10%	SE, SA
Unit 6	5 hrs	**Conduction system of the heart** 6.1 SA node, AV node, Bundle of His, Bundle branches & Purkinje Fibers	✓			5%	SE, SA
Unit 7	6 hrs	**Arterial supply of the heart** 7.1 Coronary arteries and its branches	✓			15%	LE, SE, SA
Unit 8	6 hrs	**Heart Chambers** 8.1 Right atrium, Right ventricle, Left atrium & Left ventricle	✓			5%	SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of questions
Unit 9	6 hrs	**Aorta of the heart** 9.1 Parts and branches of the Aorta	✓			10%	LE, SE, SA
Unit 10	6 hrs	**Blood pressure**: 10.1 Systolic, Diastolic, Direct/indirect measurement, brachial artery measurement & Lower extremity BP		✓		10%	LE, SE, SA
Unit 11	5 hrs	**Circulation of the blood** 11.1 Pulmonary Circulation, Systemic or general circulation: Aorta and Portal Circulation	✓			10%	LE, SE, SA

LE= Long Essay, SE= Short Essay, SA= Short Answers

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 – PART - 1

Course: AEC

Semester: 1

Credits: 3 No of Hours: 45 Hours

- **Course Outcomes:**

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

CO1: Acquire the LSRW (Listening, Speaking, Reading, and Writing) skills. Through Cambridge Interchange Fifth Edition, students will develop real world communication skills- enhancing fluency in speaking, listening, reading and writing – wile mastering grammar, expanding vocabulary and improving pronunciation with supportive digital tools.

CO2: Learn to appreciate Literature.

CO3: Be aware of social responsibilities.

CO4 : Enhance the analytical skill

- **COURSE CONTENT:**

Unit	Hrs	Content	Must Know	Good to	Desirable to Know	Weightage	Types Of Questions
Unit I	10hrs	**UNIT 1: CAMBRIDGE: INTERCHANGE FIFTH EDITION** 1.1 Good Memories 1.2 Life in the City 1.3 Making Changes 1.4 Have you ever tried it? 1.5 Hit the Road. 1.6 Sure. I will do it. 1.7 What do you use this for? 1.8 Time to Celebrate.	√			23%	SA
Unit II	8hrs	**UNIT- II: PHONETICS** 2.1 Brief Introduction 2.2 Classification of Vowels, Diphthongs and Consonants 2.3 Pronouncing the words phonemically and transcribing them into Phonetics 2.4 IPA	√			18%	SA
Unit III	11hrs	**UNIT – III: Grammar and Written Communication**	√			24%	

Unit	Hrs	Content	Must Know	Good to	Desirable to Know	Weightage	Types Of Questions
		3.1 Parts of Speech 3.2 Verb Tenses 3.3 Articles 3.4 Capitalization and Punctuation 3.5 E-mail Drafts 3.6 Formal Letters 3.7 Essay Writing					SA
Unit IV	4hrs	**UNIT – IV : Prose** 4.1 Steev Jobs: Commencement Address 4.2 Mother Teresa's Award-Winning Speech	√			9%	LE, SE
Unit V	6hrs	**UNIT – V: Poetry** 5.1 The Road Not Taken: Robert Frost 5.2 The Man with the Wooden Leg: Catherine Mansfield 5.3 Our Casuarina Tree: Toru Dutt	√			13%	LE, SE

Unit	Hrs	Content	Must Know	Good to	Desirable to Know	Weightage	Types Of Questions
Unit VI	6hrs	**UNIT – VI: Short Stories** 6.1 Gift of the Magi: O' Henry 6.2 Kabuli Vala: Rabindranath Tagore 6.3 The Blue Umbrella: Ruskin Bond		√		13%	LE, SE

- **LE-** Long Essay**, SE-** Short Essay**, SA-** Short Answer

- **Recommended Books:**

1. Cambridge: Interchange Fifth Edition
2. Contemporary English Grammar Structures & Composition by David Green
3. English Grammar and Composition: Wren & Martin
4. English Grammar in Use by Raymond Murphy

KANNADA

Course: AEC

Credits: 2 **No of Hours: 30 Hours**

Course Outcome:

- Enable students to learn alphabet, words and simple sentences in Kannada.

- Enable students to enhance speaking and writing communicative skills in Kannada and learn technical words related to medical science

➢ **COURSE CONTENT:**

Unit I: Kannada Letters (vowels, Consonant)

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

Unit III:

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

LE= Long Essay, SE= Short Essay, SA= Short Answers

➢ **Recommended Books**

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

SEMESTER II

HUMAN ANATOMY & PHYSIOLOGY II

Course: Core

Credits: 4 **No of Hours: 60 Hours**

PART A- HUMAN ANATOMY

- **Course Outcomes:**

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

CO1. To identify and locate each of the body systems to apply anatomical knowledge to perform minor technical procedural skills.

CO2. To know the normal disposition of the structures in the body while clinically examining a patient and while conducting clinical procedures.

CO3. To know the anatomical basis of disease and injury

CO4. To discuss the interrelationship of systems in maintaining homeostasis.

CO5. To describe the structure of each body system

- **COURSE CONTENT:**

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	
Unit 1	5hrs	Urinary system 1.1 Kidney, ureter, urinary bladder, male and female urethra. 1.2 Demonstration of parts of urinary system. Histology of kidney, ureter, urinary bladder.	√			15%	LE, SE, SA
Unit 2	10hrs	Reproductive system 2.1Parts of male reproductive system, testis, vas deferens, epididymis, prostate 2.2 Parts of female reproductive system, uterus, fallopian tubes, ovary 2.3 Mammary gland: 2.4 Demonstration of section of male and female pelvis with organs in situ. Histology of male and female reproductive organs.	√			30%	LE, SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	
Unit 3	3hrs	Endocrine glands 3.1Endocrine glands: pituitary gland, thyroid gland, parathyroid gland, suprarenal gland 3.2 Demonstration of the glands. Histology of pituitary, thyroid, parathyroid, suprarenal glands.		√		15%	SE, SA
Unit 4	10hrs	Nervous system 4.1 Neuron, classification of nervous system, cerebrum,cerebellum,midbrain,pons, medullaoblongata,spinalcordwithspinalnerve,meninges, ventricles & cerebrospinal fluid, names of basal nuclei, blood supply of brain, cranial nerves. Sympathetic trunk& names of parasympathetic ganglia 4.2 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.	√			25%	LE, SE, SA
Unit 5	2hrs	Sensory organs 5.1 Skin: histology, appendages of skin. 5.2 Eye: parts of eye & lacrimal apparatus. Extra-ocular muscles & nerve supply. 5.3 Parts of ear: external, middle, and inner ear and contents. 5.4 Histology of thin and thick skin. Demonstration and histology of eyeball. Histology of cornea & retina.		√		15%	SE, SA

LE- Long Essay**, SE-** Short Essay**, SA-** Short Answer

- **Recommended Books**

1. Chaurasia BD. BD Chaurasia's Human Anatomy. CBS Publishers & Distributors PVt Ltd.; 2010.

2. SampathMadhyastha, Manipal Manual of Anatomy for Allied Health Sciences,New Delhi: CBS publishers and distributors.
3. Waugh A, Grant A. Ross & Wilson Anatomy and physiology in health and illness E-book. Elsevier Health Sciences; 2014 Jun 25.
4. Dilly PN. Essentials of Human Embryology. Postgraduate Medical Journal. 1984 Jun;60(704):447.
5. Inderbir S. Textbook of human histology with color atlas. New Delhi: Jaypee Brothers Medical Publishers. 2006.
6. PriyaRanganath, Leelavathy N, Basics in Human Anatomy for BSc Paramedical Courses, Revised and updated edition, The Health

PART B- PHYSIOLOGY

- **Course Outcomes:**

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

CO1: To demonstrate the understanding of physiological structure of Renal system, endocrine system, Nervous system and special senses.

CO2: To broadly identify the clinical abnormalities of organs and its clinical physiological implications

- **COURSE CONTENT:**

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Questions
Unit 1	5hrs	**Digestive System** 1.1 Introduction 1.2Physiological anatomy of gastro intestinal tract (All Structures in brief), functions of digestive system	√			15%	LE, SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Questions
		1.3Functions of Saliva 14Deglutition: definition, stages 1.5Stomach: functions 1.6Gastric secretion: composition, function, Phases of secretion 1.7Pancreas: Functions (exocrine), pancreatic juice: composition and regulation. Secretin and CCK-PZ 1.8Liver: Functions , Bile secretion, composition, function of bile; 1.9Bilirubin metabolism, types of bilirubin, Vandenberg reaction, Jaundice: types, significance. 1.10Gall bladder: Functions. 1.11Small intestine: functions, digestion					

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Questions
		and absorption, movements. (brief) 1.12Large intestine: functions, defecation reflex					
Unit 2	5 hrs	**Renal system** 2.1 Introduction: Functions of kidneys, composition of urine, nephron, cortical and juxtamedullary nephrons (comparison), 2.2 Juxta Glomerular Apparatus: structure and function. 2.3 Mechanism of urine formation 2.4 GFR: Definition, Normal Values, factors effecting GFR, Measurement (Creatine, Inulin Clearance). Tubular reabsorption, TMG, Tubular secretion (brief). 2.5Mechanism of urine concentration:	√	√		15%	LE, SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Questions
		Counter-current mechanisms, Role of ADH 2.6 Micturition, innervation of bladder, cystometrogram.					
Unit 3	2 hrs	**Skin and Body temperature** 3.1Structure and function of Skin 3.2 Body Temperature: physiological variation. 3.3 Regulatory mechanisms: Mechanisms Activated by Heat/Cold 3.4 Role of hypothalamus, and fever.	√	√		10%	SE
Unit 4	5 hrs	**Endocrine System** 4.1 Introduction: Definition, classification of endocrine glands & their hormones.		√		15%	LE, SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Questions
		4.2 Hypothalamo-pitiutary Axis 4.3 Pituitary hormones: anterior and posterior pituitary hormones, Functions of Growth hormone, 4.4 Thyroid gland: Thyroid Hormones: physiological function, regulation of secretion, disorders: hypo and hyper secretion of hormone. 4.5Adrenal cortex: functions of Cortisol and Aldosterone 4.6 Adrenal medulla: functions of Adrenalline and Noradrenalline . 4.7Pancreas (Endocrine): Hormones of pancreas. 4.8Insulin: functions, regulation of blood					

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Questions
		glucose level, Diabetes mellitus 4.9 Regulation of Calcium Metabolism: Hormones involved, actions of PTH, Calcitonin, Vit D3					
Unit 5	5 hrs	**Reproductive system** 5.1 Introduction, Function of reproductive system, Changes during puberty. 5.2 Male reproductive system: functions of testes Spermatogenesis: Definition, site, stages, factors influencing, Endocrine functions of testes. 5.3 Androgens: testosterone functions. 5.4 Female reproductive system	√	√		15%	LE, SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Questions
		5.5Menstrual cycle: Definition, changes, ovulation 5.6 Functions of progestorene and estrogen 5.7 Physiological changes during pregnancy, Lactation(brief), milk ejection reflex					
Unit 6	3 hrs	**Special senses** 6.1 Vision: Functions of different parts(brief) 6.2 Optic Pathway, Dark Adaptation, Colour vision. 6.3Hearing: Function of Middle Ear, Functions of inner ear, mechanism of hearing (brief). 6.4Chemical Senses: Taste: types, receptor, Smell: physiology, receptors.	√	√		15%	SE, SA
Unit 7	7 hrs	**Nervous system**	√	√		15%	LE, SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Questions
		7.1 Introduction: Parts of CNS and PNS, Functions of nervous system 7.2Neuron: definition ,structure 7.3 Nerve Fibre: classification, conduction of impulses continuous and saltatory. 7.4Synapse: Definition, structure, types, properties (brief). Receptors: definition, classification, properties (brief). 7.5Reflex : Definition, Reflex Arc, Examples. 7.6Spinal cord nerve tracts: Diagram and Functions: Lateral Spino Thalamic Tract, Dorsal Column, Pyramidal Tract.					

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Questions
		7.7Spinal cord nerve tracts: Diagram and Functions: Lateral Spino Thalamic Tract, Dorsal Column, Pyramidal Tract. 7.8Cerebro Spinal Fluid (CSF): site of formation, circulation (brief), functions. 7.9Autonomic Nervous System: Sympathetic and parasympathetic distribution and functions (brief).					

LE- Long Essay**, SE-** Short Essay**, SA-** Short Answer

- **Recommended Books**

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

PATHOLOGY & MICROBIOLOGY-II

Course: Core

Credits: 4 **No of Hours: 60 Hours**

PART A- PATHOLOGY

- **Course objectives:**

CO1: To study fundamental aspects of different groups of microorganisms and their importance.

CO2: To compute medically important infective organisms and their diagnosis.

CO3: To enumerate the common infections of bacteria, virus, parasite and fungi.

CO4: To understand fundamental analytical principles and process used in histopathology

- **COURSE CONTENT:**

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Type of questions
Unit 1	12 hrs	Histopathology 1.1 Introduction to histopathology 1.2. Grossing technique 1.3. Tissue processing (Fixation, Dehydration, Clearing & Impregnation) 1.4. Embedding technique 1.5. Section cutting 1.6. H&E staining	√			30%	LE,SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Type of questions
Unit 2	6 hrs	Cytology 2.1. Introduction to cytology. 2.2 FNAC 2.3. PAP stain.	√			25%	SE, SA
Unit 3	12 hrs	General Pathology 3.1. Cell injury: Agents causing cell injury, cellular adaptations (hypertrophy, atrophy, hyperplasia, metaplasia) reversible and irreversible injury. 3.2. Inflammation: Cardinal signs of inflammation, acute and chronic inflammation. Laboratory tests in inflammation. 3.3. Hemodynamic □ Edema & shock □ Thromboembolism & Infarction. 3.4. Neoplasia: Definition of neoplasm, differences between benign and malignant tumors, Carcinogenesis. 3.5. Genetic disorders: Introduction to genetic disease and	√			45%	LE,SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Type of questions
		classification of geneticdisorder.					

- **Recommended Books:**

1. Histopathology techniques and its management –by Dr.Ramdas Nayak
2. RamnikSood ,Text book of Medical Laboratory Technology 6th Edition, Vol 1 & 2

PART B- MICROBIOLOGY

- **Course Outcomes:**

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

CO1: To outline fundamentals aspects of microbiology including origin, evolution of microorganisms, different groups of microorganisms and their importance, microscopy principles and applications, morphology, and structure.

CO2: To explain microbiological media, isolation, cultivation and enumeration methods of microorganisms, microbial growth characteristics, maintenance, and preservation of microbial cultures

CO3: To develop knowledge on basic immunological concepts.

CO4: To develop knowledge on basic immunological concepts.

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of questions
Unit 1	**11Hrs**	**Systematic Bacteriology** **1.1** Overview of common bacterial infections & bacterial virulence factors and Antimicrobial sensitivity test **1.2** Morphology, pathogenesis and laboratory diagnosis of medically important bacteria (Staphylococcus aureus & MRSA, Pneumococcus. Enterobacteriaceae- Salmonella (Enteric fever), E. coli, Vibrio cholerae, Mycobacterium tuberculosis **1.1** Biochemical reactions and identification of bacteria.	✓			**30%**	**LE, SE,SA**
Unit 2	**8Hrs**	**Virology** 2.1 Nutrition, growth and multiplication of bacteria, Bacterial Growth Curve	✓			**30%**	**LE, SE,SA**

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of questions
		2.2 Morphology, pathogenesis and laboratory diagnosis of (HIV-1, Hepatitis viruses- Hepatitis B & Hepatitis C virus, Rabies-1, Arbo viruses- Dengue virus					
Unit 3	**4 Hrs**	**Mycology** 3.1 Introduction to Mycology-1 3.2 Morphology, pathogenesis and laboratory diagnosis of (Dermatophytes, Candida, Cryptococcus)	✓			**20%**	**LE, SE,SA**
Unit 4	**7Hrs**	**Parasitology** 4.1 Introduction to Parasitology. 4.2 Morphology, Life cycle, pathogenesis and laboratory diagnosis of (E.histolytica, Plasmodium, Ascaris, T.solium, T.saginata, Ancylostoma)	✓			**20%**	**LE, SE,SA**

❖ **LE-** Long Essay**, SE-** Short Essay**, SA-** Short Answer

Recommended Books:

1. Baveja CP. Textbook of microbiology. Arya Publications; 2005.

Ananthanarayan R. Ananthanarayan and Paniker's textbook of microbiology. Orient Blackswan; 2006.

INTRODUCTION TO OPERATION THEATRE & PERFUSION TECHNOLOGY

Course: Core

Credits: 4 Credits **No of hours: 60 Hours**

- **Course Outcomes:**

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

CO 1: State the equipment's in operation theatre and intensive care units

CO 2: Know about the patient care in recovery room and OT

CO 3: Know about the sterility and waste management in OT & ICU

➢ Course Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of questions
Unit I	10hrs	**Introduction to the operating room environment & protocols:** 1.1 General protocols followed in the operating room 1.2 Hand washing 1.3 Unsterile- sub sterile- sterile methods followed in the OR environment 1.4 Handling of Disposables in the OR 1.5 Handling and maintenance of equipment in the OR 1.6 Protocols followed in CCU	✓			15%	LE,SE,SA
Unit 2	10 hrs	**Introduction to the various components of cardiopulmonary bypass** 2.1 Cardiopulmonary bypass machine - Cardiopulmonary Bypass Circuit Blood pump, Suckers and vents 2.2 Tubing's -Size, Type, Maximum flow and drainage.	✓			20%	LE, SE,SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of questions
		2.3 Cannulas-Arterial Cannula, Venous Cannula, Cardioplegia Cannula 2.4 Oxygenators-Characteristics of Ideal Oxygenator, Types, Blood flow path through Oxygenators 2.5 Cardiopulmonary Bypass Filters 2.6 Safety Devices					
Unit 3	6 hrs	**Introduction to the basics of CPB procedure** 3.1 Safety checks and setup of the circuit 3.2 Administration of priming fluids 3.3 Priming steps for CPB circuits 3.4 Occlusion setting 3.5 Anticoagulants for CPB 3.6 Weaning off	✓			10%	LE, SE, SA
Unit 4	5 hrs	**Basics of electricity & functioning of electro medical equipment** 4.1 Electric safety (Earthing) & care of apparatus 4.2 Electricity & electro medical equipment's & safe guard's Static electricity	✓			10%	SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of questions
Unit 5	5 hrs	**Disinfection – material & methods** 5.1 Physical Methods- Sunlight, Heat, Vibration, Radiation and Filtration 5.2 Chemical Methods-liquid and Gaseous 5.3 Physiochemical Methods	✓			10%	LE, SE, SA
Unit 6	5 hrs	**Intensive coronary unit & recovery room concepts** 6.1 Patient care, medical knowledge on equipment and severity of illness		✓		10%	SE, SA
Unit 7	5hrs	**Biomedical waste & its management** 7.1 Principles of waste management 7.2 Treatment of hazardous & clinical Wastes		✓		15%	SE, SA
Unit 8	10 hrs	**Patient monitoring** 8.1 Central line placement 8.2 Arterial line placement 8.3 Endotracheal intubation 8.4 Positioning of patient 8.5 Intercostal drainage			✓	5%	SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of questions
Unit 9	2 hrs	**Cardiac Team** 9.1 Cardiac surgery team, profession and terminology, scope of perfusion technology		✓		5%	SE

LE= Long Essay, SE= Short Essay, SA= Short Answers

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

ENGLISH AND COMMUNICATION – PART - II

Course: AEC

Semester : 1I

Credits: 3 **No of Hours: 45 Hours**

- **Course Outcomes:**

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

CO1: Acquire the LSRW (Listening, Speaking, Reading, and Writing) skills. Through Cambridge Interchange Fifth Edition, students will develop real world communication skills- enhancing fluency in speaking, listening, reading and writing – wile mastering grammar, expanding vocabulary and improving pronunciation with supportive digital tools.

CO2: Learn to appreciate Literature.

CO3: Be aware of social responsibilities.

CO4 : Enhance the analytical skill

- **COURSE CONTENT:**

Unit	Hrs	Content	Must Know	Good to	Desirable to Know	Weightage	Types Of Questions
Unit 1	13hrs	**UNIT – I: CAMBRIDGE INTERCHANGES FIFTH EDITION** 1.1 Only Time Will Tell 1.2 I Like Working with People 1.3 It's Really Worth Seeing 1.4 It's a Long Story 1.5 That's Entertainment 1.6 Now I Get it 1.7 I wouldn't have done that 1.8 Making Excuses	√			29%	SA
Unit 2	3hrs	**UNIT – II: Phonetics – IPA Transcription**	√			7%	SA
Unit 3	13hrs	**UNIT – III: Grammar and Written Communication** 3.1 Reported Speech 3.2 Modals 3.3 Clauses	√			29%	

Unit	Hrs	Content	Must Know	Good to	Desirable to Know	Weightage	Types Of Questions
		3.4 Gerunds 3.5 Active and Passive Voice 3.6 Synonyms and Antonyms 3.7 News Report Writing 3.8 Speech Writing 3.9 Dialogue Writing					SA
Unit 4	4hrs	**UNIT – IV: PROSE** 4.1 Chicago Address by Swami Vivekananda 4.2 I have a Dream : Martin Luther King	√			9%	LE, SE
Unit 5	6hrs	**UNIT – V: Poetry** 5.1 Still I Rise : Maya Angelou 5.2 BThe Raven : Edgar Allen Poe 5.3 Break, Break, Break : Alfred Lord Tennyson	√			13%	LE, SE

Unit	Hrs	Content	Must Know	Good to	Desirable to Know	Weightage	Types Of Questions
Unit 6	6hrs	**UNIT – VI : Short Stories** 6.1 The Luncheon : William Somerset Maugham 6.2 The Power of Prayer : APJ Abdul Kalam 6.3 The Necklace : Guy De Maupassant		√		13%	LE, SE

- **LE-** Long Essay**, SE-** Short Essay**, SA-** Short Answer

- **Recommended Books:**

5. Cambridge: Interchange Fifth Edition
6. Contemporary English Grammar Structures & Composition by David Green
7. English Grammar and Composition: Wren & Martin
8. English Grammar in Use by Raymond Murphy

Constitution of India

Course: VAC

Credits: 2 **No of Hours: 30 Hours**

- **Course Outcome:**

At the end of this course, students will gain knowledge on

CO1: This course is to keep the students abreast with the knowledge of the Constitution of India.

CO2: To make the students understand the importance of human rights as citizens of India.

- **COURSE CONTENT:**

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type Of Questions
Unit I	5hrs	**Indian Constitution** • Meaning and Importance of Constitution • The Constituent Assembly • The Preamble • Salient Features of Constitution	√			**10%**	SE, SA
Unit II	3hrs	**Fundamental Rights and Directive Principles** • Meaning and Differences between Fundamental Rights and Directive Principles • Fundamental Rights • Rights Information Act Meaning ,importance of RTI 2005	√			20%	LE, SE, SA
Unit III	4hrs	**Union Government** • The President of India-Election ,Powers and Position • Prime Minister and Council of Ministers • Parliament – Loksabha ,Rajyasabha-	√			15%	LE, SE, SA

		Organisations and Powers					
Unit IV	4hrs	**State Government** • The Governor • Chief Minister and Council of Ministers • State Legislature Vidhanasabha ,vidhanaParishad- Organisations and Powers	√			10%	SE, SA
Unit V	2hrs	**Federalism in India** • Meaning Federal and Unitary Features	√			10%	SE, SA
Unit VI	2hrs	**The Judiciary** • The Supreme Court- Organization ,Jurisdiction and Role • The High Court- Organization ,Jurisdiction and Role	√			10%	SE, SA
Unit VII	2hrs	**Electoral Process In India** • Election Commission – Organization ,Functions	√			10%	SE, SA
Unit VIII	2hrs	**Local Governments** • Rural and Urban- Organization ,Powers and Functions	√			5%	SE, SA

Unit IX	3hrs	**Human Rights** • Human Rights- Meaning • Universal Declaration of Human Rights • Remedies against Violation of Human Rights in India	√			5%	LE, SE, SA
Unit X	3hrs	**Special Constitutional Provisions** • 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	√			5%	SE, SA

LE= Long Essay, SE= Short Essay, SA= Short Answers

- **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 III

SYSTEMIC PATHOLOGY

Course: Core

Credits: 4 **No of Hours: 60 Hours**

- **Course Outcomes:**

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

CO1: To be able to define the medical terms, define and classify disease and understand the concepts of the disease.

CO2: To be able to describe the causes and mechanism of common disease that occur during the routine work and also changes seen in different individual and various organs and fluids

CO3: To be able to enumerate various laboratory tests on various organs and serous cavities. Example : body fluids

- **COURSE CONTENT:**

Unit	Hrs	Content	Must	Good to Know	Desirable	Weightage	Types of questions

Unit 1	20 hours	**Cardiovascular system** **1.1 Atherosclerosis:** Definition, risk factors, pathogenesis, morphology and complications **1.2Ischemic Heart Disease:** Myocardial infarction- definition, pathogenesis, pathogensis, morphology and complications **1.3 Hypertension:** Benign and malignant hypertension: pathogenesis, pathology and complications **1.4Anuerysms –** Definition, classification, pathology and complications **1.5 Heart Failure- Right** and left heart failure: causes, pathophysiology and morphology **1.6 Valvular**Heart Disease- causes, pathology and complication. complications of arterial valves 1.7 **Rheumatic heart disease and infectious endocarditi**s –definition, etiopathogenesis, morphologyandcomplications. 1.8 **Congenital Heart disease**- types and atrial septal defect: aneurysm – types and morphology, cardiomyopathies in brief 1.9 **Pericardial effusion** – causes, effects and diagnosis . Cardiomyopathy – definition , types, causes and significance , Infective endocarditis myocarditis	✓			40%	LE, SE, SA

Unit	Hrs	Content	Must	Good to Know	Desirable	Weightage	Types of questions
Unit 2	10 hours	**Hematology:** **2.1 Anemia:** definition, morphological types and diagnosis of anemia, brief concept about hemolyticanemia and polycythaemia **2.2 Leukocyte disorder:** briefly leukemia, leukocytosis, agranulocytosis etc **2.3 Bleeding disorder**: definition, classification, causes and effect of important types of bleeding disorders. Briefly various laboratory tests used to diagnose bleeding disorders	✓			13%	LE, SE

Unit	Hrs	Content	Must	Good to Know	Desirable	Weightage	Types of questions
Unit 3	15 hours	**Respiratory System** 3.1Atelectasis- 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	✓			26%	SE, SA

Unit	Hrs	Content	Must	Good to Know	Desirable	Weightage	Types of questions
Unit 4	15 hours	**Renal system** **4.1** Clinical manifestation of renal disease. Briefky causes, mechanism, effects and laboratory diagnosis of ARF & CRF. Briefly glomerulonephritis and pyelonephritis **4.2** End stage Renal Disease – definition, causes, effects and role of dialysis and renal transplantation and its management **4.3** Briefly concept about obstructive uropathy	✓			21%	LE, SE, SA

LE- Long Essay**, SE-** Short Essay**, SA-** Short Answer

Recommended Books

1) Dr.RamadasNayak, Text book of Pathology for Allied Health Sciences.
2) Comprehensive clinical Nephrology-6th edition- John feehaly

APPLIED MICROBIOLOGY

Course type: Core

Credits: 4 **Duration: 60 hours**

- **Course Outcomes:**

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

CO 1: To understand health care associated infections and antimicrobial resistance

CO 2: To acquire knowledge of the principles of sterilization and disinfection in hospital.

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Question
Unit 1	**30 Hrs**	**Healthcareassociatedinfection sandantimicrobialresistance** 1.1 **Infection &Multidrug resistant organisms** 1.1.1 Definitions of various types of infections, Source of infection, modes of transmission, Drug resistant pathogens- methicillin resistant Staphylococcus aureus 1.1.2 Clostridium defile, Vancomycin resistant enterococci **1.2 Hospital acquired infections** 1.2.1 Definitions, criteria for diagnosis in brief and causative agents – catheterrelatedbloodstreaminfections,ventilatorassociatedpneumonia,surgicalsite infections **1.3 Microbiologyofurinarytractinfections** 1.3.3Definition, Causative agents, Transmission,	✓ ✓	✓		**50%**	**LE,SE,SA**

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Question
		Predisposing factors,Pathogenesis, Lab diagnosis in detail significant bacteriuria, catheter related urinary tractinfections **1.4 Healthcare personnel in hospital set up** 1.4.1 Disease communicable to hospital personnel and preventive measures tocombat the spread of these infections by monitoring and control- tuberculosis, HIV, hepatitisB,hepatitis C, salmonella 1.4.2 Respiratory route (varicella-zoster, respiratory syncitial virus etc),Blood borne transmission (cytomegalovirus, Ebola virus etc), orofaecal route (hepatitis Aetc),directcontact **1.5 Microbiological surveillance** 1.5.1 Definitions,Methods& sampling techniques	✓ ✓				

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Question
		Desirableto know: Toknow thehospital floraand toassess theantimicrobial resistance		✓			
		1.6 Opportunistic infections 1.6.1 In brief- opportunistic pathogens seen in Immunocompromised patients- Candida, Cryptococcus. 1.6.2 Parasites,viruses&bacteriaas opportunisticpathogens	✓				
		1.7 Disinfection of wards, OT andlaboratory 1.7.1 Disinfection of instruments used in patient careclassification,differentmethods, advantages anddisadvantages of thevarious methods.Disinfection of the patient care unit. Infection control measures for ICU's		✓			
		1.8 Collection of specimen forsterility testing					

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Question
		1.8.1 Collection of specimenfrom outpatient units,inpatient units, minoroperation theatre and majoroperation theatre forsterility testing Airsampling culture plates,interpretation of colonyforming units based on airflow rate and sampling time **1.9 Methods employed for sterilitytesting & Interpretation ofresults of sterility testing.** 1.9.1 Rooms: gaseoussterilization,Equipments:classification of theinstruments andappropriate methods ofsterilization. Centralsupply department: thefour areas and thefloor plan forinstrument cleaning,high-level disinfectingand sterilizing areas.Interpretation ofsterility ofhemodialysiswater/distilled water/de ionized					

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Question
		water,based on growth of colonies in BHI Agarto be reported as XCFU/ unit					
Unit 2	30 Hrs	**2.1 Immunity** 2.1.1 Definition, Classification of methods, Principles of Dry heat, Moist heat,Autoclaving in detail- Preparation of materials for Autoclaving: packing of different types ofmaterials,loading, holding timeand unloading. 2.1.2 Hot Air Oven **2.2 Disinfection, antiseptics** 2.2.1 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. 2.2.2 Disinfectant efficacy testing **2.3 Sterilization – applied aspects**	✓ ✓ ✓	✓		**50%**	**LE,SE,SA**

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Question
		2.3.1 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. 2.3.2 Quality control in CSSD **2.4 Principles of autoclaving &quality control of sterilization.Infection & and Multidrug resistantorganisms** 2.4.1 Principles of autoclaving & and quality control ofsterilization. Definition,Classification of methods,Principles of Dry heat, moist heat 2.4.2 In detail autoclaving Preparation of materialsfor autoclaving:packing of different types ofmaterials, loading, holding time and unloading. Dryheat/Moist	✓	✓ ✓			

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of Question
		heat: Temperature recordingcharts interpretation, Color change indicatorsinterpretation 2.4.3 Definitions, criteria for diagnosis in brief and causative agents – catheter related blood streaminfections, ventilator associated pneumonia,surgical site infections **2.5 Bacteriological analysis of water** 2.5.1 Differentsamplingtechniquesforpotablewater,ROwater,dialysate. 2.5.2 Endotoxin testing					

LE- Long Essay**, SE-** Short Essay**, SA-** Short Answer

Recommended Books

1)Baveja CP. Textbook of microbiology. Arya Publications; 2005.

2)Ananthanarayan R. Ananthanarayan and Paniker's textbook of microbiology. Orient Blackswan; 2006.

INTRODUCTION TO PHARMACOLOGY

Course type: Core

Credits: 04 **Duration: 60 hours**

- **Course Outcomes:**

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

CO1: Know the basics of Pharmacology like, sources of drugs, routes of drug Administration and general principles

CO2: Describe the principles of pharmacokinetics and pharmacodynamics

CO3: To appreciate various adverse drug reactions

CO4: To have a basic knowledge of drugs affecting various body systems

- **Course Content:**

Unit	Hrs	Content	Must Know	Good to	Desirable to Know	Weightage	Types of Questions
Unit 1	8hrs	General Pharmacology 1.1 Introduction to Pharmacology 1.2 Routes of drug Administration 1.3Absorption & Distribution Metabolism Excretion 1.4 Pharmacodynamics - Mechanism of drug action-receptors 1.5 Factors modifying drug actions 1.6 Adverse drug reactions	√			15%	LE, SE, SA
Unit 2	6hrs	Autonomic Nervous System drugs 2.1 Sympathomimetics 2.2 Alpha blockers 2.3 Beta-blockers 2.4 Cholinomimetics 2.5 Anticholinergics 2.6 Skeletal muscle relaxants	√			15%	LE, SE, SA
Unit 3	11hrs	Central Nervous System 3.1 Opioid analgesics 3.2 Non-opioid analgesics (Prostaglandins) 3.3 NSAIDs 3.4 Ethyl alcohol 3.5 Sedative hypnotics	√			20%	LE, SE, SA

Unit	Hrs	Content	Must Know	Good to	Desirable to Know	Weightage	Types of Questions
		3.6 Antiepileptic drugs 3.7 Local anesthetics-1 3.8 Local anesthetics-2 3.9 General anesthetics- I 3.10 G A – II (PAM) 3.11 CNS stimulants					
Unit 4	9hrs	Cardio Vascular System Drugs 4.1 Diuretics 4.2 Vasodilators (CCB's, Drugs acting on RAS) 4.3 Antihypertensives 4.4 Antianginal drugs 4.5 Pharmacotherapy of shocks 4.6 Cardiac glycosides 4.7 Cardioplegic drugs 4.8 Antiarrhythmic drugs 4.9 Primary solutions	√			15%	LE, SE, SA
Unit 5	6hrs	Blood 5.1 Anaemia, erythropoietin 5.2 Anticoagulants 5.3 Anti platelet drugs 5.4 Fibrinolytics, 5.5 Lipid lowering drugs 5.6 Vit.D and calcium, folic acid, phosphate binders			√	5%	SE, SA

Unit	Hrs	Content	Must Know	Good to	Desirable to Know	Weightage	Types of Questions
Unit 6	1hrs	Endocrines 6.1 Corticosteroids			√	5%	SE, SA
Unit 7	9 hrs	Chemotherapy 7.1 General Principles of Chemotherapy 7.2 Sulfonamides 7.3 Penicillins 7.4 Cephalosporins 7.5 Broad spectrum antibiotics 7.6 Macrolides 7.7 Aminoglycosides 7.8 Chemotherapy of UTI 7.9 Drug Therapy of Tuberculosis	√			15%	LE, SE, SA
Unit 8	1.1 hrs	Miscellaneous topics 8.1 Antihistamines 8.2 Antiemetics 8.3 Drugs used in bronchial asthma 8.4 Drugs used in bronchial asthma-2 8.5 Cough 8.6 Inhalational gases and emergency drugs 8.7 I V fluids 8.8 Metabolic and electrolyte imbalance 8.9 Immunosuppressants		√		10%	SE, SA

Unit	Hrs	Content	Must Know	Good to	Desirable to Know	Weightage	Types of Questions
		8.10 Antiseptics and disinfectants					

LE- Long Essay**, SE-** Short Essay**, SA-** Short Answer

Recommended Books:

1. ShanBhag T V, Shenoy S&NayakV.Pharmacology For Nurses, Elesever; 3rd edition.2023.
2. Udaykumar P. Textbook of Pharmacology for Dental and Allied Sciences. Jaypee Brothers Publishers; 4th edition. 2017.

BASICS OF MEDICAL DISORDERS

Course: Core

Credits: 4 Credits **Number of hours: 60 hours**

- **Course Outcomes:**

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

CO 1: State the disorders related with different organs of the body

CO 2: State the pathophysiology and its treatment options for various diseases

- **COURSE CONTENT:**

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Types of Questions
Unit I	3hrs	**The Blood Vessels and Lymphatic** 1.1 Normal Structure 1.2 Arteriosclerosis 1.3 Vasculitis 1.4 Infectious Arteritis 1.5 Non-Infectious Arteritis	✓			5%	SA
Unit II	6hrs	**Coagulation system** 2.1 Platelet Disorders- Thrombocytopenia, Thrombophilia 2.2 Coagulation pathway disorders - Von will brands diseases 2.3 Hemophilia 2.4 DIC- Disseminated intravascular coagulation	✓			15%	LE, SE, SA

Unit III	4hrs	**Respiratory System** 3.1 Pneumonia-classification 3.2 Pleural effusion 3.3 Lung cancer	✓			20%	LE, SE, SA
Unit IV	15hrs	**Central Nervous system** 4.1 Automatic nervous system (Sympathetic & Parasympathetic system) 4.2 Stroke 4.3 Cerebral edema 4.4 Parkinson disease 4.5 Alzheimer disease 4.6 Meningitis 4.7 Encephalitis 4.8 Hemiplegia 4.9 Paraplegia 4.10 Cerebral Haemorrhage 4.11 Myasthenia gravis 4.12 Polio myelitis 4.13 Gullian barre Syndrome 4.14 Epilepsy	✓			15%	LE, SE, SA
Unit V	8hrs	**Gastro intestinal and Renal System** 5.1 Peptic ulcer 5.2 Acute gastroenteritis 5.3 Hepatitis 5.4 Hepatic failure 5.5 Alcoholic liver disease 5.6 Jaundice 5.7 Budd Chiari syndrome			✓	10%	LE, SE, SA
Unit VI	6hrs	**Endocrine System** 6.1 Hypothyroidism			✓	10%	LE, SE, SA

		6.2 Hyperthyroidism 6.3 Hyperkalemia 6.4 Hypocalcemia 6.5 Cushing's Syndrome 6.6 Addison's syndrome					
Unit VII	6 hrs	**Tumour's** 7.1 Tumors and Tumor-like Lesions, 7.2 Benign Tumors and Hematoma, 7.3 Intermediate Grade Tumors 7.4 Malignant Tumors 7.5 Cardiac tumors 7.6 CNS tumors 7.7 Stomach Carcinoma 7.8 Renal cell carcinoma 7.9 Hepatic Carcinoma	✓			15%	SE, SA
Unit VIII	10 hrs	**Others** 8.1 DM 8.2 Obesity 8.3 8.3Pregnancy 8.4 8.4Pediatric Patient (neonate/Infant) 8.5 Elderly patient 8.6 Bowel ischemia 8.7 Peptic ulcer disease 8.8 Drowning 8.9 Hanging 8.10 Poisoning and drug overdosing			✓	10%	SE, SA

LE= Long Essay, SE= Short Essay, SA= Short Answers

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

INTRODUCTION TO PERFUSION TECHNOLOGY-1

Course: Core

Credits: 4 Credits **No of hours: 60 Hours**

- **Course Outcomes:**

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

CO 1: State about the history, components, physiology of the cardiopulmonary bypass.

CO 2: Learn about different diagnostic techniques of heart

CO 3: Identify various monitoring done for patients and equipment used

- **COURSE CONTENT :**

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Types of Questions
Unit I	10hrs	**History and evolution of Cardiac Surgery & Cardiopulmonary Bypass.** 1.1 History of cardiac surgery and perfusion 1.2 Dr John Gibbons Heart Lung Machine 1.3 History of Gibbon, Lillehei, Carrel 1.4 Pre CPB surgery 1.5 Cross circulation (Gross Well) technique 1.6 Hypothermic &Non-hypothermic Cardiac Surgery	√			15%	LE, SE, SA

Unit II	15hrs	**Basic Principles of the following** 2.1 Extracorporeal Circulation 2.2 Extracorporeal gas exchange 2.3 Biocompatible Materials used in Perfusion 2.4 Aseptic techniques and Sterility in perfusion.	√			20%	LE, SE, SA
Unit III	15hrs	**Basics of diagnostic techniques** 3.1 Chest X-ray 3.2 Electrocardiogram (ECG) 3.3 Echocardiogram (Echo) 3.4 Coronary Angiography 3.5 Nuclear Cardiology 3.6 Laboratory investigations- Arterial blood gas, Venous blood Gas, Renal function test, Liver function test, Hemoglobin, Hematocrit, platelet, RBC, WBC, Electrolytes	√			20%	LE, SE, SA
Unit IV	10hrs	**Basic components used in CPB** 4.1 Heart lung machine 4.2 Oxygenator 4.3 Arterial Filters 4.4 Heater cooler unit 4.5 Blood Cardioplegia device 4.6 ACT Machine	√			15%	LE, SE, SA

Unit V	10hrs	**Basics of monitoring** 5.1 Setting up of ECG machine 5.2 Pressure transducer 5.3 Syringe and peristaltic pumps 5.4 Anesthesia Monitors 5.5 Pulse oximeters 5.6 Temperature probes and Thermo regulatory monitoring 5.7 Defibrillators and Fibrillators 5.8 ACT (Activated Clotting Time) 5.9 Hemodynamic monitoring 5.10 Hemostatic monitoring 5.11 Hematologic monitoring 5.12 Neurological monitoring (SSPE, EEG and cerebral function monitor)			√	20%	LE, SE, SA

LE= Long Essay, SE= Short Essay, SA= Short Answers

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.

HUMAN RIGHTS AND GENDER EQUITY

Course: VAC

Credits: 2 **No of Hours: 30 Hours**

- **Course Outcome:**

  At the end of this course, students will gain knowledge on,

  CO1: Basic Knowledge of Human Rights and its function and authorities in society and industry women's status, issues and gender equity.

- **COURSE CONTENT:**

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Type Of Questions
Unit I	5hrs	Human Rights 1.1 Human Rights –Meaning 1.2 Universal declaration of Human Rights	√			20 %	SE, SA
Unit II	5hrs	Human Rights Advocacy 2.1 Global Advocacy of Human Rights; Amnesty International and Other Organisations 2.2 People's Union for Civil Liberty (PUCL) 2.3 Human Rights Commission in India 2.4 Minority Commission in India 2.5 Remedies Against Violation of Human Rights in India	√			25%	SE, SA
Unit III	5hrs	Gender Equity Key Concepts- 3.1 Sex and Gender 3.2 Masculinity and Femininity 3.3 Patriarchy, Matriarchy 3.4 Gender roles and Attributes, Gender Division of Labour 3.5 Gender Bias 3.6 Gender Stereotypes	√			20%	SA

		3.7 Need for Gender Sensitization					
Unit IV	5hrs	Women's Status in India Important indicators-Sex Ratio,Education,Health, Nutrition, Maternal and Infant Mortality, Work Participation Rate, And Political Participation.	√			15%	SE, SA
Unit V	5hrs	Contemporary Women's Issues 5.1 Discrimination Against Girl Child 5.2 Violence Against Women 5.3 Problems of health and nutrition 5.4 Women's Education and Gender Bias in Education 5.5 Trafficking in women 5.6 Globalization and Impact on Women	√			15%	SE, SA
Unit VI	5hrs	State Initiatives for Gender Equity 6.1 Constitutional Rights of Women 6.2 Laws Pertaining to Women 6.3 The National and State Commissions for Women		√		05%	SE

- **LA**- Long Answer**, SE**- Short Essay**, SA**- Short Answer

Recommended Books:

1. Parvathy Appaiah, Human Rights, Gender Equity and Environmental Studies, Shivam Books publishers, 2012.
2. Parvathy Appaiah, Human Rights, Gender Equity and Environmental Studies, Jai Bharat Prakashan publishers, 2016.
3. Parvathy Appaiah, Human Rights, Gender Equity and Environmental Studies, Jai Bharat Prakashan publishers, 2018-19.
4. NirmalChiranjivi: Human Rights in India, New Delhi,OUP,2001.

SEMESTER IV

INTRODUCTION TO PERFUSION TECHNOLOGY-II

Course: Core

Credits: 4 Credits **No of hours: 45 Hours**

Course Objective:

CO 1: To learn the history, components, and physiology of the cardiopulmonary bypass in detail

CO 2: The course helps in understanding about Cardiopulmonary Bypass Techniques and Heart Lung Machine

Core Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of question
Unit I	5hrs	**Oxygenators** 1.1 History of Oxygenators 1.2 Types of Oxygenators: Disc and Screen Oxygenators , Bubble Oxygenators and Membrane Oxygenator 1.3 Design & function of various Oxygenators	√			20%	LE, SE, SA
Unit II	10hrs	**Pump** 2.1 History of Pumps 2.2 Characteristics of an Ideal Pump 2.3 Pulsatile versus non-pulsatile flow 2.4 Occlusive and non-occlusive pumps	√			20%	LE, SE, SA

		2.5 Types of Pumps: Roller pumps, Centrifugal pumps, Peristaltic pumps, Bellow pumps. Sigma motor pumps, Diaphram pumps, Ventricular pumps					
Unit III	5hrs	**Element of extracorporeal circulation** 3.1 Flow meters 3.2 Bubble trap 3.3 Temperature probe 3.4 Regulating devices	√			10%	SE, SA
Unit IV	5hrs	**Filters** 4.1 Arterial filters 4.2 Cardiotomy filters 4.3 Gas line filters 4.4 Leukocyte filters	√			10%	SE, SA
Unit V	5hrs	**Blood component & Blood banking** 5.1 Blood grouping and Cross Matching 5.2 Packed Red Blood Cell 5.3 Whole blood 5.4 Platelets 5.5 Fresh Frozen Plasma 5.6 Cryoprecipitate	√			15%	LE, SE, SA
Unit VI	10hrs	**Coagulation system** 6.1 Platelet Disorders-Thrombocytopenia, Thrombophilia 6.2 Coagulation pathway disorders-Von will brand disease 6.3 Hemophilia 6.4 DIC-Disseminated intravascular coagulation 6.5 Fibrinolytic system and its disorder		√		15%	LE, SE, SA
Unit VII	5hrs	**Connection of the vascular system with extra corporeal circulation**		√		10%	SE, SA

		7.1 Arterial and venous cannulae 7.2 Connecting tubes and connectors 7.3 Vents 7.4 Suckers 7.5 Cardioplegia delivery system 7.6 Venous drainage					

LE= Long Essay, SE= Short Essay, SA= Short Answers

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:

CO 1: To learn about basic concepts of common medical disorders

CO 2: To learn about pathophysiology of medical disorders of each system

CO 3: To understand various therapeutic options of medical disorders.

Course Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Types of Questions
Unit I	20 hrs	**Cardiovascular System** 1.1 Angina 1.2 Atherosclerosis 1.3 Cardiomyopathy 1.4 Myocarditis and pericarditis 1.5 Heart failure 1.6 Arrhythmias and fibrillation 1.7 Hypertension 1.8 Ischemic heart diseases 1.9 Rheumatic heart disease 1.10 Congenital heart disease 1.11 Aneurysms 1.12 Endocardial cushion effect 1.13 Shock-types 1.14 Cardiac Tamponade 1.15 Peripheral vascular disease 1.16 Acute limb ischemia 1.17 Chronic limb ischemia 1.18 Deep vein thrombosis	√			25%	LE, SE, SA
Unit II	10hrs	**Haematology** 2.1 Anaemia 2.2 Bleeding disorders: Laboratory tests used to diagnose bleeding disorders (in brief)	√			20%	LE, SE, SA
Unit III	5hrs	**Respiratory System** 3.1 Chronic obstructive airway diseases (COPD) 3.2 Concept of obstructive versus restrictive pulmonary disease	√			20%	LE, SE, SA

		3.3 PFT and its interpretation 3.4 Haemothorax 3.5 Pneumothorax 3.6 Pulmonary edema					
Unit IV	5hrs	**Mediastinum and disorders** 4.1 Types of thoracic incision and their indication 4.2 Mediastinal tumour's 4.3 Pericardial effusion 4.4 Hemopericardium	√			15%	LE, SE, SA
Unit V	5hrs	**Renal System** 5.1 ARF & CRF 5.2 End stage renal disease 5.3 Role of dialysis and renal transplantation in its management 5.4 Electrolyte disorders (calcium, sodium potassium magnesium-hypo/hyper) 5.5 Renal calculi 5.6 Haematuria 5.7 Obstructive uropathy 5.8 Urinary tract infection	√			20%	LE, SE, SA

LE= Long Essay, SE= Short Essay, SA= Short Answers

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:

CO 1: To understand about valvular heart disorders of the heart.

CO 2: To know about the causes and pathophysiology of stenosis and regurgitation of different valves of the heart.

CO 3: To understand about management and treatment of the disorder of valves

CO 4: To know in detail about the advanced surgical procedure for the treatment of valves.

Core Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of question
Unit I	5hrs	**Aortic stenosis** 1.1 Causes 1.2 Pathophysiology 1.3 Investigations 1.4 Treatment	√			10%	LE, SE, SA
Unit II	10hrs	**Aortic Regurgitation** 2.1 Causes 2.2 Pathophysiology 2.3 Investigations 2.4 Treatment	√			10%	LE, SE, SA

Unit III	5hrs	**Mitral Stenosis** 3.1 Causes 3.2 Pathophysiology 3.3 Investigations 3.4 Treatment	√			10%	LE, SE, SA
Unit IV	5 hrs	**Mitral Regurgitation** 4.1 Causes 4.2 Pathophysiology 4.3 Investigations 4.4 Treatment	√			10%	LE, SE, SA
Unit V	5hrs	**Pulmonary Stenosis** 5.1 Causes 5.2 Pathophysiology 5.3 Investigations 5.4 Treatment	√			10%	LE, SE, SA
Unit VI	5hrs	**Pulmonary Regurgitation** 6.1 Causes 6.2 Pathophysiology 6.3 Investigations 6.4 Treatment	√			10%	LE, SE, SA
Unit VII	10hrs	**Tricuspid Stenosis** 7.1 Causes 7.2 Pathophysiology 7.3 Investigations 7.4 Treatment	√			10%	LE, SE, SA
Unit VIII	5hrs	**Tricuspid Regurgitation** 8.1 Causes 8.2 Pathophysiology	√			10%	LE, SE, SA

		8.3 Investigations 8.4 Treatment					
Unit XI	5hrs	**Infective Endocarditis** 9.1 Causes 9.2 Pathophysiology 9.3 Investigations 9.4 Treatment	√			10%	LE, SE, SA
Unit X	5hrs	**Miscellaneous** 10.1 Mechanical Prosthetic Valves 10.2 Stented bio prosthetic valves 10.3 Bentall and mini Bentall procedure 10.4 The Ross procedure 10.5 Mitral Valvotomy 10.6 Aortic root replacement 10.7Aortic root enlargement		√		10%	LE, SE, SA

LE= Long Essay, SE= Short Essay, SA= Short Answers

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

CLINICAL APPLICATION OF PERFUSION TECHNOLOGY–I

Course: Core

Credits: 8 Credits **No of hours: 120 Hours**

Course Objective:

CO 1: This course provides basic knowledge about the practical aspects of Cardiopulmonary Bypass.

Core Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage

Unit I	60hrs	**1. Blood pumps-** Principle, Types, working mechanism, Components, Purpose & Setting up the blood pump **2. Oxygenator -** working principle, purpose, types & materials of Venous reservoir, Oxygenator & Heat exchanger 2.1. Principle of gas transfer 2.2. Blood gas management **3. Bubble trap & Arterial filter-** principle, purpose, features, Pore size, advantages & disadvantages **4. Cardioplegia delivering system-** purpose, working, features, mechanism & types of cardioplegia	√			50%
Unit II	40 hrs	**5. Cannulas –** Introduction, purpose, site of insertion , types , size & material used of Arterial cannula, Venous cannula, Cardioplegia cannula (antegrade & retrograde cannula) & Ostial cannula **6. Custom pack –** Introduction, purpose, types, size & material used of **Adult -** Av loop, Pump loop, Suction pack, Connectors & Reducers **7. Connectors-** purpose, types, size, characteristics & material used	√			30%

Unit III	20 hrs	**8. Safety devices-** Introduction, purpose, position, advantages & disadvantages of Level sensors, Bubble detector & Pressure monitor. **9. Intra-aortic balloon catheter-** Principle, Indication, Site & Method of insertion	√			20%

Course outcome:

- Learned basic knowledge about the practical aspects of Cardiopulmonary Bypass.

Recommended Books:

- Gravlee GP. Cardiopulmonary bypass principles and practice.

  Lippincott Williams & Wilkins, 2020 Jun 2.

ENVIRONMENTAL STUDIES

Course: VAC

Credits: 2 **No of hours: 30 hours**

Course Outcome:

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

CO1: Student will be able to learn about environment, factors affecting it, environmental ethics and its protection.

CO2: Student will be able to describe a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, ethical, political, health and safety, manufacturability and sustainability

CO3: Student will be able to critically analyze technical subject matter (Written/ oral) for scientific merit apply learnt environmental knowledge and understanding to solve technical or research problems in new contexts

COURSE CONTENT:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Question type
Unit 1	2 hrs	Multidisciplinary nature of Environmental Studies • Multidisciplinary nature of Environmental Studies Environment definition, Components of environment, Scope of environmental studies. Four spheres of earth (Hydrosphere, Atmosphere, Lithosphere and Biosphere) • Concept of sustainability and sustainable development (Brundtland Commission), pillars of sustainability; Sustainable Development Goals (SDGs). • International Agreements: Montreal protocol, Kyoto protocol, Convention on Biological Diversity (CBD)	✓			**5%**	SE, SA
Unit 2	6 hrs	Ecosystems • What is an ecosystem? Ecological units. Structure of	✓			10%	SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Question type
		an ecosystem; biotic and abiotic components, and function of an ecosystem; energy flow in the ecosystem; biogeochemical cycle, biological interactions, food chains, food webs, ecological pyramids and ecological succession. • Types of ecosystems: a. Terrestrial • Forest ecosystem – tropical evergreen, tropical deciduous, temperate evergreen, temperate deciduous and Taiga/Boreal • Grassland ecosystem – Savannas and Temperate grasslands (Steppes, Pampas, Prairies, Veldt and Downs. • Desert ecosystem – hot and dry, semi-arid, coastal and cold. Plant and animal adaptations. b. Aquatic ecosystems – Marine, Freshwater (lentic and lotic) and Estuarine; Pond as an ecosystem. • Ecosystem services					
Unit 3	7 hrs	Natural Resources	✓			15%	SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Question type
		• Classification of natural resources - Renewable and Non-renewable resources • Forest resources: Uses (timber, medicinal, food, economic importance, prevent soil erosion, control floods, religious and cultural practices) and overexploitation (Deforestation, timber extraction, mining, construction of dams). • Water resources: Uses (domestic, agricultural, industrial, electricity and transport) and over utilization of surface and ground water (drying of wells, lakes and ponds, extraction of groundwater, decrease in water table, deterioration of water quality and land subsidence). Floods, Drought, dams – benefits and problems, conflicts over water (state and international) • Land resources: Land as a resource; Land degradation, earthquake, landslides, soil erosion and desertification.					

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Question type
		• Energy resources: Renewable and non-renewable energy sources, growing energy needs, use of alternate energy sources, case studies (Kochi – first solar powered airport, Tamilnadu – windmills, Gujarat – tidal energy) • Conservation of forest, water, land and energy resources.					
Unit 4	7 hrs	Biodiversity and its conservation • Introduction; Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; 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.	✓			15%	SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Question type
		• Ecosystem and biodiversity services: ecological, economic, social, ethical, aesthetic and informational value. • Human wildlife conflicts in Indian – People and wildlife					
Unit 5	8 hrs	Environmental Pollution Definition • Cause, effects and control measures/management of: - a. Air pollution b. Water pollution c. Soil pollution d. Light pollution e. Noise pollution f. Thermal pollution g. Radiation pollution • Pollution case studies (London smog, Bhopal gas tragedy, Beijing/Delhi air pollution, Eutrophication, Minamata disease, Exxon Valdez oil spill, Love canal tragedy, Chernobyl disaster) • Climate change, Greenhouse effect, Global warming, Acid rain, Ozone layer depletion.	✓			15%	SE, SA

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Question type
		• Solid waste management: control measures of urban and industrial wastes. • Carbon footprint – How to calculate carbon footprint and ways to reduce your carbon footprint. • Human Population growth – impacts on environment • Environmental movements: Chipko movement, Bishnois of Rajasthan, Silent Valley, Narmada bachaoandolan					

SE- Short Essay, SA- Short Answer

Recommended Books

- Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt.
- Gadgil, M., &Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ. of California Press.
- Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge.
- Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
- Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.
- Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
- McCully, P. 1996. Rivers no more: the environmental effects of dams (pp. 29-64). Zed Books.
- McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.

- Odum, E.P., Odum, H.T. & Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.
- Pepper, I.L., Gerba, C.P. &Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
- Rao, M.N. &Datta, A.K. 1987. Waste Water Treatment. Oxford and IBH Publishing Co. Pvt. Ltd.
- Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. Environment. 8th edition. John Wiley & Sons.
- Rosencranz, A., Divan, S., & Noble, M. L. 2001. Environmental law and policy in India. Tripathi 1992.
- Sengupta, R. 2003. Ecology and economics: An approach to sustainable development. OUP.
- Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. Ecology, Environmental Science and Conservation. S. Chand Publishing, New Delhi.
- Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. Conservation Biology: Voices from the Tropics. John Wiley & Sons.
- Thapar, V. 1998. Land of the Tiger: A Natural History of the Indian Subcontinent.
- Warren, C. E. 1971. Biology and Water Pollution Control. WB Saunders.
- Wilson, E. O. 2006. The Creation: An appeal to save life on earth. New York: Norton.
- World Commission on Environment and Development. 1987. Our Common Future. Oxford University Press

SEMESTER V

CLINICAL PERFUSION TECHNOLOGY

Course: Core

Credits: 4 Credits **No of hours: 60 Hours**

Course Objective:

CO 1 To learn the history, components and physiology of the Cardiopulmonary bypass in detail.

CO 2 The course helps in understanding about Cardiopulmonary Bypass Techniques and Heart Lung Machine.

CO 3 To learn about clinical aspects of perfusion technology.

Core Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Types of Questions
Unit I	5hrs	**Pharmacokinetics and Pharmacodynamics of Cardiopulmonary Bypass** 1.1 Plasma concentration 1.2 Distribution of Drugs 1.3 Elimination of Drugs	√			05%	LE, SE, SA
Unit II	5hrs	**Drugs used in Cardiopulmonary Bypass** 2.1 Vasodilators–Sodium, Nitroprusside, Nitroglycerin 2.2 Vasoconstrictors–Phenylephrine 2.3 Anti-Arrhythmic–Amiodarone, Magnesium, Lignocaine 2.4 Diuretic–Furosemide, Mannitol 2.5 Anticoagulants 2.6 Inhalational agents (Sevoflurane, Isoflurane, Analgesics – Fentanyl, Morphine, Sedatives – Midazolam, Thiopentone, Antiplatelets, Inotropes – Adrenaline, Nor adrenaline, Dopamine, Dobutamine, Milrinone, Vasopressin)	√			05%	LE, SE, SA

Unit III	5hrs	**Cardiopulmonary Bypass Circuit** 3.1 Adult circuit 3.2 Pediatric circuit 3.3 Neonatal circuit	√			10%	LE, SE, SA
Unit IV	5hrs	**Conduct and monitoring of CPB** 4.1 Initiation and maintenance of CPB 4.2 Monitoring of CPB 4.3 Anticoagulation during CPB	√			10%	LE, SE, SA
Unit V	5hrs	**Termination of CPB** 5.1 Principle and Methodology 5.2 Weaning of CPB				10%	LE, SE, SA
Unit VI	5hrs	**Adequacy of perfusion** 6.1 General consideration 6.2 Specific aspects of perfusion 6.3 Monitoring factors which may affect its adequacy	√			05%	LE, SE, SA
Unit VII	5hrs	**Pulsatile perfusion** 7.1 Introduction 7.2 Theory and physiology of pulsatile flow 7.3 Hemodynamic effect of pulsatile perfusion 7.4 Metabolic effects of pulsatile perfusion 7.5 Hematological effects of pulsatile perfusion	√			05%	LE, SE, SA

Unit VIII	6hrs	**Cannulation techniques during cardiopulmonary bypass** 8.1 Arterial cannulation–Aortic, femoral, iliac 8.2 Venous cannulation–SVC, IVC, RA, femoral vein 8.3 Cardioplegia cannulation –Antegrade, Retrograde, Ostial	√			10%	LE, SE, SA
Unit XI	6hrs	**Myocardial Protection and Cardioplegia** 9.1 Pre-treatment of the myocardium 9.2 Hypothermia 9.3 Controlled reperfusion 9.4 Crystalloid Cardioplegia–St Thomas solution, Delnido solution, Custodial 9.5 HTK solution 9.6 Blood cardioplegia delivery device (BCD) – 9.7 Myocardial protection system (MPS), 9.8 Cardioplegia reservoir 9.9 Myocardial protection for specific clinical problems 9.10Complicationsofcardioplegia 9.11 Non Cardioplegic methods during cardiac surgery on CPB	√			10%	LE, SE, SA
Unit X	5hrs	**Oxygenation** 10.1 General consideration 10.2 Bubble & membrane oxygenator (Including assessment andcomparison of oxygenator function)		√		10%	LE, SE, SA
Unit XI	3hrs	**Heat Exchanger** 11.1 Principles, function of heat exchanger & their assessment		√		10%	LE, SE, SA

		11.2 Complications related to heat exchangers and their management					
Unit XII	5hrs	**Priming Fluids and Haemodilution** 12.1 Crystalloids, Ringer Lactate, Normal Saline, Plasmalyte A, Dextrose 12.2 Colloids– Heta starch, Albumin, FFP 12.3 Additional drugs used in them –Mannitol, Heparin, Bicarbonate		√		10%	LE, SE, SA

LE= Long Essay, SE= Short Essay, SA= Short Answers

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, DavisJ.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 MDD PhilLDScFRCP (Author), Bernard J.Gersh Mb Ch BDPhil FACC(Author)Publisher

CONGENITAL HEART DISORDERS

Course: Core

Credits: 4 Credits **No of hours: 60 Hours**

Course Objective:

CO 1 To understand about congenital disorders of the heart.

CO 2 To know about the causes and pathophysiology of congenital disorders

CO 3 To understand about management and treatment of the congenital disorder of the heart.

Core Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of question
Unit I	4 hrs	**Overview of human heart** 1.1 Anatomy 1.2 Physiology 1.3 Cardiac malposition 1.4 Situs abnormalities 1.5	√			5 %	SA
Unit II	3hrs	**Atrial Septal defect** 2.1 Prevalence 2.2 Types, 2.3 Pathology, 2.4 Signs & Symptoms 2.5 Investigations 2.6 Treatment	√			10%	LE, SE, SA

		2.7 Complications					
Unit III	4hrs	**Ventricular Septal defect:** 3.1 Prevalence, 3.2 Types, 3.3 Pathology, 3.4 Signs & Symptoms, 3.5 Investigations, 3.6 Treatment 3.7 Complications	√			10%	LE, SE, SA
Unit IV	4hrs	**Patent Ductus Arteriosus:** 4.1 Prevalence, 4.2 Types, 4.3 Pathology, 4.4 Signs & Symptoms, 4.5 Investigations, 4.6 Treatment 4.7 Complications	√			10%	LE, SE, SA
Unit V	4hrs	**Total Anomalous Pulmonary Venous Connection (TAPVC)** 5.1 Prevalence, 5.2 Types, 5.3 Pathology, 5.4 Signs & Symptoms, 5.5 Investigations, 5.6 Treatment & 5.5 complications	√			5 %	SE, SA

Unit VI	4hrs	**Partial Anomalous Pulmonary Venous Connection (PAPVC)** 6.1 Prevalence, 6.2 Types, 6.3 Pathology, 6.4 Signs & Symptoms, 6.5 Investigations, 6.6 Treatment 6.5 Complications	√			5 %	SE, SA
Unit VII	4hrs	**Tetralogy of Fallot (TOF)** 7.1 Prevalence, 7.2 Types, 7.3 Pathology, 7.4 Signs & Symptoms, 7.5 Investigations, 7.6 Treatment, 7.5 Complications	√			10%	LE, SE, SA
Unit VIII	4hrs	**Coarctation of Aorta** 8.1 Prevalence, 8.2 Types, 8.3 Pathology, 8.4 Signs & Symptoms, 8.5 Investigations, 8.6 Treatment 8.5 Complications	√			10%	LE, SE, SA
Unit XI	4hrs	**Transposition of the great arteries (TGA)** 9.1 Prevalence,	√			5 %	LE, SE, SA

		9.2 Types, 9.3 Pathology, 9.4 Signs & Symptoms, 9.5 Investigations, 9.6 Treatment & 9.5 Complication					
Unit X	4hrs	**Hypoplastic left heart syndrome** 10.1 Prevalence, 10.2 Types, 10.3 Pathology, 10.4 Signs &Symptoms, 10.5 Investigations, 10.6 Treatment 10.7 Complications	√			5 %	SE, SA
Unit XI	4hrs	**Pulmonary atresia with intact septum** 11.1 Prevalence, 11.2 Types, 11.3 Pathology, 11.4 Signs &Symptoms, 11.5 Investigations, 11.6 Treatment, 11.7 Complications		√		5%	LE, SE, SA
Unit XII	4hrs	**Anomalous left coronary artery from the pulmonary artery** 12.1. Prevalence, 12.2. Types, 12.3. Pathology,	√			5%	LE, SE, SA

		12.4. Signs & Symptoms, 12.5. Investigations, 12.6. Treatment& 12.7. Complications					
Unit XIII	4 hrs	**Neonatal Ebstein's Anomaly** 13.1. Prevalence, 13.2. Types, 13.3. Pathology, 13.4. Signs & Symptoms, 13.5. Investigations, 13.6. Treatment 13.7. Complications		√		5%	LE, SE, SA
Unit XIV	4 hrs	**Persistent Truncus Arteriosus** 14.1. Prevalence, 14.2. Types 14.3. Pathology, 14.4. Signs & Symptoms 14.5. Investigations, 14.6. Treatment 14.7. Complications	√			5%	LE, SE, SA
Unit XV	4hrs	**Miscellaneous Disorders** 15.1. BT (Blalock–Taussing) shunt 15.2. Glenn procedure 15.3. Fontan procedure 15.4. Rastelli procedure 15.5. Arterial switch operation		√		5%	LSE, SA

LE= Long Essay, SE= Short Essay, SA= Short Answers

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: JosephK. Perloff, ArianeJ. Marelli
- Congenital Heart Disease, Molecular Genetics, Principles of Diagnosis and treatment; editors, Muenke M. KruszkaP.S, Sable C A, Belmont J W

APPLIED PERFUSION TECHNOLOGY

Course: Core

Credits: 4 Credits **No of hours: 60 Hours**

Course Objective:

CO 1 To provides knowledge about the applied aspects of Cardiopulmonary Bypass

CO 2 To learn about pathophysiology of anticoagulation and blood cell Trauma of Cardiopulmonary Bypass

CO 3 To understand about Systemic Inflammatory Response Syndrome and its Effect in various organs

Core Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Types of Questions

Unit I	5hrs	**Blood cell trauma** 1.1 Analysis of forces of fluid motion, effects of physical forces on blood Cell, clinical effect. 1.2 Complications of blood transfusion.	√			10%	LE, SE, SA
Unit II	10 hrs	**Unit II: Anticoagulation on bypass** 2.1 Its monitoring, its reversal and complications. 2.2 Heparin less bypass 2.1 Platelet aggregation and platelet dysfunction 2.2 Coagulopathies due to cardiopulmonary bypass and its management. 2.3 Coagulation management during CPB and its reversal 2.4 Heparin Pharmacology 2.5 Heparin Dosing and Monitoring 2.6 Heparin Resistance 2.7 Alternatives to Unfractionated Heparin 2.8 Heparin-Induced Thrombocytopenia 2.9 Protamine Pharmacology 2.10 Protamine reaction	√			10%	LE, SE, SA
Unit III	10hrs	**Effect of CPB** 3.1 Systemic Inflammatory Response Syndrome & its clinical effects. 3.2 Effect of CPB on CNS 3.3 Effect of CPB on Respiratory System 3.4 Effect of CPB on Renal system 3.5 Effect of CPB on Hepatic system 3.6 Effect of CPB on Immune system 3.7 Effect of CPB on Endocrine system	√			10%	LE, SE, SA

Unit IV	10hrs	**Blood Conservation Techniques (Pre-operative, Peri-Operative & Post-Operative)** 4.1 Hemo filtration during CPB including ultra filtration (CUF, MUF) 4.2 Retrograde Autologous priming (RAP) 4.3 Cell saver & other methods	√			20%	LE, SE, SA
Unit V	4hrs	**Micro Emboli** 5.1 Gaseous and particulate	√			10%	SE, SA
Unit VI	5hrs	**Filters used during CPB** 6.1 Arterial filters 6.2 Cardiotomy filters 6.3 Gas line filters 6.4 Leukocyte filters	√			10%	LE, SE, SA
Unit VII	5hrs	**Micro pore filtration during CPB**	√			10%	SE, SA

Unit VIII	10hrs	**Counter pulsation techniques and assist devices** **8.1 Intra-Aortic Balloon Pump** 8.1.1. Introduction to IABP 8.1.2. Parts of IABP machine 8.1.3. Parts of IABP balloon 8.1.4. Insertion sites 8.1.5. Different IABP sizes 8.1.6. Indications 8.1.7. Steps of insertion and Removal 8.1.8. Complications and Contraindications **8.2 Ventricular Assist Device** 8.2.1 LVAD 8.2.2 RVAD 8.2.3 BIVAD 8.2.4 Artificial heart	√			20%	LE, SE, SA

LE= Long Essay, SE= Short Essay, SA= Short Answers

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:

CO 1 To learn about paediatric perfusion techniques in CPB

CO 2 To learn about various cardiac assist device used for infants and children.

Course Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type of question
Unit I	10hrs	**Paediatric Cardiopulmonary Bypass** 1.1 Historical aspects 1.2 Difference between infants and adults 1.3 Physiology of cardiopulmonary bypass 1.4 Blood Gas Management 1.5 Initiation of CPB 1.6 Weaning of CPB 1.6 Modified Ultra Filtration	√			15%	LE, SE, SA
Unit II	10 hrs	**Paediatric Extra corporeal circuit** 2.1 Prime 2.2 Oxygenators 2.3 Pump 2.4 Tubing 2.5 Cardiotomy circuit 2.6 Cannulas	√			15%	LE, SE, SA
Unit III	5hrs	**Myocardial Protection for Neonates and infants** 3.1 Methods 3.2 Hypothermia 3.3 Cardioplegic drugs	√			10%	LE, SE, SA

Unit IV	5hrs	**Brain Injury and Neuro protective Strategies in Paediatric Cardiac Surgery** 4.1 Neurological injury 4.2 Hypothermic Injury to the brain 4.3 Cerebral Blood Flow	√			15%	LE, SE, SA
Unit V	10hrs	**Membrane Oxygenation in Infants and Children** 5.1 Applications of ECMO 5.2 Pathophysiology 5.3 Patient selection 5.4 Techniques and management 5.5 Components of the ECMO Circuit. 5.6 Weaning 5.7 Complications and its management.	√			15%	LE, SE, SA
Unit VI	10 hrs	**Ventricular Assist Devices for Infants and Children: State of the Art and Future** 6.1 Indication 6.2 Pathophysiology 6.3 Types and Applications 6.4 complications	√			20%	LE, SE, SA
Unit VII	10hrs	**Systemic Inflammatory Response Syndrome** 7.1 Renal response 7.2 Pulmonary response 7.3 Endocrine response	√			10%	LE, SE, SA

LE= Long Essay, SE= Short Essay, SA= Short Answers

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–II

Course: Core

Credits: 8 Credits **No of hours: 120 Hours**

Course Objective:

CO 1 This course provides knowledge about the practical aspects of Cardiopulmonary Bypass.

Core Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage
Unit I	90hrs	**Cardiopulmonary Bypass Equipment's:** 1.1 Analyse - Chest X-ray, ECG, Echo, Coronary Angiography, Nuclear Cardiology, ACT Machine 1.2 Observe - Heart lung machine, Oxygenator, Heater cooler unit, Blood Cardioplegia device, ACT Machine 1.3 Setting up of ECG machine, Pressure transducer, Syringe and peristaltic pumps, Anaesthesia Monitors, Pulse oximeters, Temperature probes and Thermo regulatory monitoring, Defibrillators, Fibrillators, ACT (Activated Clotting Time)	√			70%

		1.4 Design & function of Roller pumps 1.5 Filters- Arterial filters, Cardiotomy filters, Gas line filters & Leukocyte filters 1.6 Types of tubing used in CPB Heat Exchangers 1.7 Safety Devices- Level detector, Bubble detector, Pressure sensor, Pump slave & Handcranks 1.8 Pulsatile Perfusion 1.9 Introduction to IABP Indications, steps of insertion and removal, complications and contraindications				
Unit II	30 hrs	**Cardiopulmonary Bypass Monitoring:** 2.1.1 Laboratory investigations- Arterial blood gas, Venous blood gas, Renal function test, Liver function test, Coagulation profile, Hemoglobin, Haematocrit, Platelet, RBC, WBC & Electrolyte	√			30%

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.

MEDICAL ETHICS

Course: VAC

Credits: 2 **No of Hours: 30 Hours**

- **Course Outcomes:**

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

CO1: Increasing the awareness and knowledge of students of the valuedimensions of interactions with the patients, colleagues, relations andpublic.

CO2: Fostering the development of skills of analysis, decision making and judgment.

CO3: Making the students aware of the need to respect the rights of the patient.

- **COURSE CONTENT:**

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type Of Questions
Unit 1	3hr	Introduction to ethics What is ethics, what are values and norms, freedom and personal responsibility?	√			15%	SA, SE
Unit 2	4hrs	Definition of medical ethics Major principles of medic ethics.	√			20%	LE, SA
Unit 3	4hrs	Perspective of medical ethics The Hippocratic oath, The pof Helsinki, The WHO Declaration of Geneva, International code of Medical Ethics (1993),	√			15%	LE, SA, SE

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Type Of Questions
		Medical Council of India Code of Ethics (2002).					

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Type Of Questions
Unit 4	4hrs	Ethics of the individual Truth and confidentiality, the concept of disease, health and healing, the Right to health.	√			15%	SE
Unit 5	3hrs	The ethics of human life Prenatal sex determination.	√			15%	SA, SE
Unit 6	4hrs	The family and society in medical ethics Euthanasia, cancer and terminal care.		√		10%	LE, SA
Unit 7	4hrs	Death and dying Use of life-support systems, the right to die with dignity, suicide–the Ethical outlook.		√		05%	LE, SA, SE
Unit 8	4hrs	Professional Ethics Contract and confidentiality, malpractice and negligence.		√		05%	SA, SE

LE- Long Essay**, SE-** Short Essay**, SA-** Short Answer

Recommended Books:

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

2. Loewy EE, Loewy RS. Textbook of healthcare ethics. Springer Science & Business Media; 2004 Jun 29.

SEMESTER VI

ADVANCED PERFUSION TECHNOLOGY

Course: Core

Credits: 4 Credits **No of hours: 60 Hours**

Course Objective:

CO 1: To understand about deep hypothermic circulatory arrest in cardiopulmonary CPB.

CO 2: To understand about Thoracic Aortic surgeries and its application.

CO 3: To know about the recent advance in cardiac surgery.

CO 4: To know about the complications, safety and accidents in Cardiopulmonary bypass and their management.

Core Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Types of Questio
Unit I	5hrs	**Perfusion techniques for pediatric cardiac surgery** 1.1 Conduct and monitoring of CPB 1.2 Maintenance of CPB 1.3 Weaning of CPB	√			10%	SA, SE

Unit II	10 hrs	**Extracorporeal Membrane Oxygenation (ECMO)** 2.1 Introduction to ECMO 2.2 Components of ECMO circuits 2.3 Indications and contraindications to ECMO 2.4 Types of ECMO 2.5 Complication of ECMO 2.6 Perfusion for non-cardiac surgery, invasive cardiology and outside the operation suite.	√			10%	LE, SA, SE
Unit III	5hrs	**Perfusion as a method of Cardiopulmonary Bypass including femoral bypass** 3.1 Cannulation of the femoral vessels for cardiopulmonary bypass 3.2 Management and Complication of femoral Cannulation	√			10%	LE, SA, SE
Unit IV	5hrs	**Complications and safety during CPB** 4.1 Cardiopulmonary Bypass safety 4.2 Organizational aspects of accidents and its cause 4.3 Perfusion management of bypass accidents.	√			10%	LE, SA, SE

Unit V	5hrs	**Minimally Invasive Cardiac Surgery and the Perfusionist** 5.1Benefits of minimally invasive cardiac surgery 5.2 Procedure 5.3 Types of minimally invasive cardiac surgeries 5.4 Perfusion Management of MICS 5.5 Complications and management of MICS				10%	LE, SA, SE
Unit VI	10hrs	**Deep Hypothermic Circulatory Arrest (DHCA)** 6.1 Steps Taken Before Going on DHCA 6.2 Antegrade & Retrograde Cerebral Perfusion 6.3 Alpha Stat Management 6.4 Ph Stat Management 6.5 Non hypothermic cardiac surgeries	√			10%	LE, SA, SE
Unit VII	5hrs	**Recent advances in Perfusion** 7.1 Biocompatible coatings 7.2 Minimal extracorporeal circulation 7.3 XVIVO Perfusion System/EVLP 7.4 Ex-Vivo Lung Perfusion 7.5 Steen solution	√			10%	SA, SE

Unit VIII	5hrs	**Perfusion for Thoracic Aortic Surgery** 8.1 Surgical repair of thoracic aortic aneurysm and dissection 8.2 Proximal Aortic Operations 8.3 Hypothermic Circulatory Arrest and Cerebral Perfusion Adjunct 8.4 Left sided Heart bypass and selective visceral perfusion 8.5 Technical Details of Aortic Arch Repair Procedures	√			10%	LE, SA, SE
Unit IX	5hrs	**Experimental perfusion** 9.1 In-VIVO lung Perfusion 9.2 Langendorff vs working heart perfusion	√			10%	SA, SE
Unit X	5hrs	**Role of Perfusionist in non-cardiac surgeries** 10.1 Application in Lung Surgery 10.1Applications in Neurosurgery 10.2Applications in Liver surgery 10.3Applications in Urologic surgery 10.4Other applications 10.5Complications				10%	SA, SE

LE= Long Essay, SE= Short Essay, SA= Short Answers

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. Extracorporeal life support. Bmj. 2010 Nov 2; 34.

SPECIAL SITUATION IN CARDIAC SURGERY

Course: Core

Credits: 4 Credits No of hours: 60 Hours

Course Objective:

CO 1 To learn special situations in cardiac surgery

CO 2 To understand about management of CPB in cyanotic patients

CO 3 To learn blood conservation techniques.

CO 4 To understand about blood material and hematological interactions during cardiac surgery

Core Content

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	Weightage	Types of Question

Unit I	10hrs	**Management of CPB in Cyanotic patients** 1.1 Blood Gas Management 1.2 ABG 1.3 VBG 1.4 Calculation of circulating hematocrit 1.5 Various priming options	√			25%	LE, SA, SE
Unit	**Hrs**	**Content**	**Must Know**	**Good to**	**Desirable to**	**Weightage**	**Types of Question**
Unit II	10 hrs	**Blood-material interactions** 2.1 Rheological effects of blood-material interactions in extracorporeal circulation 2.2 Biocompatibility research on extracorporeal components 2.3 Experimental studies in hemo - and bio incompatibility of artificial surfaces in cardiovascular surgery	√			25%	LE, SA, SE
Unit III	20 hrs	**Hematological and tissue-related reactions** 3.1 Material and circuit related bio incompatibility of cardiopulmonary bypass in cardiovascular surgery. 3.2 Alterations of the hemostatic system under extracorporeal Conditions. 3.3 The systemic inflammatory response and myocardial injury during extracorporeal circulation. 3.4 Cytokine release regarding different perfusion systems and its effect on S100B protein levels 3.5 Smart and blood air interface - a new concept to improve biocompatibility of extracorporeal circuits	√			25%	LE, SA, SE

Unit IV	20 hrs	**Special considerations in Cardiopulmonary Bypass** 4.1 Blood conservation in cardiac surgery 4.2 Religious objection to blood transfusion 4.3 Medical legal aspects of CPB 4.4 Warm blood Cardioplegia and Normothermic CPB 4.5 Chest Trauma and Emergency CPB 4.6 Emergency Coronary Artery Bypass and CPB	√			25%	LE, SA, SE

LE= Long Essay, SE= Short Essay, SA= Short Answers

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	Hrs	Content	Must	Good to	Desirable	weightage	Types of Questions
Unit I	10hrs	**Cardiac assist device in clinical settings** 1.1 Short term circulatory support 1.2 CADs for extended use 1.3 Pediatric pumps 1.4 Clinical complications 1.5 Driveline infections 1.6 Pump thrombosis 1.7 Gastro intestinal bleeding	√			20 %	LE, SA, SE
Unit	**Hrs**	**Content**	**Must**	**Good to**	**Desirable**	**weightage**	**Types of Questions**
Unit II	10 hrs	**Mechanical circulatory support** 2.1 Intra-Aortic Balloon 2.2 Pump Counter pulsation 2.3 Axial flow pump 2.4 Internal Ventricular Assist device 2.4 Univentricular or biventricular devices cardiovascular surgery	√			15 %	LE, SA, SE
Unit III	10 hrs	**Cardiac assist devices** 3.1 General aspects of mechanical support 3.2 Extracorporeal devices 3.3 Intracorporeal devices Future devices	√			15 %	LE, SA, SE
Unit IV	5hrs	**Devices used to bridge to transplantation** 4.1 Thoratec VAD 4.2 Novacor LVAD 4.3 Heartmate 4.4 Totally artificial heart	√			10 %	LE, SA, SE

Unit V	5hrs	**Non-blood contacting Cardiac Assisting Devices** 5.1 Counter pulsation direct cardiac compression sleeve 5.2 Counter pulsation Extra-Aortic Balloon Pump 5.3 Passive periventricular restraint	√			10 %	LE, SA, SE
Unit VI	5hrs	**The Intravascular Oxygenator, IVOX®:** 6.1 Augmentation of Blood– Gas Transfer	√			10 %	LE, SA, SE
Unit	**Hrs**		**Must**	**Good to**	**Desirable**	**weightage**	**Types of Questions**
Unit VII	10hrs	**Robotic Cardiac Surgery** 7.1 Cardio pulmonary bypass during port –access surgery and robotic surgery: 7.2 Endo vascular catheter system, 7.3 Minimally invasive cardiac surgery 7.4 Directs vision 7.5 Micro-incision and video assisted, and robotic operations.	√			10 %	LE, SA, SE

LE= Long Essay, SE= Short Essay, SA= Short Answers

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 December

CLINICAL APPLICATION OF PERFUSION TECHNOLOGY– III

Course: Core

Credits: 8 Credits **No of hours: 120 Hours**

Course Objective:

CO 1 Demonstrate practical skills in the conduct of Cardiopulmonary Bypass.

CO 2 Observe and describe the use of various equipment's and its application in cardiac surgery.

CO 3 Set up the heart lung machine and assist in managing patients during Cardiopulmonary bypass.

Core Content:

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	weightage

Unit I	10hrs	1. Adult circuit 2. Pediatric circuit 3. Neonatal circuit 4. Arterial cannulation-Aortic, femoral, iliac 5. Venous cannulation-SVC, IVC, RA, femoral vein 6. Cardioplegia cannulation-Antegrade, Retrograde, Ostial 7. Assembling the circuit 8. Priming and Setting occlusion 9. Initiation of CPB and Gas management. 10. Venting of the Heart and Cardiotomy Suction 11. Cardioplegia dosage and management 12. ABG and ACT management 13. Adequacy of Perfusion , Pre-CPB checklist, Pre weaning, off bypass checklist 14. St Thomas solution 15. Delnido solution	√			

Unit	Hrs	Content	Must Know	Good to Know	Desirable to Know	weightage
Unit II	10 hrs	1. Vasoconstrictors - Phenylephrine, Anti Arrhythmic-Amiodarone, Magnesium, Lignocaine, Diuretic-Furosemide 2. Anticoagulants-Heparin, Low molecular Weight heparin 3. Protamine Steroids – Dexamethasone, Sodium Bicarbonate 4. Potassium Chloride Heparin and its alternatives- Bivalirudin, Argatroban , 5. Inotropes - Adrenaline, Noradrenaline, Dopamine, Dobutamine, Milrinone, Vasopressin, Levosimendan 6. Case scenarios of adult heart disease, congenital heart disease and thoracic vascular disease and lung diseases mentioned in the above units	√			
Unit III	21 hrs	**1.** Assembling of CPB 2. Initiation of CPB circuit 3. Maintenance of CPB 4. Weaning of CPB 5. Conventional ultrafiltration CUF	√			

		6. Modified Ultrafiltration MUF				
Unit	21 **Hrs**	**Content**	**Must Know**	**Good to**	**Desirable**	**weightage**
	22	7. Intra-Aortic Balloon Pump (IABP) in detail 8. Deep Hypothermic Circulatory Arrest (DHCA) 9. Antegrade & Retrograde Cerebral Perfusion				

Recommended Books:

- Gravlee GP. Cardiopulmonary bypass principles and practice.

Lippincott Williams & Wilkins, 2020 Jun 2

BIOSTATISTICS

Course: VAC

Credits: 2 **No of Hours: 30 Hours**

- **Course Outcomes:**

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

CO 1: Understand the concepts of Statistics in the field of Health Professionals.

- **COURSE CONTENT:**

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Question
Unit 1	3 hours	**Introduction** 1.1 Meaning, definition of statistics. 1.2 Importance of the study of statistics. 1.3 Branches of statistics. 1.4 Statistics and health science including nursing. 1.5 Parameters and estimates. 1.6 Descriptive and inferential statistics. 1.7 Variables and their types. 1.8 Measurement scales		√		15%	SA, SE
Unit 2	3 hours	**Tabulation of Data** 2.1 Raw data, the array, frequency distribution 2.2 Basic principles of graphical representation 2.3 Types of diagrams - histograms, frequency polygons, smooth frequency polygon, cumulative frequency curve, ogive.	√			15%	SA, SE

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Question
		2.4 Normal probability curve.					
Unit 3	4 hours	**Measure of Central Tendency** 3.1 Need for measures of central tendency 3.2 Definition and calculation of mean - ungrouped and grouped 3.3 Meaning, interpretation and calculation of median ungrouped and grouped 3.4 Meaning and calculation of mode. 3.5 Comparison of the mean, and mode.	√			15%	LE, SE
Unit4	6 hours	**Measure of Variability** 4.1 Need for measure of dispersion. The range, the average deviation. 4.2 The variance and	√			15%	LE, SE

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Question
		standard deviation. 4.3 Calculation of variance and standard deviation ungrouped and grouped. 4.4 Properties and uses of variance					
Unit 5	6 hours	**Probability and Standard Distributions** 5.1 Meaning of probability of standard distribution. 5.2 The Binominal distribution. 5.3 The normal distribution. 5.4 Divergence from normality - skewness, kurtosis.	√			15%	SA, SE
Unit 6	5 hours	**Sampling Techniques** 6.1 Need for sampling - Criteria for good samples. 6.2 Various sampling designs. 6.3 Procedures of	√			15%	LE, SA, SE

Unit	Hrs	Content	Must Know	Good to Know	Desirable to	Weightage	Types of Question
		sampling and sampling designs errors. 6.4 Sampling variation. 6.5 Tests of significance.					
Unit 7	3 hours	**Health Indicator** 7.1 Importance of health Indicator. 7.2 Indicators of population, morbidity, mortality, health services. 7.3 Calculation of rates and rations of health.		√		10%	SA, SE

LE- Long Essay**, SE-** Short Essay**, SA-** Short Answer

- **Recommended Books:**

1. K S Negi, Biostatistics, Third Edition, AITBS Publishers, India, 2020.

2. K VisveswaraRao, Biostatistics a Manual of Statistical Methods for Use in Health Nutrition and Anthropology. 2 nd Edition, JAYPEE, 2009.

INTERNSHIP (SEMESTER VII &VIII)

SKILLS TO BE ACQUIRED :

1. Be able to practice as perfusionist independently
2. 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 aesthetics
3. Experts of other life support devices and intra-aortic balloon pump
4. Develop a strong knowledge base in cardiac anatomy, physiology and pathophysiology as well as pharmacology, fetal and neonatal cardiac development and perfusion science.
5. 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.
6. 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.

LEARNING OUTCOMES

S. No	Learning Outcomes	Knowledge /Comprehension	Application/Synthesis / Evaluation
1	Be able to do diagnostic laboratory investigations analysis of blood gases, hematocrit and coagulation	• Able to Collect and review background information relevant to the patient's health before performing the Cardiac Surgeries and maintenance of it throughout the procedure.	• Develop rapport to obtain history and current health status • Obtain a relevant history and current health status.
2	Collects assessment data relevant to the	• Informs the client of the nature and purpose of	• Monitors the client's health status for

	patient's disease condition and for the planning of appropriate surgery techniques for patient.	assessment and the surgery performing as well as any associated significant risk during post-operative time.	significant changes during the assessment and takes appropriate actions for the cardiac surgery. • Perform assessment procedure safely and accurately, taking into account patient consent, known indications, Guidelines, limitations and risk-benefit considerations.
3	Be able to conduct the patient evaluation and perform the surgery as per condition.	• Be familiar with different operation techniques. • Able to perform cardiopulmonary bypass. • Demonstrate knowledge of different cardiac surgeries and handling of emergency procedure.	• Safely and accurately examines and re-examines a patient using standardized measures • Interpret all assessment findings to allow for identification of the patient's clinical status

4	Be able to perform cardiopulmonary bypass and handle the mechanical circulatory devices.	• Know the use of equipment's in CPB and also hand on training with the equipment's and materials used. • Able to understand the principles and use of all the equipment's and its making	• To know the intracellular and extracellular effects during CPB and Cardiac surgery. • Plan the effects of the surgical procedure and also the draw backs of the inflammatory response system.
5	Understands the process and knowledge of various perfusion equipment and supplies used in the health care setting	• Demonstrate comprehensive knowledge of heart lung machine for performing cardiopulmonary bypass for performing various surgeries	• Operate and handle the heart lung machine • Demonstrates appropriate use of barrier precautions and cleaning and disinfection procedures
6	Assesses the clinical skills in auto transfusion, blood conservation and blood product management.	• Knowledge of possible complications and ways during the transfusion	• Responds properly to patient complaints and takes appropriate measures as per the clinical status of the patient.

7	Operation and Maintenance of all equipment	• Factual knowledge of the appropriate system calibration, startup procedure and alarm systems function test and troubleshooting.	• Performs alarms troubleshooting, appropriately initiates, and monitors the equipment's. • Contacts the Biomedical Engineering Department for the maintenance of all the equipment's.