K.R. MANGALAM UNIVERSITY

THE COMPLETE WORLD OF EDUCATION

SCHOOL OF MEDICAL AND ALLIED SCIENCES

B.Sc. (Hons.) CARDIOVASCULAR TECHNOLOGY

PROGRAMME CODE- 88

UNDERGRADUATE

PROGRAMME

DETAILED SYLLABUS

with effective from

2025-26

Session: 2025-2029

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1. Preface

The K.R. Mangalam Group has made a name for itself in the field of education. Over a period, the various educational entities of the group have converged into a fully functional corporate academy. Resources at KRMU have been continuously upgraded to optimize opportunities for the students. Our students are groomed in a truly interdisciplinary environment wherein they develop integrative skills through interaction with students from engineering, management, journalism, and media study streams.

The K.R. Mangalam story goes back to the chain of schools that offered an alternative option of world-class education, pitching itself against the established elite schools, which had enjoyed a position of monopoly till then. Having blazed a new trail in school education, the focus of the group was aimed at higher education. With the mushrooming of institutions of Higher Education in the National Capital Region, the university considered it very important that students take informed decisions and pursue career objectives in an institution, where the concept of education has evolved as a natural process.

K.R. Mangalam University was founded in the year 2013 by Mangalam Edu Gate, a company incorporated under Section 25 of the Companies Act, 1956.

Uniqueness of KRMU

I. Enduring legacy of providing education to high achievers who demonstrate leadership in diverse fields.
II. Protective and nurturing environment for teaching, research, creativity, scholarship, social and economic justice.

Education Objectives

1. To impart undergraduate, post-graduate and Doctoral education in identified areas of higher education.
2. To undertake research programmes with an industrial interface.
3. To integrate its growth with the global needs and expectations of the major stake holders through teaching, research, exchange & collaborative programmes with foreign, Indian Universities/Institutions and MNCs.
4. To act as a nodal center for transfer of technology to the industry.
5. To provide job oriented professional education to the student community with particular focus on Haryana.

NEP-2020: K.R. Mangalam University has adopted the National Education Policy NEP-2020 to establish a holistic and multidisciplinary undergraduate education environment, aiming to equip our students for the demands of the 21st century. In compliance with the guidelines of NEP-2020 regarding curriculum structure and duration of the undergraduate programme, we now offer a Four-Year Undergraduate Programme. On completion of 8th sem. with the required number of credits, a student will be awarded a 4-year **Bachelor's Degree (Hons.)**

S. No.	Broad Categories of Courses	Minimum Credit Requirement for Four Year UG Program

1	Major (Core)	69
2	Minor	23
3	Multidisciplinary	09
4	Ability Enhancement Course (AEC)	09
5	Skill Enhancement Course (SEC)	10
6	Value-Added Course (VAC)	08
7	Summer Internship	04
8	Research Project/Dissertation	40
9	Total	172

Categories of Courses

Major: The major would provide the opportunity for a student to pursue in-depth study of a particular subject or discipline.

Minor: Students will have the option to choose courses from disciplinary/interdisciplinary minors and skill-based courses. Students who take a sufficient number of courses in a discipline or an interdisciplinary area of study other than the chosen major will qualify for a minor in that discipline or in the chosen interdisciplinary area of study.

Ability Enhancement Course (AEC): Students are required to achieve competency in a Modern Indian Language (MIL) and in the English language with special emphasis on language and communication skills. The courses aim at enabling the students to acquire and demonstrate the core linguistic skills, including critical

reading and expository and academic writing skills, that help students articulate their arguments and present their thinking clearly and coherently and recognize the importance of language as a mediator of knowledge and identity.

Skills Enhancement Courses (SEC): These courses are aimed at imparting practical skills, hands-on training, soft skills, etc., to enhance the employability of students

2. University Vision and Mission

2.1 Vision

K.R. Mangalam University aspires to become an internationally recognized institution of higher learning through excellence in inter-disciplinary education, research, and innovation, preparing socially responsible life-long learners contributing to nation building.

2.2 Mission

1. Foster employability and entrepreneurship through futuristic curriculum and progressive pedagogy with cutting-edge technology
2. Instill notion of lifelong learning through stimulating research, Outcomes-based education, and innovative thinking
3. Integrate global needs and expectations through collaborative programs with premier universities, research centres, industries, and professional bodies.
4. Enhance leadership qualities among the youth having understanding of ethical values and environmental realities.

3.About School of Medical and Allied Sciences

The **School of Medical & Allied Sciences** is a premier school committed to excellence in health education, research, and clinical

training. With a multidisciplinary approach, the School offers a wide range of undergraduate, postgraduate, and doctoral programs in fields such as medical sciences, pharmacy, physiotherapy, and other allied health professions. Our mission is to prepare competent healthcare professionals who are equipped with strong academic knowledge, clinical skills, and ethical values. We foster an environment that encourages innovation, evidence-based practice, and lifelong learning.

Supported by experienced faculty, state-of-the-art laboratories, and collaborations with various industries, the School empowers students to become leaders in healthcare delivery and biomedical research. Through its holistic and student-centered education model, the School of Medical & Allied Sciences plays a vital role in shaping the future of healthcare both nationally and globally. Additionally, Our School stands apart through its strong emphasis on industry-academia collaboration, experiential learning, and a future-ready curriculum designed to meet the evolving demands of the healthcare sector. The curriculum is aligned with current industry standards and healthcare requirements, enabling students to effectively contribute to patient care and clinical support services.

We offer undergraduate programs that emphasize practical exposure through hospital-based training, simulation labs, and internships in leading healthcare institutions. To bridge the gap between classroom learning and clinical application, we involve experienced healthcare professionals and medical experts in the teaching process. Our students benefit from workshops, skill development sessions, industry-led seminars, and career guidance programs focused on the healthcare sector.

The department regularly organizes and participates in community outreach initiatives such as health camps, awareness drives, and first-aid training programs, helping students gain real-world exposure while contributing to public health education. We also assist students with placement opportunities in reputed hospitals, diagnostic centers, emergency services, and specialized healthcare facilities both in India and abroad. Our industry ties include collaborations with organizations such as Fortis Memorial Hospital Ltd. , Metro Hospitals, Accord Hospitals, Marengo Asia Hospitals, Tirath Ram Shah Hospital, RG

Stone Hospitals, Orange Health Lab, Pathkind Diagnostic Pvt. Ltd., Core Diagnostic , Redcliffe Lab, Aarvey Hospitals & Nephrocare Health Services Pvt. Ltd.

Our collaborations with healthcare providers and industry partners ensure that students are well-prepared for diverse roles in patient care, emergency response, critical carE assistance, dialysis care and diagnostic technology.

4 .School Vision and Mission

Vision:

To become a premier institution for Allied Healthcare education, dedicated to producing competent, compassionate, and skilled professionals who advance patient care and emergency medical services, thereby contributing to improved healthcare access and outcomes both in India and globally.

Mission

- To train students to become technically proficient, ethically grounded, and socially responsible allied healthcare professionals who can meet the evolving needs of hospitals, emergency care, and diagnostic services.
- To establish a center of excellence in Allied Health Sciences education and research, promoting innovation, critical thinking, and hands-on learning through partnerships with leading healthcare institutions.
- To foster a culture of community engagement by encouraging students to participate in health awareness initiatives and outreach programs aimed at improving public health.
- To support interdisciplinary collaboration across healthcare fields, enabling students to contribute to integrated patient care models.
- To offer continuous learning and professional development opportunities that prepare graduates to adapt and thrive in a dynamic global healthcare environment.

5. About the Programme

The school offers B.Sc. (Hons.) Cardiovascular Technology programs designed to impart scientific knowledge to the students and will provide theoretical as well as practical training in their respective fields. The curriculum has been specifically designed to impart latest knowledge and skills relevant to Cardiac Sciences including Industrial Visits / Training / Guest Lectures of Experts from Industry and Academia**.**

The course of study for B.Sc.(Hons.) Cardiovascular Technology shall extend over a period of 3+1year eight semesters (four academic years) and six semesters (three academic years) for lateral entry students. The curriculum and syllabi for the program shall be prescribed from time to time by the University. It strives to cultivate a deep understanding of Cardiac sciences, regulatory compliance, and medical ethics, while also encouraging critical thinking, creativity, and adaptability. Through a combination of classroom instruction, practical projects, internships, and exposure to cutting-edge technologies, this programme aims to produce healthcare professionals who are not only well-informed but also socially responsible and technical savvy.

5.1 Definitions

- **Programme Educational Objectives (PEOs)**

  Programme Educational Objectives of a degree are the statements that describe the expected achievements of graduates in their career, and what the graduates are expected to perform, achieve and how they will conduct professionally during the first few years after graduation.

- **Programme Outcomes (POs)**

  Programme Outcomes are statements that describe what the students are expected to know and would be able to do upon graduation. These relate to the skills, knowledge, and behaviour that students acquire through the programme.

- **Programme Specific Outcomes (PSOs)**

  Programme Specific Outcomes are statements about the various levels of knowledge specific to the given program which the student would be acquiring during the program.

- **Credit**

  Credit refers to a unit of contact hours/tutorial hours per week or 02 hours of lab/practical work per week

5. 2 Programme Educational Objectives (PEOs*)*

These are deferred outcomes measured few years after completion of the programme, where the graduates of this program will:

PEO-1 Professional Competence: Graduates will demonstrate strong foundational knowledge and technical proficiency in cardiovascular diagnostics and interventional procedures to work effectively in clinical and critical care environments

PEO-2 Ethical and Responsible Practice: Graduates will uphold the highest standards of ethics, patient confidentiality, and professional conduct while delivering cardiovascular care and diagnostic services.

PEO-3 Teamwork and Leadership: Graduates will function effectively as part of multidisciplinary cardiac care teams and exhibit leadership qualities in managing cardiovascular procedures and technology

PEO-4 Lifelong Learning and Career Advancement: Graduates will engage in continuous learning and pursue advanced certifications, research, or higher education to stay abreast of evolving cardiovascular technology and healthcare practices

PEO-5 Research and Innovation: Graduates will contribute to the advancement of cardiovascular diagnostics and interventions through evidence-based research and innovative technological practices in cardiac care.

5.3 Programme Outcomes (POs)

At the end of the programme the students will be:

PO-1 Disciplinary Knowledge: - Apply core knowledge of cardiovascular diagnostics, cardiac procedures, and patient monitoring protocols in clinical and critical care practice.

PO-2 Critical Thinking: - Analyze cardiac conditions and clinical parameters to make informed decisions during diagnostic and interventional cardiovascular procedures

PO-3 Effective Communication: - Communicate effectively with patients, cardiologists, and interdisciplinary healthcare teams to ensure accurate information exchange and coordinated care.

PO-4 Social Interaction: - Collaborate with cardiac care teams, demonstrating empathy, respect, and professionalism toward patients and colleagues in high-pressure environments.

PO-5 Effective Citizenship: -Contribute positively to public health by recognizing the cardiovascular technologist's role in prevention, awareness, and early diagnosis of cardiac diseases.

PO-6 Ethics: - Uphold ethical principles in all aspects of cardiovascular care, including maintaining patient confidentiality, informed consent, and professional integrity.

PO-7 Environmental and Sustainability: - Implement safe and sustainable practices in cardiac labs and cath labs to reduce environmental impact and ensure responsible resource utilization

PO-8 Self-Directed and Lifelong Learning: - Engage in continuous learning to stay updated with evolving cardiac care technologies, clinical protocols, and advancements in cardiovascular science.

PO-9 Research-Related Skills: - Conduct or participate in clinical research related to cardiovascular diagnostics and interventions to enhance patient care and procedural outcomes.

PO-10 Scientific Interpretation: - Interpret clinical and scientific data from ECG, echocardiograms, and hemodynamic monitors to support evidence-based decision-making in cardiovascular settings.

PO-11 Information and Digital Literacy: - Use digital tools, electronic health records, and diagnostic software efficiently to manage cardiac patient data and support clinical accuracy and workflow.

5.4 Programme Specific Outcomes (PSOs)

At the end of the program the students will be:

PSO-1 Cardiac Diagnostic Practices: Apply theoretical knowledge and technical skills to perform accurate and reliable cardiovascular diagnostic tests, such as ECG, echocardiography, treadmill testing, and Holter monitoring

PSO-2 Instrumentation and Quality Control:: Operate, maintain, and troubleshoot cardiovascular instruments including ECG machines, defibrillators, cardiac monitors, and echocardiographs, ensuring quality control and safety standards are met.

PSO-3 Cardiac Procedure Assistance: Assist in invasive and non-invasive cardiac procedures such as cardiac catheterization, pacemaker implantation, and angiography, while maintaining aseptic techniques and supporting emergency interventions.

PSO-4 Documentation and Patient Safety: Maintain accurate documentation of patient data and procedures while adhering to biomedical waste disposal, infection control, and cardiovascular care safety protocols.

5.5 Career Avenues

B.Sc. (Hons.) Cardiovascular Technology opens up a wide range of career avenues like the following but not limited to:

- **Cardiac Technologist:**Specialised in the operation and maintenance of cardiovascular diagnostic equipment, including advanced ECG, echocardiography, and stress testing systems. Involved in direct patient care during diagnostic procedures and assisting in the interpretation of data for clinical decision-making.
- **Cath Lab Technologist**:Expertise in the setup, operation, and troubleshooting of high-tech cardiovascular equipment such as fluoroscopy systems and angiographic machines. Plays a crucial role in interventional cardiology procedures like coronary angioplasty, stenting, and implantation of cardiac devices, ensuring safety and accuracy during complex procedures.
- **Echocardiography Technician:**Specialised in performing advanced echocardiography procedures, including 3D/4D echocardiography and transesophageal echocardiograms, to assess heart function and structure. Expertise in Doppler ultrasound techniques to evaluate blood flow, heart valve function, and congenital heart abnormalities.
- **Electrophysiology (EP) Lab Technologist:**

  Highly skilled in supporting electrophysiology procedures to diagnose and treat arrhythmias. Proficient in operating mapping systems, ablation technologies, and complex pacing devices. Assists in complex electrophysiology studies and procedures such as catheter ablation and implantation of defibrillators or pacemakers.
- **Cardiac Rehabilitation Specialist:**

  Advanced training in designing and overseeing personalised cardiac rehabilitation programs for patients recovering from heart surgeries, cardiac events, or chronic conditions. Expertise in exercise physiology, patient education, and behavioural modification strategies to improve cardiovascular health and prevent future complications.

- **Medical Device Industry Professional:**

  Specialised role in the development, testing, or application of cutting-edge cardiovascular medical technologies. Involves working closely with healthcare providers to facilitate the adoption of new diagnostic tools or therapeutic devices such as pacemakers, stents, or high-end diagnostic machines, with a focus on product training, clinical trials, and R&D.

- **Healthcare Administrator (Cardiology Department):**

  Focused on overseeing the operations, budgeting, and staffing of cardiology departments in hospitals or clinics. Involves managing clinical workflows, ensuring regulatory compliance, and improving service quality and patient care within cardiac units. Specialisation may extend to the strategic planning of healthcare services and leading quality improvement initiatives.

- **Academic and Research Positions:**

  In-depth involvement in the education and training of future cardiac technologists, researchers, or healthcare professionals. Specialises in advancing cardiovascular knowledge through academic research or clinical trials, contributing to publications, and engaging in teaching at undergraduate or postgraduate levels.

- **Clinical Application Specialist:**

  Advanced knowledge of cardiovascular diagnostic and therapeutic systems. Works with clinicians to provide in-depth training and support for the effective application of high-tech cardiovascular equipment. Involves troubleshooting, system updates, and enhancing the quality of patient care by improving clinical workflows.

- **Further Studies and Specialisation:**

  Pursue specialised graduate programs like M.Sc. in Cardiovascular Technology, or certifications in advanced cardiology techniques such as invasive/non-invasive cardiology, or even hospital administration (MHA) or public health (MPH) for leadership roles in the healthcare sector.

5.6 Duration –

The course of study for B.Sc. (Hons.) Cardiovascular Technology shall extend over a period of eight semesters (four academic years) and six semesters (three academic years) for lateral entry students. The curriculum and syllabi for the program shall be prescribed from time to time by Haryana State Higher Education.

6.Criteria for award of degree

6.1 Eligibility Criteria

The candidate should have passed 10+2 or its equivalent examination from a recognized Board with a minimum of 50% marks in aggregate. The reservation and relaxation for SC/ST/OBC/PWD and other categories shall be as per the rules of central/state government, whichever is applicable.

6.2 Criteria for award of degree

The minimum credit points required for the award of a B.Sc. (Hons.) Cardiovascular Technology degree is 172. These credits are distributed across Theory courses, Tutorials, Practicals and Internships over the duration of eight semesters.

Learners are expected to follow the semester-wise schedule of courses as outlined in the syllabus. The curriculum includes a combination of classroom instruction, hands-on clinical training, and field postings to ensure holistic development of both theoretical knowledge and practical skills.

Internships and project work, particularly in Semesters VII and VIII, carry significant weight, contributing a total of 80 credit points across both semesters (40 credits each), emphasizing the importance of clinical exposure and real-world application.

The lateral entry students shall get 48 credit points transferred from their Diploma in Cardiovascular Technology or an equivalent paramedical diploma program. Such students shall take up additional remedial courses of ‘Communication Skills for Healthcare Professionals’ (Theory and Practical) and ‘Introduction to Computing’ (Theory and Practical) equivalent to 3 and 4 credit points respectively, a total of 7 credit points, to attain 55 credit points, the maximum equivalent of I and II semesters.

7.Student's Structured Learning Experience from Entry to Exit in the Programme

- **Education Philosophy and Purpose**:

- **Learn to Earn a Living:**

  At KRMU we believe in equipping students with the skills, knowledge, and qualifications necessary to succeed in the job market and achieve financial stability. All the programmes are tailored to meet industry demands, preparing students to enter specific careers and contributing to economic development.

- **Learn to Live:**
  The university believes in the holistic development of learners, fostering sensitivity towards society, and promoting a social and emotional understanding of the world. Our aim is to nurture well-rounded individuals who can contribute meaningfully to society, lead fulfilling lives, and engage with the complexities of the human experience.
- University Education Objective: **Focus on Employability and Entrepreneurship through Holistic Education using Bloom's Taxonomy**

By targeting all levels of Bloom's Taxonomy—remembering, understanding, applying, analysing, evaluating, and creating—students are equipped with the knowledge, skills, and attitudes necessary for the workforce and entrepreneurial success. At KRMU we emphasize on learners critical thinking, problem-solving, and innovation, ensuring application of theoretical knowledge in practical settings. This approach nurtures adaptability, creativity, and ethical decision-making, enabling graduates to excel in diverse professional environments and to innovate in entrepreneurial endeavours, contributing to economic growth and societal well-being.

- **Importance of Structured Learning Experiences**

A structured learning experience (SLE) is crucial for effective education as it provides a clear and organized framework for acquiring knowledge and skills. By following a well-defined curriculum, teaching-learning methods and assessment strategies, learners can build on prior knowledge systematically, ensuring that foundational concepts are understood before moving on to more complex topics. This approach not only enhances comprehension but also fosters critical thinking by allowing learners to connect ideas and apply them in various contexts. Moreover, a structured learning experience helps in setting clear goals and benchmarks, enabling both educators and students to track progress and make necessary adjustments. Ultimately, it creates a conducive environment for sustained intellectual growth, encouraging learners to achieve their full potential. At K.R. Mangalam University SLE is designed as rigorous activities that are integrated into the curriculum and provide students with opportunities for learning in two parts:

Inside Classroom

A structured approach within the classroom focuses on the following key aspects:

- **Cognitive Outcomes**: Classroom learning aims to enhance critical thinking, problem-solving, and decision-making skills. These outcomes help students develop a deep understanding of cardiac practices, and healthcare challenges.

- **Student-Centric Learning**: The learning process is designed to actively involve students, fostering an environment of inquiry and engagement. This may include discussions, case studies, group projects, and interactive sessions to personalize the learning experience.
- **Methods and Approaches**: Diverse teaching methods are employed to enhance cognitive development. These include:

    - ✔ **Lectures**: For foundational understanding.
    - ✔ **Group Discussions**: To facilitate peer learning.
    - ✔ **Case Studies**: To promote application of theory in real-life scenarios.
    - ✔ **Problem-Based Learning (PBL)**: Focuses on active problem-solving and research.

- **Tools and Techniques**: Technology and modern educational tools enhance classroom experiences. Examples include:

    - ✔ **E-learning platforms and simulations** for understanding complex cardiac mechanisms.
    - ✔ **Laboratory-based tools** to reinforce practical understanding.

Outside Classroom

Experiences outside the classroom are designed to develop both psychomotor and people skills. These practical experiences help students integrate knowledge with hands-on practice:

- **Industry Internships and Industrial Visits**: Exposure to real-world cardiac industry practices, including quality assurance, and research and development, helps students apply their classroom knowledge to industrial settings.
- **Community Training**: Involves students in working with the cardiac community, where they develop communication skills, understand patient needs, and enhance their knowledge of drug dispensing and patient education.
- **Laboratory Practicals**: Hands-on lab work in labs help in refining the psychomotor skills necessary for professional practice.
- **Collaborative Research Projects**: Involves students in ongoing research, fostering innovation and scientific inquiry while cultivating teamwork and project management skills.

- **Fieldwork and Health Camps**: Encourages students to work with healthcare professionals in various settings, building their ability to engage with communities and deliver patient-centric care.

8.Learning and Development Opportunities

The B.Sc.(Hons.)Cardiovascular Technology programme is designed around the educational philosophy of "Learn to Earn Living" and "Learn to Live," providing a holistic learning experience from entry to exit.

A well-defined academic plan ensures the structured and timely execution of the curriculum. The following components contribute to the successful implementation and continuous enhancement of the learning experience: scheduled theory and practical sessions, regular clinical exposure in cardiovascular departments, use of simulation-based modules, assessments aligned with real-world competencies, feedback-driven learning improvements, and integration of ethical, legal, and communication skills essential for cardiovascular professionals.

8.1 Laboratories and Practical Learning

Laboratories serve as a vital platform for hands-on learning that reinforces theoretical knowledge through practical applications. In the B.Sc. (Hons.) CVT programs, specialized labs such as Cardiac Care Skills Lab, Anatomy & Physiology Lab, Microbiology Lab, and Simulation Labs enable students to practice life-saving procedures, analyze clinical samples, and learn the use of Cardiac medical equipment. Regular practical sessions help develop technical proficiency, clinical judgment, precision, and critical thinking skills essential for emergency care professionals.

8.2 Experiential Learning

Experiential learning bridges the gap between classroom knowledge and real-world practice. Students gain exposure through internships in hospitals, cardiovascular departments, ambulance services, and pre-hospital care settings. Field postings, mock drills, and industrial visits further acquaint students with operational environments. This mode of learning fosters teamwork, quick decision-making, patient-centered communication, and professional conduct under real-life scenarios.

8.3 Case-Based Learning/ Problem-Based Learning/ Project-Based Learning

These student-centric approaches promote analytical thinking and problem-solving in cardiac care situations:

- **Case-Based Learning (CBL):** Students analyze real-life emergency scenarios and suggest evidence-based interventions.
- **Problem-Based Learning (PBL):** Open-ended clinical problems encourage inquiry and collaborative problem-solving.
- **Project-Based Learning:** Students work on long-term projects related to cardiac preparedness, community enhancing cardiac related research, and presentation skills.

8.4 Workshops, Seminars, Guest Lectures

Skill-building workshops on advanced life support, cardiac trauma management,Cardiac arrest response and use of specialized equipment form a crucial part of the curriculum. Seminars and conferences encourage academic discussions and keep students updated with the latest practice in cardiac services. Guest lectures by cardiac physicians, paramedics, disaster managers, and industry experts provide insights into career pathways, new technologies, and global trends in CVT.

8.5 Inside & Outside Classroom Learning

Learning is enriched through multiple modes beyond traditional classrooms. Flipped classrooms, blended learning modules, and simulation-based training are used alongside learning management systems (LMS), e-learning platforms, and peer group discussions. Outside-classroom activities like participation in health camps, community emergency drills, first-aid awareness drives, and extension activities help students develop a sense of social responsibility and community service.

8.6 Holistic Education

Holistic development is a key focus of the CVT program. Students are encouraged to develop intellectual, emotional, ethical, and physical

well-being through value-based learning, stress management workshops, leadership training, yoga, and mindfulness activities. Participation in sports, extracurricular activities, and student clubs helps build confidence and team spirit, ultimately shaping competent, empathetic emergency medical professionals dedicated to lifelong learning.

9. Assessment and Evaluation

Grading Policies and Procedures for theory courses, practical courses, projects, Internships, Dissertation: As per university examination policy of K R Mangalam University, the Program Outcome assessments is done by aggregating both direct and indirect assessments, typically assigning 80% weightage to direct assessment and 20% to indirect assessments, to compute the final course attainment.

EVALUATION SCHEME:

For Theories:

<table>
<tr><td colspan="3">Evaluation Components</td><td>Weightage</td></tr>
<tr><td rowspan="8">Internal Evaluation (Theory) – I) Continuous Assessment (30 Marks)</td><td>Components</td><td>Marks</td><td rowspan="8">30Marks</td></tr>
<tr><td>I. Quizzes</td><td>5</td></tr>
<tr><td>II. Presentations</td><td>5</td></tr>
<tr><td>III. Assignments</td><td>5</td></tr>
<tr><td>IV. Class Participation</td><td>02</td></tr>
<tr><td>V. Case Studies</td><td>05</td></tr>
<tr><td>VI. Reflective Journals</td><td>03</td></tr>
<tr><td>VII. Attendance</td><td>05</td></tr>
<tr><td colspan="3">Internal Evaluation (Theory) - Mid Term Exam</td><td>20Marks</td></tr>
<tr><td colspan="3">External Evaluation (Theory): End Term Examination</td><td>50marks</td></tr>
<tr><td colspan="3">Total</td><td>100 marks</td></tr>
</table>

Note: It is compulsory for a student to secure 40% marks in Internal and End Term Practical Exam and Viva Voce separately to secure minimum passing grade.

For Practicals:

Evaluation Components			Weightage
Internal Evaluation (Practical) – I) Continuous Assessment (30 Marks)	Components	Marks	50Marks
	1. Conduct of Experiment	10	
	2. Lab Records	10	
	3. Lab Participation	10	
	4. Lab Project	20	
External Marks (Practical): - End term Practical Exam and Viva Voce			50Marks
Total			100 marks

Note: It is compulsory for a student to secure 40% marks in Internal and End Term Practical Exam and Viva Voce separately to secure minimum passing grade.

For Internships:

Evaluation Components		Weightage
Internal Evaluation (Internship) – I)Components	Marks	100Marks
Continuous Assessment (30 Marks) 1. Attendance	20	
2.Case study	30	100Marks
3. Practical Skill's book	50	
External Marks (Internship): - Dissertation and Viva Voce		
Total		200 marks

10. Practical Training and Internships

10.1 Practical Evaluation:

Students undergo practical evaluations as part of each course module, carrying a total of 100 marks—with 50 marks for internal assessment and 50 marks for end-term practical and viva voce. The internal assessment includes conduct of experiments (10 marks), lab records (10 marks), lab participation (10 marks), and lab project work (20 marks). Students must secure a minimum of 40% marks in both internal and external components to pass.

10.2 Internship Evaluation:

The internship is evaluated out of 200 marks, with 100 marks for internal assessment based on attendance (20 marks), case study (30 marks), and practical skills book (50 marks), and 100 marks for external evaluation through dissertation and viva voce. A minimum of 40% must be secured separately in both internal and external assessments for successful completion.

11. Feedback and Continuous Improvement Mechanisms: Teaching-learning is driven by outcomes. Assessment strategies and andragogy are aligned to course outcomes. Every CO is assessed using multiple components. The attainment of COs is calculated for every course to know the gaps between the desired and actual outcomes. These gaps are analysed to understand where the student lags in terms of learning levels. Thereafter each student’s learning levels are ascertained, if found below desirable level, and intervention strategy is affected in the following semester to make necessary corrections. To cater to the diverse learning needs of its student body, K.R. Mangalam University employs a comprehensive assessment framework to identify both slow and advanced learners. Students' learning levels are continually assessed based on their performance at various stages. If a student's performance in internal assessments falls below or equal to 55%, they are categorized as slow

learners. Conversely, if a student's performance score in internal assessments is greater than or equal to 80%, they are identified as advanced learners. Such students are encouraged to participate in advanced learning activities. Through periodic evaluations and the utilization of modern management systems, the institution adeptly tracks students' performance across various courses, allowing for targeted interventions and support mechanisms.

12. Academic Integrity and Ethics: The School of Medical and Allied Sciences places a strong emphasis on academic integrity and ethics, fostering a culture of honesty and responsibility among students. Clear guidelines are established to educate students about the importance of plagiarism prevention, proper citation practices, and ethical sourcing in their work. Regular workshops and seminars are conducted to discuss case studies and real-world scenarios, encouraging critical thinking about ethical dilemmas in the healthcare system. Faculty members serve as role models, promoting transparency and accountability in their interactions and evaluations. By instilling these values, the school prepares students to uphold high ethical standards in their professional careers, emphasizing the critical role that integrity plays healthcare system.

13. Programme Scheme:

S. No.	Category of Courses	Course Code	Course	L	T	P	C	Hours/ We ek
1.	**Major-I**	BPAH101	Human Anatomy & Physiology - I	3	1	0	4	4
2.	**Major-II**	BPAH102	Basic Electrocardio graphy	3	1	0	4	4
3.	**Minor-I**	BPAH103	Biochemistry	3	0	0	3	3
4.	**Ability Enhanceme nt course-I AEC-I**	BPAH104	Professional Communicati on and Soft Skills in Healthcare I	3	0	0	3	3

5.	**Skill Enhancement Course -I SEC-I**	BPAH105	Introduction to Quality and patient safety	2	0	0	2	2
6.	**Value Added Course-I VAC I**	BPAH106	Healthcare Informatics and Data Analytics	2	0	0	2	2
7.	**Major -I (Practical)**	BPAH151	Human Anatomy & Physiology - I	0	0	2	1	2
8.	**Major -II (Practical)**	BPAH152	Basic Electrocardio gra phy	0	0	2	1	2
9.	**Minor I(Practical)**	BPAH153	Biochemistry	0	0	2	1	2
10.	**Skill Enhancement Course -I SEC-I (Practical)**	BPAH154	Introduction to Quality and patient safety	0	0	2	1	2
Total				**16**	**2**	**8**	**22**	**26**
Semester-II								
S. No.	**Category of Course**	**Course Code**	**Course**	**L**	**T**	**P**	**C**	**Hours/ We ek**
1.	**Major-III**	BPAH201	Human Anatomy & Physiology - II	3	1	0	4	4
2.	**Major-IV**	BPCVT202	Applied Anatomy & Drugs in CVST	3	1	0	4	4
3.	**Minor-II**	BPAH203	Microbiology	3	0	0	3	3
4.	**Multidisci pli nary -I**	BPAH204	Fundament als Computer	2	0	0	2	2
	MDP-I							
5.	**Ability Enhancement course-II**	BPAH 205	Professional Communicati on and Soft Skills in	3	0	0	3	3

	AEC-II		Healthcare II					
6.	**Value Added Course-II VAC II**	BPAH206	Self Awareness	2	0	0	2	2
7.	**Major -II (Practical)**	BPAH251	Human Anatomy & Physiology - II	0	0	2	1	2
8.	**Minor - II(Practical)**	BPAH253	Microbiology	0	0	2	1	2
9.	**Multidisci pli nary -I MDP I(Practical)**	BPAH254	Fundament als Computer	0	0	2	1	2
Total				**16**	**2**	**6**	**21**	**24**
Semester-III								
S. No.	**Category of Course**	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**	**Hours/ We ek**
1.	**Major-V**	BPCVT301	Cardiovascul ar Disorders	3	1	0	4	4
2.	**Major-VI**	BPCVT302	Cardiac Instrumentation	3	1	0	4	4
3.	**Minor-III**	BPCVT303	Basic Echocardiog rap hy	3	0	0	3	3
4.	**Multidisci pli nary -II MDP-II**	BPAH304	Accounting and Finance	3	0	0	3	3
5.	**Ability Enhanceme nt course-II AEC-II**	BPAH305	##Mental Health & Holistic Well Being	**3**	0	0	**3**	3
6.	**Skill Enhanceme nt Course -II SEC-II**	BPAH306	Preventive and Social Medicine	2	0	0	2	2
7.	**Value Added Course**	BPAH307	Managing People and Organizations	2	0	0	2	2

	VAC III							

8.	**Major - V(Practical)**	BPCVT351	Cardiovascular Disorders	0	0	2	1	2
9.	**Major - VI(Practical)**	BPCVTI352	Cardiac Instrumentation	0	0	2	1	2
10.	**Minor-III (Practical)**	BPCVT353	Basic Echocardiography	0	0	2	1	2
Total				**19**	**2**	**6**	**24**	**27**

Mental Health & Holistic Well-Being is an online MOOC course via SWAYAM-NPTEL, registered in Semester 2 and completed by Semester 3. Certificate submission to the MOOC Coordinator is mandatory after completion.

Semester-IV								
S. No.	**Category of Course**	**Course Code**	**Course**	**L**	**T**	**P**	**C**	**Hours/ Week**
1.	**Major-VII**	BPCVT401	Paediatric Cardiovascular Disorder	3	1	0	4	4
2.	**Major-VIII**	BPCVT402	Advanced Echocardiography	3	1	0	4	4
3.	**Major-IX**	BPCVT403	Fetal & Neonatal - Cardiovascular System	3	1	0	4	4
4.	**Multidisciplinary -III MDP-III**	BPAH404	Disaster Management & Environmental Sciences	3	0	0	3	3
5.	**Skill Enhancement Course -III SEC-III**	BPCVT405	Advanced Electrocardiography	2	0	0	2	2
6.	**Value Added Course VAC-IV**	BPAH406	Entrepreneurship in Allied Healthcare	2	0	0	2	2
7.	**Major - VII(Practical)**	BPCVT451	Paediatric Cardiovascular Disorder	0	0	2	1	2

8.	**Major - VIII(Practica l)**	BPCVT452	Advanced Echocardiography	0	0	2	1	2
9.	**Skill Enhancement Course -III SEC III(Practical)**	BPCVT453	Advanced Electrocardiography	0	0	2	1	2
Total				**16**	**3**	**6**	**22**	**25**

Semester-V								
S. No.	**Category of Course**	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**	**Hours/ Week**
1.	**Major-X**	BPCVT501	Cardiac Catheterization	3	1	0	4	4
2.	**Major-XI**	BPCVT502	Invasive Cardiology	3	1	0	4	4
3.	**Minor-IV**	BPCVT503	TMT & Holter Monitoring	3	0	0	3	3
4.	**Skill Enhancement Course-IV SEC-IV**	BPAH504	Advanced Intensive Care (BLS, ACLS, PALS & NALS)	2	0	0	2	2
5.	**Major - X(Practical)**	BPCVT551	Cardiac Catheterization	0	0	2	1	2
6.	**Major - XI(Practical)**	BPCVT552	Invasive Cardiology	0	0	2	1	2
7.	**Minor-IV (Practical)**	BPCVT553	TMT & Holter Monitoring	0	0	2	1	2
8.	**Skill Enhancement Course SEC-IV (Practical)**	BPAH554	Advanced Intensive Care (BLS, ACLS, PALS & NALS)	0	0	2	1	2
9.	**#Summer Internship**	BPSI555	Internship	0	0	8	4	8
Total				**11**	**2**	**16**	**21**	**29**

#Summer Internship- students have to complete 4 weeks internship during the summers and submit a completion certificate.								
Semester-VI								
S. No.	**Category of Course**	**Course Code**	**Course**	**L**	**T**	**P**	**C**	**Hours/ We ek**
1.	**Major-XII**	BPCVT601	Perfusion Technology	3	1	0	4	4
2.	**Major-XIII**	BPCVT602	Principles of Ultrasonogr aph y	3	1	0	4	4
3.	**Major-XIV**	BPCVT603	Advanced Cardiac Catheterization	3	1	0	4	4
4.	**Minor-V**	BPAH604	Hospital Administration	3	0	0	3	3
5.	**Minor-VI**	BPAH605	Research Methodology & Biostatistics	3	0	0	3	3
6.	**Major -XII (Practical)**	BPCVT651	Perfusion Technology	0	0	2	1	2
7.	**Major -XIII (Practical)**	BPCVT652	Principles of Ultrasonogr aphy	0	0	2	1	2
8.	**Major -XIV (Practical)**	BPCVT653	Advanced Cardiac Catheterization	0	0	2	1	2
9.	**Minor-V (Practical)**	BPAH654	Hospital Administration	0	0	2	1	2
Total				**15**	**3**	**8**	**22**	**26**

Bachelor's Degree (Honours) Semester-VII							
S. No.	**Category of Course**	**Course Code**	**Course**	**L**	**T**	**P**	**C**
1	##Internship I	BPCVT751	Internship	**0**	**0**	40	20
Total						40	20
Bachelor's Degree (Honours) Semester-VIII							
1	##Internship II	BPCVT851	Internship			40	20
Total						40	20
##The internship will be conducted over a term of one year, mandatory in the VII and VIII semesters. Credits will be awarded upon submission of the internship certificate, dissertation, and successful completion of the viva voce examination..							

Total Credits: 172+1=173

SUMMARY:

S.No	Category Of Courses		Credit Per Course	Total Credit As Per Category		No. Of Courses In the Entire Programme
1.	Major	THEORY	4	56	68	14
		PRACTICAL	1	12		12
2.	MINOR	THEORY	3	18	23	6
		PRACTICAL	1	05		5
3.	MULTIDISCIPLINARY	THEORY	2/3	08	09	3
		PRACTICAL	1	01		1
4.	AEC	THEORY	3	09		3

5.	SEC	THEORY	2	08	11	4
		PRACTICAL	1	03		3
6.	VAC	THEORY	2	08		4
7.	SUMMER INTERSHIP	POSTING	4	04		1
8.	INTERNSHIP AND DISSERTATION	POSTING	20	40		2
	TOTAL			172		58

Semester wise distribution

Semester	Credit Points
I	22
II	21
III	24
IV	22
V	21
VI	22
VII	20
VIII	20
Extra Curricular	1
Total Credits	172+1=173

Total Credits: 172+01=173

The program includes a minimum of 172 credits, plus 1 additional credit for extracurricular activities within the course structure. The credit points assigned for extra curricular shall be submitted to the university, the criteria to acquire this credit point shall be defined by the university from time to time.

Policy for Awarding Extracurricular Credit

Allied Sciences Program

Eligibility & Timeline:

- Students may apply for 1 extracurricular credit at the end of the 4th year before internship completion.
- Credit is awarded once per program based on verified activities throughout the course.

Approved Activities:

Credit may be claimed for:

1. Sports & Cultural Events – State/National/International competitions.
2. Awards/Prizes – Recognition at state, national, or international levels in academics, research, or extracurricular fields.
3. Community Service – NSS, health camps, environmental or social initiatives.
4. Leadership Roles – Student Council, event organizing committees.
5. Professional Development – Research presentations, workshops, conferences.

Requirements:

Submission of:

- Certificates/Award letters
- Event reports (if applicable)
- Faculty mentor recommendation

Approval Process:

1. Program Coordinator – Verifies documents and recommends credit.
2. Academic Coordinator – Reviews and forwards for final approval.
3. Dean – Grants final approval for credit inclusion.

Credit Award:

- Credit is non-graded and recorded in the transcript.
- Maximum: 1 extracurricular credit per student.

Submission Deadline:

- Application with documents must be submitted before internship completion in the 4th year.

14. DETAILED SYLLABUS:

SEMESTER I					
Course Code BPAH101	**Course Title** Human Anatomy & Physiology - I	**L**	**T**	**P**	**C**
Version	2025	**3**	**1**	**0**	**4**
Category of Course	**Major-I**				
Total Contact Hours	45 HRS				

Pre-Requisites/ Co-Requisites	Pre-requisite: Basic knowledge of Biology and Chemistry at 10+2 level. Co-requisite: Medical Terminology and Introduction to Cardiovascular Technology.

Course Perspective :

This course lays the foundation for careers in healthcare and allied sciences by providing essential knowledge of the human body's structure and function. It helps students understand how organ systems work individually and together to maintain health, forming the basis for clinical subjects like pathology and pharmacology. Students gain skills in identifying anatomical structures, understanding physiological processes, and applying this knowledge in real-life healthcare situations—such as interpreting vital signs or recognizing symptoms of common disorders. The course enhances scientific thinking, preparing students for academic growth and professional roles in medical and allied health fields.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: TO **Remember** and recall key anatomical terms, levels of organization, and the names and functions of major body systems.

CO 2: TO **Understand and explain** the structure and functions of cells, tissues, and organ systems, including their roles in maintaining homeostasis.

CO 3: TO **Apply** anatomical and physiological concepts to identify structures and interpret their basic functions in the human body.

CO 4: TO **Apply** knowledge to relate structure to function and identify common disorders associated with dysfunctions in various organ systems.

Course Outline:

Unit number-1	**Title: Fundamentals of Human Anatomy, Physiology, and Cellular Biology**	**No. of hours-8**
Anatomy and physiology basics, body organization, systems, and cell structure. Homeostasis, cell division, signaling, tissues, histology, and clinical case review.		
Unit number-2	**Title: Musculoskeletal System: Structure, Function, and Disorders**	**No. of hours-12**
Bone functions, structure, types, and joint classifications with movements. Muscle types,		

structure, contraction process, and common muscle and skeletal disorders.		
Unit number-3	**Title: Nervous and Endocrine Systems: Structure, Function, and Disorders**	**No. of hours-8**
Nervous system organization, neuron function, brain, spinal cord, reflexes, and common disorders. Endocrine glands, hormones, regulation, disorders, with case studies and quizzes.		
Unit number-4	**Title: Cardiovascular and Respiratory Systems: Anatomy, Physiology, and Disorders**	**No. of hours-8**
Heart anatomy, blood vessels, blood components, and types of circulation. Respiratory system structure, gas exchange, and common cardiovascular and respiratory disorders.		
Unit number-5	**Title: Digestive, Urinary, and Reproductive Systems: Structure, Function, and Disorders**	**No. of hours-9**
Digestive system organs, digestion, absorption, and common disorders. Urinary and reproductive system anatomy, functions, hormones, and related disorders.		

Learning Experience:
The course combines interactive lectures, visual aids, hands-on labs, group work, and case studies. Online tools like quizzes, assignments, projects, and case studies, along with attendance tracking and continuous assessment, ensure active participation. Regular feedback supports theoretical and practical skill development in healthcare.

Textbooks:
Ross & Wilson Anatomy and Physiology in Health and Illness, by **Anne Waugh, Allison Grant**, Edition **13th**, published by **Elsevier Health Sciences.**

Suggested Readings:

- **Tortora's Principles of Anatomy & Physiology, by** Tortora, Gerard J.; Derrickson, Bryan, 14th Edition, published by Wiley
- **Human Anatomy and physiology, by** Bhise, S.B ; Yadav, A.V, 6th Edition, published by Nirali Prakashan

Open Educational Resources (OER):
1. https://openstax.org/details/books/anatomy-and-physiology
2. https://opentextbc.ca/anatomyandphysiology/
3. https://med.libretexts.org/Bookshelves/Anatomy_and_Physiolog

Practical

SEMESTER I					
Course Code BPAH151	**Course Title** Human Anatomy & Physiology – I Practical	**L**	**T**	**P**	**C**
Version	2025	**0**	**0**	**2**	**1**
Category of Course	**Major -I (Practical)**				
Total Contact Hours	30 Hrs				
Pre-Requisites/Co Requisites	Pre-requisite: Basic knowledge of high school-level biology, especially human anatomy and physiology Co-requisite: Should be taken alongside introductory practical/lab sessions in anatomy and physiology for hands-on understanding				

Course Perspective :

This course builds a foundational understanding of human anatomy and physiology essential for careers in healthcare. It equips learners with core knowledge of body systems, structures, and functions, enabling clinical reasoning and practical application in diagnostics, patient care, and laboratory practices. The course enhances academic growth, supports professional readiness, and bridges theory with real-world healthcare scenarios.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: Demonstrate major anatomical structures using models/dissections.

CO2: **Observe** and describe physiological functions and systems.

CO3: **Practice** clinical and lab techniques for anatomical/physiological assessment.

CO4: **Adapt** knowledge to applied/simulated clinical or case-based contexts.

Practical Outline:

S.No	Lab Task	Mapped

		CO/COs
1.	Identification of Bones in Upper and Lower Limbs	**CO1,CO2**
2.	Demonstrate Thoracic Cage and Lungs Dissection/Model Study	**CO1,CO2**
3.	Observe Surface Anatomy and Dissection of Heart	**CO1,CO2**
4.	Identification of Coronary Arteries and Major BloodVessels	**CO1,CO2, CO4**
5.	Demonstrate Study of Thoracic and Upper Limb Muscles	**CO1,CO2, CO3**
6.	Understand Muscle Palpation and Surface Marking	**CO3,CO4**
7.	Measure Vital Signs.	**CO1,CO2**
8.	Perform Hemoglobin by Sahli's Method & CMG method.	**CO2,CO4**
9.	Perform Total RBC count,total leucocyte count, differential leucocyte count.	**CO1,CO2**
10.	Perform Calculation of Packed Cell Volume(PCV) &Red cell indices.	**CO2,CO3, CO4**

Open Educational Resources (OER):

1. https://www.youtube.com/playlist?list=PL8dPuuaLjXtOAKed_MxxWBNaPno5h3Zs8

2. https://www.getbodysmart.com/

3. https://sites.google.com/umich.edu/bluelink/anatomy-labs

SEMESTER I					
Course Code **BPCVT102**	**Course Title** **Basic Electrocardiography**	**L**	**T**	**P**	**C**
Version	2025	**3**	**1**	**0**	**4**

Category of Course	Major
0Total Contact Hours	45 Hours
Pre-Requisites/ Co Requisites	Pre-requisite: Basic knowledge of human anatomy and physiology, especially the cardiovascular system. Co-requisite:concurrent enrollment in a foundational clinical skills or patient assessment course is recommended

Course Perspective :

The Basic Electrocardiography course is designed as an essential foundational module for students pursuing careers in cardiovascular technology and allied health sciences. It provides the theoretical understanding and hands-on skillset needed to accurately record and interpret standard ECGs. Emphasizing clinical relevance, the course enables students to correlate basic cardiac electrical activity with surface ECG tracings, ensuring readiness for more advanced cardiology modules.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: To **recall** the anatomy and electrophysiology of the heart relevant to ECG interpretation

CO2:To **describe** the normal ECG waveform components and standard lead placements

CO3:To **demonstrate** correct electrode placement and ECG machine setup in clinical settings

Course Outline:

Unit number-1	**Tittle: Introduction to Electrocardiography**	**No. of hours-9**

Definition and principles of electrocardiography, ECG machine components (e.g., electrodes, leads, amplifier), Role of electrodes in ECG recording		
Unit number-2	**Tittle: Electrode Placement**	**No. of hours-9**
Electrode placement guidelines (leads I, II, III, aVR, aVL, aVF, V1-V6),Purpose of each lead,Electrode application techniques,Troubleshooting electrode placement issues (e.g., artifact, poor contact)		

Unit number-3	**Tittle: Patient Preparation**	**No. of hours- 10**
Patient positioning,Clothing removal,Skin preparation (e.g., cleaning, shaving),Patient comfort and cooperation, Factors affecting ECG recordings (e.g., muscle movement, electrical interference.		
Unit number-4	**Tittle: ECG Machine Maintenance**	**No. of hours- 8**
Routine maintenance procedures (e.g., cleaning, calibration),Electrode and wire inspection and replacement, Troubleshooting ECG machine problems, Ensuring proper machine function.		
Unit number-5	**Tittle:The Role of Cardiac Care Technicians**	**No. of hours-9**
P wave, QRS complex, T wave,Significance of each waveform,Common ECG abnormalities (e.g., sinus rhythm, atrial fibrillation, ventricular tachycardia),ECG Procedure and Interpretation,ECG procedure steps ECG interpretation (normal and abnormal),ECG documentation, Limitations of ECG interpretation (e.g., sensitivity, specificity).		

Learning Experience:

Students will begin by exploring the components and function of ECG machines, electrode

placement, and lead systems through instructor-led demonstrations and practical lab sessions. As they progress, students engage with real and simulated ECG recordings to practice identifying waveforms, intervals, and segments. The course incorporates hands-on experience with electrode placement on peers or mannequins, calibration procedures,

Textbooks:

An Introduction to Electrocardiography, by **Dr. Leo Schamroth,** Edition **10th**, Published by **Elsevier**

Suggested Readings:

1.**ECG Made Easy,** by John R. Hampton & Joanna Hampton, 9th Edition, Published by Elsevier

2. **Rapid Interpretation of EKG's**, by Dale Dubin, 6th Edition, Published by Cover Publishing Company

Open Educational Resources (OER):

- https://cnx.org/contents/NrXx9aMw@5.1:EjIb5Z5X@1/Electrocardiography
- https://openoregon.pressbooks.pub/ekgtextbook/
- https://med.libretexts.org

SEMESTER I					
Course Code **BPCVT152**	**Course Title** **Basic Electrocardiography Practical**	**L**	**T**	**P**	**C**
Version	2025	**0**	**0**	**2**	**1**
Category of Course	Major				
Total Contact Hours	30 Hrs				
Pre-Requisites/Co Requisites	Pre-requisite:Basic understanding of human cardiovascular anatomy and physiology. **Co-requisite:** Enrollment in or completion of the Basic Electrocardiography (P) course.				

Course Perspective :

This course buildsThis practical course introduces students to the essential hands-on skills required for accurate and safe ECG recording in clinical settings. It emphasizes proficiency in operating ECG machines, correct electrode placement, patient preparation, and identification of basic artifacts. The course is designed to build clinical confidence and prepare students for further cardiovascular diagnostics training.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: **Demonstrate** the parts, placement, and setup of the ECG machine.
CO2: **Observe** and identify normal and abnormal ECG waveforms and patterns.
CO3: **Perform** ECG recordings and calculations accurately and independently.
CO4:**Interpret** ECG results and troubleshoot errors in real or simulated clinical scenarios.

Practical Outline:

S.No	Lab Task	Mapped CO/COs
1.	Introduction to ECG machine, identification and function of ECG machine parts	**CO1,CO2**
2.	Understanding lead configurations: ECG recording and techniques	**CO1,CO2, CO3**
3.	Demonstration of Normal ECG waveform: P wave, PR interval, QRS complex, ST segment, T wave, QT interval	**CO2,CO3, CO4**
4.	Interpretation of ECG paper reading: speed, voltage, calibration, grid interpretation	**CO1,CO2, CO3**
5.	Demonstrate Standard electrode placement: limb leads (RA, LA, RL, LL), chest leads (V1 to V6)	**CO1,CO3**
7.	Observation of Sinus arrhythmia, bradycardia, tachycardia,Atrial fibrillation and atrial flutter,Ventricular tachycardia and fibrillation	**CO2,CO4**
8.	Practising Heart rate calculation using ECG: RR interval, 300 rule, 1500 rule	**CO2,CO3, CO4**
9.	Interpret Myocardial infarction patterns (ST elevation, Q wave)	**CO2,CO4**
10.	Interpret Bundle branch blocks and axis deviations,Heart blocks: first, second, third degree	**CO2,CO4**
11.	Observing Troubleshooting artifacts (motion, muscle tremor, electrical interference)	**CO2,CO3, CO4**
12	Demonstrations/simulations of abnormal ECG patterns	**CO2,CO4**

- **Open Educational Resources (OERs):**
  https://cnx.org/contents/NrXx9aMw@5.1:EjIb5Z5X@1/Electrocardiography
- https://www.skillstat.com/tools/ecg-simulators
- https://www.practicalclinicalskills.com/

SEMESTER I					
Course Code BPAH103	**Course Title** Biochemistry	**L**	**T**	**P**	**C**
Version	2025	3	0	0	3
Category of Course	**Minor-I**				
Total Contact Hours	45 hours				
Pre-Requisites/ Co-Requisites	Pre-requisite: Basic knowledge of Biology and Chemistry at 10+2 level. Co-requisite: Should be taken alongside introductory practical/lab sessions in biochemistry and molecular biology for hands-on understanding.				

Course Perspective :

This course builds a strong scientific foundation for careers in healthcare and allied sciences by exploring the chemical principles underlying biological processes. It helps students understand the molecular structure and function of biomolecules such as carbohydrates, proteins, lipids, and nucleic acids, and how these contribute
to cellular activities and overall body function. Through this understanding, students are better equipped to grasp clinical subjects like pathology, pharmacology, and nutrition. The course develops essential skills in interpreting biochemical reactions, understanding metabolic pathways, and applying this knowledge to real
life healthcare contexts—such as analyzing laboratory results or recognizing biochemical imbalances in disease. It promotes critical scientific thinking and problem-solving, preparing students for further academic learning and professional responsibilities in medical and allied health fields.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: TO **Remember** and **recall** the basic concepts of biochemistry, including the structure and function of biomolecules such as carbohydrates, proteins, lipids, and nucleic acids.

CO 2: TO **Understand** and **explain** key biochemical processes and pathways involved in metabolism, enzyme function, and molecular interactions within the body.

CO 3: TO **Apply** biochemical principles to interpret normal physiological functions and relate them to laboratory findings and clinical scenarios.

CO 4: TO **Analyze** and **evaluate** the biochemical basis of common metabolic disorders and understand how imbalances affect health and disease progression.

Course Outline:

Unit number-1	**Tittle: Introduction to Biochemistry and Carbohydrates**	**No. of hours-10**
Introduction to biochemistry, its scope, branches, career options, and key biomolecules.Carbohydrates: types, structures, properties, derivatives, and their biological importance.		
Unit number-2	**Tittle: Lipids, Proteins, and Nucleic Acids**	**No. of hours-9**
Lipids and fatty acids: types, functions, and clinical relevance. Proteins and nucleic acids: classification, structures, and clinical importance.		
Unit number-3	**Tittle: Enzymes and Hormones**	**No. of hours-8**
Enzymes: nature, types, properties, factors affecting activity, and inhibition. Hormones: classification, action mechanisms, clinical importance, and diagnostic enzymes.		
Unit number-4	**Tittle: Vitamins & Minerals**	**No. of hours-9**
Vitamins: Characteristics, Classification, and functions; Dietary sources; and Clinical aspects Minerals: Key minerals and their importance		
Unit number-5	**Tittle: Metabolic profiles**	**No. of hours-9**
Carbohydrate metabolism(glycolysis),Krebs cycle, Glycogenesis, lipid metabolism,amino acid metabolism, urea cycle		

Learning Experience:

The course combines interactive lectures, visual aids, hands-on labs, group work, and case studies. Online tools like quizzes, assignments, projects, and case studies, along with attendance tracking and continuous assessment, ensure active participation. Regular feedback supports theoretical and practical skill development in healthcare.

Textbooks:

1.**Medical Biochemistry**, by **Bhagvan, N.V, 4th** Edition**, published by** Elsevier

Suggested Readings:

1. **Biochemistry,** by Satyanarayana, U ; Chakrapani, U, 6th Edition, Published by Elsevier.
2. **Biochemistry** by Kulkarni, M.V. et.al, 9th Edition, Published by Nirali Prakashan

Open Educational Resources (OER):

- **https://biochem.science.oregonstate.edu/biochemistry-free-and-easy**
- **https://openstax.org/books/concepts-biology/pages/2-introduction**
- **https://openoregon.pressbooks.pub/biochemistry**

Practical

SEMESTER I					
Course Code BPAH153	**Course Title** Biochemistry Practical	**L**	**T**	**P**	**C**
Version	2025	0	0	2	1
Category of Course	Minor-I (Practical)				
Total Contact Hours	30 Hrs				
Pre-Requisites/Co Requisites	Pre-requisite: Basic knowledge of Biology and Chemistry at 10+2 level. Co-requisite: Must be taken alongside introductory practical/lab sessions in biochemistry for hands-on understanding of biochemical techniques and concepts.				

Course Perspective :

This course lays a foundational understanding of biochemistry essential for careers in healthcare and life sciences. It equips learners with core knowledge of biomolecules, metabolic pathways, enzymatic functions, and molecular interactions that govern cellular processes. The course enables scientific reasoning and supports practical application in diagnostics, pathology, pharmacology, and clinical laboratory practices. It enhances academic development, strengthens professional competence, and bridges theoretical concepts with real-world biomedical and healthcare scenarios.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1 – **Demonstrate** lab setup, equipment use, and safety protocols.

CO2 – **Observe** tests, chemical reactions, and interpret expected outcomes.

CO3 –Accurately **perform** lab techniques, reagent preparation, and biochemical tests

CO4 – Ability to troubleshoot experiments and apply knowledge to identify unknown samples or respond to lab hazards.

Practical Outline:

S.No	Practical Name	CO
1	Laboratory essential practices Essentials of Laboratory Operations: Introduction to biochemistry laboratory, Common glassware, equipment, chemicals and reagents.	**CO1,CO2**
2	Laboratory safety: Introduction to safety guidelines and laboratory discipline, Bioethical considerations in the laboratory, Laboratory waste management	**CO1,CO4**
3	SOPs of Laboratory instruments: Adherence to safety protocols, handling of hazardous chemicals and equipment, emergency procedures and knowledge of safety equipment and techniques.	**CO1,CO3, CO4**
4	Sterilization techniques: Adherence to safety protocols while using various sterilization techniques in biochemistry, Heat, chemical and pressure-based sterilization techniques.	**CO1,CO2, CO4**
5	Preparing Reagents and Chemicals: Dilution and mixing techniques, error minimizing, and measurement of chemicals.	**CO1,CO3**
6	Test for macronutrients Test for Carbohydrates: Identification of known and unknown carbohydrates using various reagents and identification methods. Investigative analysis of unknown carbohydrates.	**CO3,CO2, CO4**
7	Test for Proteins: Identification of known and unknown proteins using various reagents and identification methods. Investigative analysis of unknown proteins.	**CO2,CO3, CO4**
8	Investigative Analysis of Unknown nutrients Unknown Sample Investigation: Comprehensive practical investigation to determine the nature of unknown samples.	**CO2,CO3, CO4**

SEMESTER I					
Course Code BPAH104	**Course Title** Professional Communication and Soft Skills in Healthcare I	**L**	**T**	**P**	**C**
Version	2025	3	0	0	3
Category of Course	**Ability Enhancement course-I** **AEC-I**				
Total Contact Hours	45 Hrs				
Pre-Requisites/ Co Requisites	Pre-requisite: Basic English understanding. Co-requisite: Should be taken alongside practical sessions to develop effective communication, interpersonal skills, and professionalism in healthcare settings.				

Course Perspective :

The course aims to develop effective communication skills among healthcare professionals to enhance patient care, interdisciplinary collaboration, and professional relationships. By the end of the course, students should be able to understand the importance of communication in healthcare settings, demonstrate empathy and active listening, communicate clearly and respectfully with patients and colleagues, and resolve conflicts constructively.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: Understanding the Importance of Communication in Healthcare

CO 2: Enhancing Verbal and Nonverbal Communication Skills

CO 3: Building Effective Interdisciplinary Communication

CO 4: To inherit the skills of Time management

Course Outline:

Unit number-1	**Tittle: FIRST IMPRESSION**	**No. of hours-12**
First Impression, Personal Hygiene, Personal Grooming, Uniform Guidelines, Grooming Kit, Quick Fixes / Hacks		
Unit number-2	**Tittle: NON-VERBAL COMMUNICATION: BODY LANGUAGE AND POSH**	**No. of hours-9**
Body Language, Sexual Harassment		
Unit number-3	**Tittle: IMPORTANCE OF COMMUNICATION**	**No. of hours-8**
Communication, English Language		
Unit number-4	**Tittle: CONSONANT AND CONSONANT SOUNDS**	**No. of hours-8**
English Language: Consonants, What are Consonants and Consonant Sounds?, Conclusion, Practice Time		
Unit number-5	**Tittle: VOWELS**	**No. of hours-8**
English Language: Vowels, Conclusion, Practice Time, Syllables & Syllable Stress, Conclusion, Practice Time, Listening, Conclusion, Reading, Conclusion		

Learning Experience:

The course combines interactive lectures, visual aids, hands-on labs, group work, and case studies. Online tools like quizzes, assignments, projects, and case studies, along with attendance tracking and continuous assessment, ensure active participation. Regular feedback supports theoretical and practical skill development in healthcare.

Textbooks:

1.**Health Communication: Strategies for Healthcare Professionals,** by **Michael P. Pagano, 1st** Edition, Published by **Springer**

Suggested Readings:

1.**Professional Communication,** by Raman, M, 3rd Edition, published by Oxford University Press, New Delhi.

2.**Communication and Soft Skill Development**, by Oswal, R.J., Antre, R.V, 3rdEdition, published by Nirali Prakashan

Open Educational Resources (OER):

1.**MacEwan Open Books** – for Professional Communication Skills PDF

2.**FutureLearn – Interpersonal Skills at Work** – Free course on professional communication in healthcare and workplace.

3.**OpenWHO – Communicating with Patients about Vaccination** – WHO course on patient centered communication.

SEMESTER I					
Course Code BPAH105	**Course Title** Introduction to Quality and patient safety	**L**	**T**	**P**	**C**
Version	2025	2	0	0	2
Category of Course	**Skill Enhancement Course -I** **SEC-I**				
Total Contact Hours	30				
Pre-Requisites/ Co Requisites	Pre-requisite: General healthcare understanding. Co-requisite: Should be taken alongside practical sessions on quality improvement tools and patient safety protocols for hands-on application.				

Course Perspective :

Upon completion, Students should be able to apply healthcare quality improvement and patient safety principles, concepts, and methods at the micro-, meso-, and macro-system levels.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: To understand the basics of emergency care and life support skills.

CO 2: To Manage an emergency including moving a patient

CO 3: To help prevent harm to workers, property, the environment and the general public.

CO 4: To provide knowledge on the principles of on-site disaster management

Course Outline:

Unit number-1	**Tittle: Quality assurance and Management**	**No. of hours-4**
Concepts of Quality of Care, Quality Improvement Approaches, Standards and Norms, Quality Improvement Tools & Introduction to current NABH guidelines		
Unit number-2	**Tittle: Basics of emergency care and Life support**	**No. of hours-8**
Vital signs, primary assessment, and basic emergency care including first aid and triage. CPR techniques, use of bag-valve masks, AED operation, and emergency patient management.		
Unit number-3	**Tittle: Bio medical waste management and environment safety**	**No. of hours-6**
Biomedical waste: definition, segregation, collection, transport, treatment, disposal, and color coding.Waste minimization, PPE use, disinfection methods, modern technologies, and infection control.		
Unit number-4	**Tittle: Infection prevention**	**No. of hours-4**
Use of PPE and infection control devices to prevent cross infections. Healthcare-associated infection prevention, infection control programs, and NABH/JCI guidelines.		
Unit number-5	**Tittle: Antibiotic Resistance. Disaster Management**	**No. of hours-\8**
History of antibiotics, mechanisms and types of resistance, and trends in drug resistance. Consequences of resistance, bacterial persistence, antibiotic sensitivity, and antimicrobial stewardship in hospitals. Basics of emergency management, psychological impact, and resource planning. Preparedness, risk reduction, and key response roles in public health, logistics, governance, and recovery.		

Learning Experience:

The course combines interactive lectures, visual aids, hands-on labs, group work, and case studies. Online

tools like quizzes, assignments, projects, and case studies, along with attendance tracking and continuous assessment, ensure active participation. Regular feedback supports theoretical and practical skill development in healthcare.

Textbooks:

1. **Introduction to Healthcare Quality Management"** by **Patrice L. Spath, MA, RHIT & Kenneth A. DeVane, MBA, MS**, 4th **Edition**, published by **Gateway to Healthcare Management**

Suggested Readings:

1. **"Patient Safety: Achieving a New Standard for Care"** by Philip Aspden, Julie A. Wolcott, J. Lyle Bootman and Linda R. Cronenwett, 1st Edition, published by National Academies Press, Washington, D.C.
2. **Patient Safety and Healthcare Improvement at a Glance,** bySukhmeet S. Panesar, Andrew Carson-Stevens, Sarah A. Salvilla & Aziz Sheikh, 1st Edition, published by Wiley-Blackwell

Open Educational Resources (OER):

•https://www.coursera.org/learn/quality-improvement-healthcare

. https://www.ihi.org/education/IHI

.https://www.coursera.org/learn/quality-improvement-healthcare

Practical

SEMESTER I					
Course Code BPAH154	**Course Title** Introduction to Quality and patient safety practical	**L**	**T**	**P**	**C**
Version	2025	0	0	2	1
Category of Course	**Skill Enhancement Course -I** **SEC-I (Practical)**				
Total Contact Hours	30 Hrs				

Pre-Requisites/Co Requisites	Pre-requisite: General healthcare understanding. Co-requisite: Should be taken alongside practical sessions on quality improvement tools and patient safety protocols for hands-on application.

Course Perspective :

This course builds a foundational understanding of human anatomy and physiology essential for careers in healthcare. It equips learners with core knowledge of body systems, structures, and functions, enabling clinical reasoning and practical application in diagnostics, patient care, and laboratory practices. The course enhances academic growth, supports professional readiness, and bridges theory with real-world healthcare scenarios.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: Understand the principles of quality assurance, infection prevention, and waste management in healthcare settings.

CO 2: Demonstrate competence in basic emergency care, life support techniques, and disaster preparedness.

CO 3: Apply knowledge of biomedical waste management and environmental safety to ensure safe healthcare practices.

CO4: Analyze the impact of antibiotic resistance and implement strategies for infection control and antimicrobial stewardship.

Practical Outline:

S.No	Lab Task	Mapped CO/COs
1.	Conduct a mock NABH quality audit.	**CO1,CO3**
2.	Chart and analyze quality indicators (e.g., infection rate).	**CO1,CO4**
3.	Perform root cause analysis (RCA) for a clinical error.	**CO1,CO4**
4.	Demonstrate the PDCA cycle for quality improvement.	**CO1**
5.	Measure and record vital signs (TPR & BP).	**CO2**
6.	Perform a primary survey using the ABCDE approach.	**CO2**
7.	Practice CPR on adult and child mannequins.	**CO2**

8.	Use a bag-valve-mask for assisted ventilation.	**CO2**
9.	Simulate AED usage during cardiac arrest.	**CO2**
10.	Demonstrate basic first aid techniques.	**CO2**
11.	Conduct a triage drill with color-coded tags.	**CO2**
12.	Practice biomedical waste segregation by color coding.	**CO1,CO3**
13.	Demonstrate proper donning and doffing of PPE.	**CO1,CO3**
14.	Prepare and use disinfectants for surface cleaning.	**CO1,CO3**
15.	Simulate collection and transport of biomedical waste.	**CO1,CO3**
16.	Demonstrate sterilization using an autoclave.	**CO1,CO3**
17.	Practice WHO's hand hygiene techniques.	**CO1,CO3**
18.	Use infection control devices (e.g., sharps container).	**CO1,CO3**
19.	Simulate HAI identification and surveillance.	**C01,CO4**
20.	Demonstrate antibiotic sensitivity testing (AST).	**CO4**
21.	Role-play antimicrobial stewardship decision-making.	**CO1,CO4**

Open Educational Resources (OER):

1. https://www.who.int/teams/integrated-health-services/patient-safety
2. https://www.coursera.org/learn/quality-improvement-healthcare
3. https://www.ahrq.gov/patient-safety/index.

SEMESTER I					
Course Code BPAH106	**Course Title** Healthcare Informatics and Data Analytics	**L**	**T**	**P**	**C**
Version	2025	2	0	0	2
Category of Course	**Value Added Course-I** **VAC I**				
Total Contact Hours	30 Hrs				

Pre-Requisites/ Co Requisites	Pre-requisite: Familiarity with basic computer use. Co-requisite: Must be taken alongside theory classes to apply data collection, electronic health record (EHR) usage, and analytics tools for healthcare decision-making.

Course Perspective :

To integrate technology with healthcare, analyze healthcare data to improve outcomes, enhance decision making, optimize processes, and facilitate evidence-based practices for better patient care.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: Understand the role of informatics in healthcare delivery.

CO 2: Gain proficiency in healthcare information systems and technologies.

CO 3: Learn data collection, storage, and retrieval methods in healthcare settings.

CO 4: Develop skills in data analysis and interpretation for improving healthcare outcomes.

Course Outline:

Unit number-1	**Tittle: Introduction to Healthcare Informatics**	**No. of hours-6**
What is Informatics? Informatics in Various Industries, Data, Information, Knowledge, and Wisdom (DIKW Pyramid),Information Systems: Components, Processes, and Outputs, How Informatics Helps in Decision-Making Key Technologies in Informatics: Databases, Networks, and Software Applications.		
Unit number-2	**Tittle: Fundamentals of Healthcare Informatics**	**No. of hours-5**
Healthcare Informatics: Definition and Importance ,Key Components of Healthcare Informatics Healthcare Workflows Where Informatics Plays a Role ,Examples of Informatics Improving Patient Care		
Unit number-3	**Tittle: Data in Healthcare**	**No. of hours-6**
Types of Healthcare Data ,Sources of Healthcare Data Methods of Data Collection,Data Accuracy, Privacy, and Security in Healthcare Healthcare Data Standards: HL7, ICD-10, SNOMED,Challenges in Managing Healthcare Data:		

Interoperability and Consistency Challenges in Maintaining Patient Confidentiality During Data Collection and Sharing		
Unit number-4	**Tittle: Basics of Data Analysis for Allied Healthcare**	**No. of hours-6**
Basics of Data Analysis ,Healthcare Data Analysis ,Excel: A Simple Tool for Data Analysis,Basic Statistics: Averages and Trends in Healthcare Data Analysing Patient Appointment Trends: A Practical Use Case,Monitoring Inventory of Medical Supplies: A Use Case,Evidence-Based Practice in Healthcare Ethical Concerns in Predictive Analytics in Patient Care		
Unit number-5	**Tittle: Emerging Trends and Technologies**	**No. of hours-7**
Artificial Intelligence (AI) in Healthcare,Telemedicine and Remote Patient Monitoring,Wearable Health Devices ,Real-World Applications of Emerging Technologies ,Growth of Mobile Health Apps,Challenges of Adopting New Technologies,Ethical Considerations in the Use of Advanced Technologies Future Directions in Healthcare Informatics		

Learning Experience:

The course combines interactive lectures, visual aids, hands-on labs, group work, and case studies. Online tools like quizzes, assignments, projects, and case studies, along with attendance tracking and continuous assessment, ensure active participation. Regular feedback supports theoretical and practical skill development in healthcare.

Textbooks:

1.**Essentials of Health Information Systems and Technology**, by **Jean A. Balgrosky**, **4th** Edition, published by **Jones & Bartlett Learning**

Suggested Readings:

1. **Biomedical Informatics: Computer Applications in Health Care and Biomedicine**, by Edward H. Shortliffe, James J. Cimino, 5th Edition, published by Springer Nature (Springer, Cham / Springer London)
2. **Data Science for Healthcare: Methodologies and Applications**, by Sergio Consoli, Diego Reforgiato Recupero, 1st Edition, published by Springer Nature, Cham, Switzerland

Open Educational Resources (OER):

https://oercommons.org/browse?f.keyword=health-informatics

https://library.fiu.edu/healthinformatics

https://www.aacu.org/oer/research/open-educational-resources-oers-in-health-informatics

https://link.springer.com/chapter/10.1007/978-3-030-53813-2_20

SEMESTER-II

SEMESTER II					
Course Code BPAH201	**Course Title** Human Anatomy & Physiology - II	**L**	**T**	**P**	**C**
Version	2025	**3**	**1**	**0**	**4**
Category of Course	Major				
Total Contact Hours	45 Hours				
Pre-Requisites/ Co-Requisites	Pre-requisite: Successful completion of Human Anatomy & Physiology - I, body systems, tissues, and cellular functions. Co-requisite: To complement theoretical knowledge with hands-on experience.				

Course Perspective :

This course builds upon foundational knowledge from Human Anatomy & Physiology - I to deepen understanding of key body systems essential for health sciences. It emphasizes the integration of anatomy (structure) and physiology (function) to explain how different systems work individually and together to maintain homeostasis. The course prepares students for advanced studies in medical, allied health, and biomedical fields by developing critical thinking and practical skills necessary for clinical applications.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: TO **Understand** and Describe the anatomical structure and physiological function of major human organ systems.
CO 2: TO **Understand and Explain** hormonal functions and reproductive physiology, including disorders.

CO 3: TO **Apply and Illustrate** metabolic pathways and urinary system mechanisms.
CO 4: TO **Apply and Analyze** common disorders related to cardiovascular, immune, respiratory, and digestive systems.

Course Outline:

Unit number-1	**Title:** The Special Senses and the Endocrine System	**No. of hours-08**
The eye and vision: structure, function, and disorders. The ear and hearing: anatomy, hearing mechanism, balance, and disorders. Taste and smell: taste buds, olfactory system, and flavor perception.Touch and proprioception: receptors, body position, and movement coordination. Endocrine glands and hormones: major glands and hormone functions. Hormone action and regulation: mechanisms and feedback. Endocrine disorders: diabetes, thyroid, adrenal issues, symptoms, and treatments.		
Unit number-2	**Title:** The Cardiovascular and Lymphatic Systems	**No. of hours-09**
Blood components and functions, common blood disorders. Heart anatomy, cardiac cycle, electrical activity, output, and related disorders. Blood vessel types, blood flow, pressure regulation, and vascular conditions. Lymphatic system structure and function. Immune system cells, organs, responses, and disorders.		
Unit number-3	**Title:**The Respiratory and Digestive Systems	**No. of hours-10**
The respiratory system, including the nose, airways, and lungs, enables breathing and gas exchange, with oxygen transported by hemoglobin. Pulmonary tests help diagnose conditions like asthma and COPD. The digestive system, comprising organs from the mouth to the intestines and accessory glands, breaks down food with enzymes and absorbs nutrients. Common digestive disorders such as GERD and IBS are diagnosed and treated based on symptoms and clinical evaluation.		
Unit number-4	**Title:**Metabolism, Nutrition, and the Urinary System: Structure, Function, and Regulation	**No. of hours-8**
Metabolism and nutrition: anabolic and catabolic processes, energy production (glycolysis, Krebs cycle, electron transport chain), essential macronutrients and micronutrients, metabolic disorders (diabetes, thyroid disorders, obesity, metabolic syndrome).		

Urinary system: anatomy of kidneys, ureters, bladder, urethra, nephron structure, urine formation (filtration, reabsorption, secretion), regulation of fluid, electrolyte (Na^+, K^+, Ca^{2+}), and acid-base balance, urinary disorders (UTI, kidney stones, chronic kidney disease).		
Unit number-5	**Title:** Reproductive Systems, Development, and Inheritance	**No. of hours-10**
Reproductive system: male anatomy (testes, epididymis, vas deferens, seminal vesicles, prostate, penis), female anatomy (ovaries, fallopian tubes, uterus, vagina, external genitalia). Reproductive hormones: testosterone, estrogen, progesterone, LH, FSH, HCG; menstrual cycle and spermatogenesis regulation. Reproductive processes: fertilization, pregnancy stages, fetal development, childbirth. Reproductive disorders: infertility, PCOS, erectile dysfunction, STDs. Development and inheritance: prenatal stages (zygote, embryo, fetus), postnatal growth, Mendelian genetics, chromosomal inheritance, DNA structure. Developmental disorders: Down syndrome, cystic fibrosis, congenital abnormalities, teratogens.		

Learning Experience:

This course explores the reproductive systems, covering male and female anatomy, reproductive hormones, and processes such as fertilization, pregnancy, and childbirth. It also examines common reproductive disorders and their management. Additionally, students study human development from prenatal to postnatal stages, basic genetics, inheritance patterns, and developmental disorders. Hands-on learning includes anatomical studies, hormone function analysis, and case-based approaches to genetic and reproductive health.

Textbooks:

"Human Anatomy & Physiology" by **Elaine N. Marieb & Katja Hoehn Suggested Readings, 11th Edition,** Published by **Pearson Education**

Suggested Readings:

1. **Anatomy Atlases (for Visual Learning)** by Frank H. Netter, MD, Illustrated 8th Edition (2022).
2. **Principles of Anatomy and Physiology,** 16th Edition (2022), by Gerard J. Tortora & Bryan H. Derrickson
3. **Human Anatomy Laboratory Manual with Cat Dissections** by Elaine N. Marieb, Patricia Brady Wilhelm, Jon B. Mallatt, 9th EditionEdition (2021).

Open Educational Resources (OER):

1.Anatomy and Physiology 2e (OpenStax)
https://openstax.org/books/anatomy-and-physiology-2e/pages/1-introduction

2.Anatomy and Physiology, 2nd Edition
https://openstax.org/books/anatomy-and-physiology-2e

3.Michigan State University OER – Anatomy Modules
https://msuopenbooks.github.io/

SEMESTER II					
Course Code BPAH251	**Course Title** Human Anatomy & Physiology – II	**L**	**T**	**P**	**C**
Version	2025	**0**	**0**	**2**	**1**
Category of Course	Major(Practical)				
Total Contact Hours	30 Hrs				
Pre-Requisites/ **Co-Requisites**	Pre-requisite: Completion of Human Anatomy & Physiology – I theory and practical courses or equivalent foundational knowledge in human biology. Co-requisite: Concurrent enrollment in Human Anatomy & Physiology – II theory course to complement practical sessions and reinforce learning through integrated theory and hands-on experience.				

Course Perspective :

This course offers essential hands-on experience in human anatomy and physiology. You'll gain skills in observing, dissecting, and analyzing anatomical structures and physiological processes, enhancing your understanding of complex body systems for future studies and clinical use.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: Recall and identify major human anatomical structures through models and slides.
CO2: Explain and interpret functional anatomy of internal organ systems

CO3: Analyze structural differences in specialized organs such as sensory systems.
CO4: Apply anatomical knowledge to describe gender-specific structures.
CO5: Evaluate and document observations across multiple systems using models and slides.

Practical Outline:

S.No	Lab Task	Mapped CO/COs
1.	Demonstration on Major Organs through Models and Permanent Slides	**CO1**
2.	Demonstration on Parts of the Circulatory System from Models	**CO1**
3	Demonstration on Parts of the Respiratory System from Models	**CO1**
4	Demonstration on Digestive System from Models	**CO2**
5	Demonstration on an Excretory System from Models	**CO2**
6	Demonstration Structure of Eye and Ear from Models	**CO3**
7	Demonstration on Various Parts of Male & Female Reproductive System from Models	**CO4**
8	Compare Observation using Slides and Models (e.g., organ texture/structure)	**CO5**

Open Educational Resources (OER):
1.OpenStax Anatomy & Physiology Lab Manual – https://openstax.org/details/books/anatomy-and-physiology.
2. The Biology Project – Human Biology Lab Exercises http://www.biology.arizona.edu/human_bio/activities.html.
3. Zygote Body (3D Anatomy for Dissection Practice) https://zygotebody.com/

SEMESTER II					
Course Code BPAH202	**Course Title** Applied Anatomy & Drugs in CVST	**L**	**T**	**P**	**C**
Version	2025	**3**	**1**	**0**	**4**
Category of Course	Major				
Total Contact Hours	45 Hours				

Pre-Requisites/ Co-Requisites	Pre-requisite:Basic knowledge of human anatomy, physiology, and introductory pharmacology. Co-requisite: This course should be taken alongside subjects such as cardiovascular physiology, diagnostic techniques, and clinical practice in CVST.

Course Perspective :

This course is designed to provide students with an applied understanding of human anatomy relevant to cardiovascular function and the pharmacological agents used in the diagnosis and treatment of cardiovascular conditions. It bridges foundational knowledge with clinical application, preparing students to interpret anatomical structures and drug actions in real-world cardiovascular and stroke care settings

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: TO **Understand and Describe** the anatomical and physiological structure of the heart and its electrical conduction system.
CO 2: TO **Understand and Explain** the physiological properties of cardiac muscle and the dynamics of vascular circulation**.**
CO 3: TO **Apply and Identify** coronary anatomy and evaluate pathological conditions affecting coronary circulation.
CO 4: TO **Evaluate** the pharmacology of cardiovascular drugs, their mechanisms, therapeutic uses, and side effects.

Course Outline:

Unit number-1	**Title:** Morphology and Function of the Cardiac System	**No. of hours- 10**
Cardiac anatomy includes chambers, valves, and vessels. Electrical activity of the heart involves the conduction system and electrocardiogram. Normal and abnormal cardiac rhythms include sinus rhythm and arrhythmias.The cardiac cycle consists of systole and diastole. Mechanical function of the heart involves contractility, preload, and afterload.		
Unit number-2	**Title:** Cardiac Muscle Physiology and Vascular Circulation	**No. of hours-10**
Cardiac myocyte structure and function involve the specialized muscle cells of the heart. Cardiac muscle contraction depends on calcium and cross-bridge cycling. Peripheral circulation includes arteries, veins, and capillaries. Coronary circulation covers anatomy and blood flow regulation. Physical activity impacts blood flow and oxygen delivery.		
Unit number-3	**Title:** Coronary Artery Anatomy and Blood Supply	**No. of hours-08**
Coronary artery anatomy includes the left and right coronary arteries and their branches. These arteries supply blood to the heart muscle. Coronary artery disease involves conditions such as atherosclerosis, angina, and myocardial infarction.		
Unit number-4	**Title:** Determinants of Cardiac Output	**No. of hours-08**
Cardiac output determinants include heart rate, stroke volume, preload, and afterload. The Frank-Starling mechanism explains how the heart adjusts stroke volume. Physical activity impacts cardiac output, as do various environmental factors.		
Unit number-5	**Title:** Pharmacology of Cardiovascular Drugs	**No. of hours-09**
Antianginal drugs (nitrates, beta-blockers, calcium channel blockers), anti arrhythmic drugs (sodium channel blockers, beta-blockers, potassium channel blockers), diuretics (loop diuretics, thiazide diuretics, potassium-sparing diuretics), beta-blockers (non-selective, cardioselective). Calcium channel blockers (non-dihydropyridine, dihydropyridine), digitalis glycosides, antihypertensive drugs (ACE inhibitors, angiotensin II receptor blockers, alpha-blockers), anticoagulants (warfarin, heparin), antiplatelet drugs (aspirin, clopidogrel), drug interactions and side effects.		

Learning Experience:

The learning experience in Applied Anatomy and Drugs in CVST combines theoretical understanding with clinical relevance through interactive lectures, visual aids, and case-based discussions. Students engage in identifying cardiovascular structures, understanding drug actions, and applying knowledge in practical settings. Emphasis is placed on critical thinking, integration of anatomy with pharmacology, and preparation for real-world cardiovascular and stroke-related scenarios**.**

Textbook:

"Anatomy & Physiology for Health Professionals" by **Jahangir Moini, 3rd Edition,** Published by **Jones & Bartlett Learning.**

Suggested Readings:

"Cardiovascular Physiology" by Achille G. Grassi, 11th Edition, McGraw-Hill Education.

"Pharmacology for the Health Care Professions" by W. Renée Acosta, 5th Edition, CRC Press.

"Clinically Oriented Anatomy" by Keith L. Moore, Arthur F. Dalley, and Anne M. R. Agur, 8th Edition, Wolters Kluwer.

Open Educational Resources (OER):

1.Anatomy and Physiology – OpenStax (Rice University)
https://openstax.org/books/anatomy-and-physiology/pages/1-introduction

2.Pharmacology Education Project – International Union of Basic and Clinical Pharmacology(IUPHAR)
https://www.pharmacologyeducation.org

3.TeachMeAnatomy
https://teachmeanatomy.info

SEMESTER II					
Course Code BPAH203	**Course Title** Microbiology	**L**	**T**	**P**	**C**
Version	2025	**3**	**0**	**0**	**3**
Category of Course	Minor				
Total Contact Hours	45 Hours				
Pre-Requisites/ Co-Requisites	Pre-requisite: Basic knowledge of Biology, including Cell Biology and Biochemistry, is essential for understanding microbiological concepts. Co-requisite: Courses such as Human Anatomy & Physiology				

SEMESTER II	
	and Biochemistry should be taken alongside Microbiology to provide complementary understanding of microbial interactions within the human body.

Course Perspective :

This course in Microbiology provides foundational knowledge of microorganisms, their classification, structure, and role in health and disease. It equips students with essential laboratory skills for microbial identification, cultivation, and sterilization techniques. Understanding microbiology is critical for healthcare professionals to prevent and control infections, contributing to improved patient care and safety.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: TO **Remember and Recall** microbial classification, nomenclature, and types of microscopes.
CO 2: TO **Understand** how to do sterilization, disinfection, culture media, and culture methods.
CO 3: TO **Apply** how to perform bacterial culture techniques and measure immunity.
CO 4: TO **Analyze** how to differentiate types of immunity, hypersensitivity, and infection transmission.

Course Outline:

Unit number-1	**Title:** General Microbiology: Concepts and Laboratory Techniques	**No. of hours-10**
Introduction and History of Microbiology – History, Classification, Nomenclature and Taxonomy; Microscopy–Different types of Microscopes used in the Laboratory; Sterilization and Disinfection – Sterilizing Agents (Physical and Chemical agents). Testing of Disinfectants, Sterilization and Disinfection in a Healthcare Setting; Culture Media – Types of Media and Special Media employed in the laboratory; Culture Methods – Aerobic and anaerobic culture methods, Methods of Isolating pure cultures of bacteria.		
Unit number-2	**Title:** Clinical Immunology: Principles, Reactions, and Immune Diseases	**No. of hours- 09**
Immunity – Innate or native immunity, Acquired or adaptive immunity, types, Measurement of immunity; Antigen and antibody – Definitions, types, biological classes of antigens and antibodies; Hypersensitivity – Classification and types; Autoimmunity – Definition and Mechanisms, Classification of autoimmune diseases.		

Unit number-3	**Title:** Strategies for Effective Infection Prevention and Control	**No. of hours-08**
Health-care associated infections – Types, sources, modes of transmission, methods to control infection; Infection – Classification, Sources, Methods of transmission, predisposing factors, types of infectious diseases.		
Unit number-4	**Title:** Biomedical Waste: Classification, Handling, and Disposal	**No. of hours-08**
Biomedical waste management – Types and General principles, use of equipment for sterilization, chemicals used in disinfection.		
Unit number-5	**Title:** Fundamentals of Virology and Viral Diseases	**No. of hours- 10**
General properties of viruses, diseases caused and prevention of following viruses – Hepatitis, HIV, Rabies, and Poliomyelitis.		

Learning Experience:

To engage in theoretical learning, gaining knowledge of microbial structure, classification, and immune responses. Hands-on laboratory sessions will develop skills in microscopy, culture techniques, sterilization, and infection control, preparing students for effective clinical and research applications in healthcare.

Textbooks:

"Microbiology: A Clinical Approach",by **Richard McPherson and Matthew Pincus, 3rd edition,** Published by **Garland Science.**

Suggested Readings:

"Manual of Clinical Microbiology" by Karen C. Carroll et al. — ASM Press
"Microbiology and Immunology" by Gerard J. Tortora, Berdell R. Funke, Christine L. Case — Pearson
"Essentials of Microbiology" by Ananthanarayan and Paniker — Universities Press

Open Educational Resources (OER):

1. OpenStax – Microbiology
https://openstax.org/details/books/microbiology
2.Khan Academy – Microbiology
https://www.khanacademy.org/science/health-and-medicine/infectious-diseases
3.CDC – Microbiology and Infectious Diseases Resources
https://www.cdc.gov/microbiology/index.html

SEMESTER II					
Course Code BPAH253	**Course Title** Microbiology practical	**L**	**T**	**P**	**C**
Version	2025	**0**	**0**	**2**	**1**
Category of Course	Minor				
Total Contact Hours	30 Hrs				
Pre-Requisites/ Co-Requisites	Pre-requisite: Basic knowledge of biology, human anatomy and physiology, and lab safety procedures. Co-requisite: Should be taken with Microbiology theory to reinforce concepts through practical application; parallel study of Pathology or Biochemistry is beneficial.				

Course Perspective :

The Microbiology Practical course provides hands-on experience in fundamental microbiological techniques, including staining, culturing, and identifying microorganisms. It complements theoretical learning by developing essential laboratory skills, promoting safety awareness, and enhancing students' ability to analyze and interpret microbial behavior. This course lays the groundwork for further studies and practical work in clinical, research, and diagnostic microbiology.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: Identify and describe laboratory tools and their parts.
CO 2: Understand sterilization equipment and their usage.
CO 3: Perform microbiological staining and motility techniques.
CO4: Analyze diagnostic serological tests for interpretation.
CO5: Evaluate rapid diagnostic tests and clinical markers

Practical Outline:

S.No	Lab Task	Mapped CO/COs
1.	Demonstration on Microscope and its Parts	**CO1**
2.	Demonstration on Glassware Used in Microbiology	**CO1**

3.	Demonstration on Autoclave and Sterilization of Glasswares	**CO2**
4.	Demonstration on Hot Air Oven and Sterilization of Glasswares	**CO2**
5.	To Perform Gram Staining	**CO3**
6.	To Perform Acid Fast Staining (Ziehl-Neelsen Staining)	**CO3**
7.	To Perform Indian Ink Staining	**CO3**
8.	To Perform Hanging Drop Method	**CO3**
9.	To Demonstrate Agglutination Reaction	**CO4**
10	To Perform RA Test	**CO4**
11.	To Perform WIDAL Test	**CO4**
12.	To Perform RPR Test	**CO5**
13.	To Perform CRP Test	**CO5**

Open Educational Resources (OER):

1.Microbiology by OpenStax
https://openstax.org/books/microbiology.
2. PHET Interactive Simulations – Microbiology
https://phet.colorado.edu
3.The Biology Project – University of Arizona (Microbiology Modules)
http://www.biology.arizona.edu/micro

SEMESTER II					
Course Code BPAH204	**Course Title** Fundamentals Computer	**L**	**T**	**P**	**C**
Version	2025	**2**	**0**	**0**	**2**
Category of Course	MDP				
Total Contact Hours	30 Hours				
Pre-Requisites/	Pre-requisite: Basic understanding of English and				

Co-Requisites	mathematics at the high school level to grasp fundamental computer concepts effectively. Co-requisite: Introduction to Information Technology alongside may enhance understanding for students new to the subject.

Course Perspective :

The Fundamentals of Computer course provides a foundational understanding of computer systems, including hardware, software, operating systems, and basic applications. It equips students with essential digital skills needed for academic, professional, and everyday use, laying the groundwork for advanced study in computer-related fields.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: TO **Understand and Explain** the basic components, characteristics, generations of computers, and classify input/output devices**.**

CO 2: TO **Describe** the functions of CPU, memory, and storage devices, and **Demonstrate** basic document creation and formatting using MS Word.

CO 3: TO **Apply and Explain** spreadsheet and presentation tools (MS Excel and PowerPoint) for data organization and communication, basic operating system concepts and DOS commands.

CO 4: TO **Apply and Perform** essential Windows operations, applications of computers across various fields.

Course Outline:

Unit number-1	**Title:** Introduction and Types of computer devices	**No. of hours-06**
Introduction, characteristics of computer, block diagram of computer, generations of computer,computer languages. Input output devices: input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices (monitors, pointers, plotters, screen image projector, voice response systems).		
Unit number-2	**Title:** Memory and Operating Systems	**No. of hours-06**
The Central Processing Unit (CPU), main memory. Storage Devices: sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices. Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.		

Unit number-3	**Title:** Worksheet and DOS Management	**No. of hours-08**
Introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs. Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs. Introduction of Operating System: introduction, operating system concepts, types of operating system. Introduction to MS-DOS: History of DOS, features of MS-DOS, MS-DOS Commands (internal and external).		
Unit number-4	**Title:** Internet sources and its applications	**No. of hours-10**
History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.). Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network. Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet. Application of Computers in various fields: Medical, Education, Railway, Defense, Industry, Management, Sports, Commerce, Internet.		

Learning Experience:

The Fundamentals of Computer course offers a hands-on learning experience through interactive lectures, practical sessions, and real-world applications. Students engage with basic computer operations, software tools, and internet usage, fostering digital literacy and problem-solving skills essential for modern academic and professional environments.

Textbooks:

"Computer Fundamentals", by **Pradeep K. Sinha & Priti Sinha, 8th Edition,** Published by **BPB Publications**

Suggested Readings:

- **"Fundamentals of Computers"** by V. Rajaraman**,** 6th Edition— PHI Learning
- **"Computer Basics Absolute Beginner's,"** by Michael Miller, 10th Edition(2022)—Que Publishing
- **"Operating System Concepts" ,** by Abraham Silberschatz, Peter B. Galvin, Greg Gagne, 10th Edition, Wiley (formerly Addison-Wesley)

Open Educational Resources (OER) :

1. **"**Computer Science: An Interdisciplinary Approach"
   https://introcs.cs.princeton.edu
2. "Introduction to Computers and Information Technology"
   https://open.umn.edu/opentextbooks

3. “GCFGlobal – Computer Basics”
https://edu.gcfglobal.org/en/computerbasics/

SEMESTER II					
Course Code BPAH254	**Course Title** Fundamentals Computer	**L**	**T**	**P**	**C**
Version	2025	**0**	**0**	**2**	**1**
Category of Course	MDP-I Practical				
Total Contact Hours	30 Hrs				
Pre-Requisites/ Co-Requisites	Pre-requisite: Basic literacy, numeracy skills, and a foundational understanding of computer concepts . Co-requisite: This course should be taken alongside the practical to reinforce theoretical knowledge through hands-on application.				

Course Perspective :

This course provides hands-on experience with basic computer operations, internet usage, and common office applications. It aims to build practical skills in word processing, spreadsheets, presentations, and database management

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: Remember and Recall basic concepts and commands related to operating systems and office applications**.**
CO2: Understand and Explain the functions of common software tools such as web browsers, email, and office applications.
CO3: Apply and Perform commands and tools to perform tasks in DOS, MS Word, Excel, PowerPoint, and Access
CO4: **Analyze** document, spreadsheet, and presentation requirements to choose appropriate tools and features
CO5: Evaluate the effectiveness of formatting, design, and functionality in created documents, graphs, and presentations.

Practical Outline:

S.No	**Lab Task**	**Mapped CO/COs**
1.	Using basic DOS commands	**CO1**

2.	Using external DOS commands	**CO1**
3.	Creating an email account	**CO2**
4.	Using web browser for searching and surfing	**CO2**
5.	Creating and formatting a document in MS Office	**CO3**
6.	Using autocorrect, auto text, and spell check operation in MS Office	**CO3**
7.	Create tables in MS Word	**CO3**
8.	Inserting different kinds of objects in MS Word	**CO3**
9.	Use mail merge options in MS Office	**CO3**
10	Create an Excel worksheet with alignment options	**CO4**
11.	Using Excel formulas	**CO4**
12.	Create a graph with available data in MS Excel	**CO4**
13.	Create a PPT presentation using AutoContent Wizard	**CO5**
14.	Use Clip Art, animation effects, and WordArt galleries in presentations	**CO5**
15.	Using transitions and setting timings for slide show	**CO5**
16.	Use MS Access to create database and tables	**CO5**

Open Educational Resources (OER):

1. Digital Literacy Course – Government of India
   https://www.digilocker.gov.in
2. GCFGlobal – Free Computer Training
https://edu.gcfglobal.org/en/
3.Khan Academy – Computing Fundamentals
   https://www.khanacademy.org

SEMESTER II					
Course Code BPAH205	**Course Title** Professional Communication and Soft Skills in Healthcare II	**L**	**T**	**P**	**C**
Version	2025	**3**	**0**	**0**	**3**
Category of Course	AEC				

Total Contact Hours	45 Hours
Pre-Requisites/ Co-Requisites	Pre-requisite: Successful completion of Professional Communication and Soft Skills in Healthcare I. Co-requisite: To boost practical communication and soft skills in clinical settings, consider courses like Healthcare Ethics, Patient Care and Safety, or Interpersonal Skills in Healthcare.

Course Perspective :]

This course aims to enhance students' professional communication and interpersonal skills tailored to healthcare environments. It focuses on developing empathy, cultural sensitivity, active listening, conflict resolution, and teamwork abilities. Emphasis is placed on real-world application through patient interaction, peer collaboration, and ethical communication, preparing students for effective and compassionate healthcare delivery.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1:Demonstrate effective communication skills for handling difficult conversations, delivering bad news, and resolving conflicts in a healthcare setting.

CO 2: Explain professional etiquette, cultural sensitivity, and empathy to build positive rapport with patients and their families.

CO 3: Apply effectively within healthcare teams by understanding team dynamics, roles, and managing group interactions.

CO 4: Develop critical thinking, emotional intelligence, and self-management strategies to handle stress, prioritize tasks, and make informed decisions in clinical environments.

Course Outline:

Unit number-1	**Title: Foundational Communication Skills**	**No. of hours-9**
What is a Question?, Practice Time, The Power of Written Communication in the Medical Field, Communication Styles		
Unit number-2	**Title: Handling Complex Interactions in Healthcare**	**No. of hours-9**
Communication: Handling Difficult Conversations, Conclusion, Practice Time		
Unit number-3	**Title: Professionalism and Social Etiquette in Healthcare**	**No. of hours-9**
General Etiquette and Mannerisms, Section 01: Courtesy, Section 02: Manners & Etiquette, Social Media Conduct, Section 03: Etiquette of Workplace Friendships		
Unit number-4	**Title: Empathy and Bedside Manner in Patient Care**	**No. of hours-9**
Treat Patients Like People, Not Cases, Demonstrating Bedside Manners, Empathy: Walk a Mile in Their Shoes, The Paradox of Patient Care: Clinical Excellence vs. Patient Experience, Resolving the Paradox, Empathy vs. Sympathy,Practice Time		
Unit number-5	**Title: Personal Development and Teamwork**	**No. of hours-9**
Building Values,Teamwork: Collaboration, Time Management, Problem Solving & Decision Making, Mental Health: Cultivating Resilience and Growth, Enhance Emotional Intelligence, Frustration: A Common Human Emotion		

Learning Experience:

Students will engage in interactive activities such as role-plays, group discussions, case studies, and simulations to practice and refine communication and interpersonal skills. Emphasis will be placed on real-world healthcare scenarios to enhance empathy, teamwork, and professionalism in patient and peer interactions.

Textbooks:

"Health Communication for Health Care Professionals: An Applied Approach", by **Michael P. Pagano, PhD, PA-C, 1st Edition,** Published by **Springer Publishing Company.**

Suggested Readings:

Communication Skills for the Healthcare Professional by Laurie Kelly McCorry & Jeff Mason, 2nd Edition, Enhanced
Health Communication for Health Care Professionals: An Applied Approach by Michael P. Pagano,1st Edition
Therapeutic Communication: Knowing What to Say When by Paul L. Wachtel, 1st Edition.

Open Educational Resources (OER):

1. Communication Skills – OER Commons
https://www.oercommons.org

2.Health Communication: Effective Communication in the Healthcare System
https://learn.saylor.org/course/view.php?id=379

3.Interpersonal Skills by College of the Canyons
https://www.canyons.edu

SEMESTER II					
Course Code BPAH206	**Course Title** Self Awareness	**L**	**T**	**P**	**C**
Version	2025	**2**	**0**	**0**	**2**
Category of Course	VAC				
Total Contact Hours	30HRS				
Pre-Requisites/ Co-Requisites	Pre-requisite: Basic psychology, personal development, and communication skills. Familiarity with reflective thinking and				

	emotional intelligence concepts. Co-requisite: Students are encouraged to take complementary courses like Emotional Intelligence, Stress Management, or Professional Development to enhance the practical application of Self Awareness.

Course Perspective :

The course on Self Awareness is designed to foster a deeper understanding of one's thoughts, emotions, values, and behaviors in both personal and professional contexts. It emphasizes introspection, mindfulness, and reflective practices to enhance emotional intelligence, decision-making, and interpersonal relationships. Through interactive sessions, self-assessment tools, and experiential learning, the course prepares students to become more empathetic, responsible, and self-regulated individuals. It supports overall personal development and serves as a vital foundation for leadership, teamwork, and ethical conduct in healthcare and allied health professions.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: Remember and articulate their personal strengths, weaknesses, values, and beliefs through self-reflection and assessment tools.
CO 2: Understand improved emotional intelligence, including self-regulation, empathy, and interpersonal communication skills.
CO 3: Apply goal-setting strategies and motivational techniques to enhance personal and professional development.
CO 4: Evaluate mindfulness and self-care techniques to manage stress and maintain mental well-being in daily life.

Course Outline:

Unit number-1	**Title: Introduction to Self-Awareness**	**No. of hours- 6**
Meaning and importance of self-awareness, Johari Window model, Types of self-awareness (internal vs external), Self-concept, self-image, self-esteem, Reflection exercises and self-assessment tools.		
Unit number-2	Title: **Personality and Emotional Intelligence**	**No. of hours- 7**
Understanding personality types (MBTI, Big Five, etc.), Emotional intelligence: definition and domains (Daniel Goleman's model), Managing emotions and stress, Developing empathy and self-regulation, Case studies and role plays		

Unit number-3	Title: **Values, Beliefs, and Attitudes**	**No. of hours- 5**
Core values and how they shape behaviour, Understanding beliefs, biases, and assumptions, Value clarification techniques, Attitude formation and change, Group activities and personal reflection		
Unit number-4	Title: **Self-Motivation and Goal Setting**	**No. of hours- 5**
Concept of intrinsic vs extrinsic motivation, SMART goal setting, Building resilience and a growth mindset, Time management and overcoming procrastination, Creating a personal development plan		
Unit number-5	**Title: Mindfulness and Self-Care Practices**	**No. of hours- 7**
Mindfulness: concepts and practices, Techniques for managing anxiety and building focus, Importance of physical, emotional, and mental self-care, Work-life balance in healthcare professions, Guided meditation and journaling practices		

Learning Experience:

Students will explore their values, emotions, and behaviors through journaling, discussions, assessments, and mindfulness. Activities like role-play and peer feedback will enhance self-awareness, empathy, and emotional regulation for personal and professional growth.

Textbooks:

"Self-Awareness (HBR Emotional Intelligence Series)", by **Harvard Business Review, 1st Edition (2018),** Published by **Harvard Business Review Press**

Suggested Readings:

- **"Mindset: The New Psychology of Success,"**by Carol S. Dweck**,**25th Anniversary Edition(2021)—Bloomsbury
- **"The Gifts of Imperfection,"** by Brené Brown, 10th Anniversary Edition (2020)—Hazelden
- **"The Seven Habits of Highly Effective People: Powerful Lessons in Personal Change" ,** by Stephen R. Covey, 30th Anniversary Edition (2020)—Simon & Schuster

Open Educational Resources (OER) :

1. **"**Self-Awareness: How to Develop Emotional Intelligence"
   https://positivepsychology.com/self-awareness/
2. "The Science of Well-Being" – Yale University's
   https://www.coursera.org/learn/the-science-of-well-being
3. "Emotional Intelligence" – by University of California, Berkeley (edX)
   https://www.edx.org/course/emotional-intelligence-at-work

SEMESTER-III

SEMESTER III					
Course Code BPCVT301	**Course Title** Cardiovascular Disorders	**L**	**T**	**P**	**C**
Version	2025	**3**	**1**	**0**	**4**
Category of Course	Major				
Total Contact Hours	45 Hours				
Pre-Requisites/ Co-Requisites	Pre-requisite: Successful completion of Human Anatomy and Physiology I & II to understand the cardiovascular system. Knowledge of Basic Pathology, Medical Terminology and Pharmacology. Co-requisite: Courses like Clinical Microbiology, Diagnostic Techniques, and Advanced Pharmacology complement this subject by enhancing knowledge of infections, diagnostic tools, and drug therapy.				

Course Perspective :

The course offers a focused understanding of common and critical conditions affecting the heart and circulatory system. It equips students with theoretical knowledge and clinical relevance necessary for identifying, managing, and assisting in the treatment of cardiovascular diseases. The course emphasizes the integration of anatomy, physiology, pathology, diagnostics, and pharmacology to build a comprehensive approach to cardiovascular care.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: To **Remember** the anatomical structures and physiological functions of the cardiovascular system.

CO 2: TO **Understand and Describe** the diagnostic procedures and tools used in the assessment of cardiovascular conditions.

CO 3: TO **Apply** foundational pharmacological knowledge to understand drug actions used in cardiovascular treatments.

CO 4: TO **Understand** the pathophysiology of major cardiovascular diseases such as hypertension, myocardial infarction, and heart failure.

Course Outline:

<table>
<tr><td>Unit number-1</td><td>Title: Valvular Heart Disorders and Coronary Artery Disease: A Clinical Approach</td><td>No. of hours-10</td></tr>
<tr><td colspan="3">Valvular heart diseases (rheumatic fever and rheumatic heart disease), aortic and mitral valve disorders, combined and tricuspid valve disease, and infective endocarditis.

Introduction to coronary artery disease, angina pectoris, myocardial infarction, and their medical and surgical management. Acquired valvular heart disease.</td></tr>
<tr><td>Unit number-2</td><td>Title: Integrated Approach to Hypertension, Heart Failure, and Myocardial Disorders</td><td>No. of hours-12</td></tr>
<tr><td colspan="3">Essential and secondary hypertension, its management through lifestyle changes, medications, and the DASH diet. Includes pulmonary hypertension and pulmonary thromboembolism.
Focus on heart failure—left, right, and biventricular—covering pathophysiology, causes, symptoms, and both medical and surgical treatments. Discusses cardiomyopathies (dilated, hypertrophic, restrictive) and myocarditis.</td></tr>
<tr><td>Unit number-3</td><td>Title:Comprehensive Approach to Cyanotic and Acyanotic Congenital Heart Diseases and Pericardial Diseases</td><td>No. of hours-13</td></tr>
<tr><td colspan="3">Acyanotic congenital heart diseases (ASD, VSD, PDA, coarctation of aorta) and cyanotic congenital heart diseases (TOF, DORV, pulmonary atresia, TGA, TAPVC), along with their clinical features and management.
Pericardial disorders such as pericardial effusion, constrictive pericarditis, cardiac tamponade, and the procedure of pericardiocentesis.</td></tr>
</table>

Unit number-4	**Title:** Emergency and Vascular Care: Peripheral Vascular Disease and Cardiac Arrest	**No. of hours-10**
Atherosclerotic peripheral vascular disease, aortic aneurysms, aortic dissection, and Takayasu's arteritis. Covers cardiac arrest with classification, 6 H's and 6 T's, signs, symptoms, diagnosis, and treatment. Also includes an overview of COPD, covering causes, stages, clinical features, diagnosis, and management.		

Learning Experience:

Students will engage in a comprehensive exploration of cardiovascular disorders, including valvular diseases, coronary artery disease, hypertension, heart failure, congenital heart defects, pericardial diseases, peripheral vascular disease, and cardiac emergencies. Through a blend of theoretical knowledge and practical case analyses, learners will develop a clear understanding of disease mechanisms, clinical features, diagnostic methods, and current treatment protocols.

Textbooks:

Clinical Cardiology Made Ridiculously Simple by **Michael A. Chizner, 6th Edition**

Published by **MedMaster, 2014**

Suggested Readings:

- **Cardiovascular Physiology Concepts** by Richard E. Klabunde, 2nd Edition, 2015 — Lippincott Williams & Wilkins
- **Essentials of Cardiovascular Disease,** by Michael H. Crawford, Bruce F. Lindsay, ,4th Edition (2019) — Elsevier
- **Heart Disease: Clinical Cases and Pearls,** by Iqbal Malik, 1st Edition —Wolters Kluwer

Open Educational Resources (OER):

1. MERLOT – Health Sciences (Cardiology)
https://www.merlot.org/merlot/index.htm
2.MedlinePlus – Heart Diseases
https://medlineplus.gov/heartdiseases.html
3. American Heart Association – Professional Education Hub
https://professional.heart.org

SEMESTER III					
Course Code	**Course Title**	**L**	**T**	**P**	**C**
BPCVT351	Cardiovascular Disorders				

Version	2025	**0**	**0**	**2**	**1**
Category of Course	Major				
Total Contact Hours	30 Hours				
Pre-Requisites/Co-Requisites	Pre-requisite: Basic knowledge of cardiovascular anatomy and physiology, pathology, medical terminology, and vital signs monitoring using instruments. Co-requisite: To be taken alongside or after the Cardiovascular Disorders theory course covering disease mechanisms, diagnostics, ECG interpretation, and cardiac pharmacology.				

Course Perspective :

This practical course offers hands-on experience in diagnosing and managing cardiovascular disorders through ECG interpretation, cardiac monitoring, and emergency simulations. It integrates anatomical knowledge with clinical skills to build competence in cardiac assessment, intervention, and emergency response.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: To **Recall** cardiac anatomy and common cardiovascular conditions
CO 2: To **Understand** basic cardiac tests and procedures.
CO 3: To **Apply** diagnostic tools and interpret cardiological data.
CO4: To **Analyze** clinical parameters and lab results in cardiac cases.
CO5: To **Evaluate** emergency protocols and patient documentation

Practical Outline:

S.No	Lab Task	Mapped CO/COs
1.	Demonstration of Cardiac Anatomy via Models, Charts & Imaging.	**CO1**
2.	Presentation on Common CVDs (Observation & Case-Based Learning)	**CO1**
3.	Demonstration on ECG Recording & 12-lead Placement Review	**CO2**
4.	Demonstration of Treadmill Test (TMT) – Introduction & Observation	**CO2**
5.	Demonstration of Basic Understanding of PTCA, Pacemaker, ICD/CRT	**CO2**
6.	Demonstration of Echocardiography (2D Echo) – Demonstration & Image Interpretation	**CO3**

7.	Demonstration of Interpretation of Disease-Specific ECG Patterns.	**CO3**
8.	Demonstration on Holter Monitoring – Device Setup & Analysis	**CO3**
9.	Demonstration on Coronary Angiography – Video Demonstration & Interpretation	**CO3**
10.	Demonstration on Vital Signs Monitoring in Cardiac Patients	**CO3**
11.	Demonstration of Cardiac Biomarkers – Lab Test Overview (Troponins, CK-MB, BNP)	**CO4**
12.	To perform Cath Lab Protocols – Sterile Setup & Roles of Technician	**CO4**
13.	To perform Post-procedure Monitoring & Care,Pulse, BP, SpO_2, Respiratory Rate in Emergencies	**CO4**
14.	Demonstration of Cardiac Emergency Protocols – Code Blue Simulation to Use Defibrillator (Demo on Simulator)	**CO5**
15.	Presentation on Case Scenarios (MI, Heart Failure, Arrhythmia, Post-PTCA Care),To Documentation & Reporting in CVD Patients	**CO5**

Open Educational Resources (OER):

1. HEARTSMAP Simulation Toolkit (University of British Columbia)– https://heartsmap.ca
2. MIT OpenCourseWare – Cardiovascular Pathophysiology https://ocw.mit.edu
3. SkillsCommons https://www.skillscommons.org

SEMESTER III					
Course Code BPCVT302	**Course Title** Cardiac Instrumentation	**L**	**T**	**P**	**C**
Version	2025	**3**	**1**	**0**	**4**
Category of Course	Major				
Total Contact Hours	45 Hours				
Pre-Requisites/ Co-Requisites	Pre-requisite: Basic knowledge of human anatomy and physiology, especially cardiovascular systems, Medical electronics, bio-signals, and introductory physics. Co-requisite: It is beneficial to take courses in biomedical instrumentation, clinical cardiology, or electrocardiography concurrently, to reinforce theoretical concepts with practical.				

Course Perspective :

This course provides an in-depth understanding of cardiovascular disorders, covering their etiology, pathophysiology, symptoms, diagnostics, and management. Through theory and case studies, students will learn to recognize, interpret, and assist in managing cardiac conditions, preparing them for clinical practice in allied and paramedical health.

Course Outcomes

Upon completion of the course the learner will be able to:

CO 1: TO **Remember and Recall** the anatomy and physiology of the cardiovascular system and define key terminologies related to cardiovascular diseases.
CO 2: TO **Understand and Explain** the pathophysiology, causes, signs, and symptoms of common cardiovascular disorders such as hypertension, heart failure, and myocardial infarction..
CO 3: TO **Apply and Demonstrate** the ability to interpret basic diagnostic findings such as ECG changes, and apply knowledge to identify cardiovascular conditions in clinical scenarios..
CO 4: TO **Evaluate** the treatment options including lifestyle modifications, pharmacological interventions, and surgical procedures for cardiovascular conditions.

Course Outline:

Unit number-1	**Title:** Medical Physics: Concepts and Applications	**No. of hours-09**
Definition and scope of medical physics , Applications of medical physics , Basic principles (e.g., biomechanics, bioelectricity, biomagnetism) , Medical physics equipment and techniques.		
Unit number-2	**Title:** Electro-Physiological Measurements: Concepts and Tools	**No. of hours-12**
Electrodes (limb, floating, pregelled, microneedle, surface), ECG lead systems and recording methods, ECG waveforms and interpretation, Electrical safety in the medical environment, Shock hazards, leakage current, Safety checks for biomedical equipment, Transducer selection criteria (e.g., sensitivity, accuracy, biocompatibility).		
Unit number-3	**Title:** Principles of Non-Electrical Parameter Monitoring	**No. of hours-12**
Blood pressure measurement (manual, automatic), Cardiac output measurement (e.g., Fick's method, echocardiography), Stethoscope (heart rate, heart sounds), ACT (activated clotting time), Pulmonary function measurements (spirometry, body plethysmography), Blood gas analysis (pH, pCO2, pO2), Finger-tip oximetry, ESR		

(erythrocyte sedimentation rate), GSR (galvanic skin response).		
Unit number-4	**Title:** Fundamentals of Assisting and Therapeutic Equipment	**No. of hours-12**
Pacemakers (fixed-rate, demand, biventricular), Defibrillators (internal, external), Ventilators (mechanical, non-invasive), C-arm imaging (fluoroscopy), Coronary CT and MRI, TLD (thermoluminescent dosimetry), Radiographic and fluoroscopic techniques, Echocardiography (TTE, TEE, stress echo), Coronary angiography (PTCA).		

Learning Experience:

This course offers a concise yet comprehensive overview of cardiovascular disorders, combining theory with practical skills. Through case studies, diagnostics, and hands-on sessions, students develop clinical reasoning and a patient-centered approach for effective real-world application in cardiovascular care.

Textbooks:

"Pathophysiology of Heart Disease: An Introduction to Cardiovascular Medicine"by **Leonard S. Lilly, 8th Edition,** Published by **Wolters Kluwer Health**

Suggested Readings:

- **"Cardiology Secrets,"** by Glenn N. Levine, 7th Edition, 2015 — Elsevier
- **"Clinical Cardiology Made Ridiculously Simple,"** by Michael A. Chizner, 6th Edition (2018) — MedMaster
- **"Rapid Review Pathology," ,** by Edward F. Goljan, 4th Edition — Elsevier

Open Educational Resources (OER):

1. Merlot (Multimedia Educational Resource for Learning and Online Teaching)
https://www.merlot.org/merlot/
2. Physiology Web – Cardiovascular Physiology
https://www.physiologyweb.com/
3. Khan Academy – Health & Medicine > Circulatory System
https://www.khanacademy.org/science/health-and-medicine/circulatory-system

SEMESTER III					
Course Code	**Course Title**	**L**	**T**	**P**	**C**
BPCVT352	Cardiac Instrumentation				

Version	2025	**0**	**0**	**2**	**1**
Category of Course	Major-VI Practical				
Total Contact Hours	30 Hrs				
Pre-Requisites/ Co-Requisites	Pre-requisite: Basic knowledge of cardiovascular anatomy, physiology, biomedical signals, and electrical safety. Co-requisite: To be taken with or after the Cardiac Instrumentation theory course covering ECG, defibrillators, pacemakers, and non-invasive monitoring; co-study in clinical cardiology or biomedical instrumentation is recommended..				

Course Perspective :

This course provides practical training in the use, handling, and troubleshooting of cardiac instruments such as ECG machines, defibrillators, pacemakers, Holter monitors, and treadmill systems. Students will gain skills in device setup, calibration, signal interpretation, and patient preparation through demonstrations and simulations, preparing them to assist in routine and emergency cardiovascular care.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: To **Understand** the structure, function, and application of cardiac diagnostic instruments. .
CO2: To **Demonstrate** proper setup and operation of ECG, defibrillators, monitors, and pacemakers
CO 3: To **Analyze** readings and troubleshoot common errors in cardiac monitoring devices.
CO4: To **Evaluate** performance, calibration, and safety of cardiac equipment.
CO5: To **Maintain** logs, follow biomedical maintenance protocols, and ensure equipment hygiene.

Practical Outline:

S.No	Lab Task	Mapped CO/COs
1.	Demonstration on ECG: Structure, Electrode Placement, Recording, Calibration	**CO1, CO2**
3.	Presentation on Introduction to Pacemaker (Temporary & Permanent)	**CO1**
4.	Presentation on Introduction to ICDs and CRT Devices	**CO1**
5.	Demonstration on IABP(Simulation),Electrophysiology study (EPS) equipment	**CO1**
6.	Use of Multiparameter Monitors,Portable Cardiac Monitors (ICU Setup)	**CO2**
7.	Charging, Shock Delivery, Paddles Placement	**CO2**
8.	Pacemaker modes and programming	**CO2**

9.	TMT system - setup and application	**CO2**
10.	Ambulatory BP & ECG Monitors,Holter Monitoring – Placement & Download	**CO2**
11.	Pressure Transducers & Hemodynamics,Simulator practice: AED & Manual Defibrillation	**CO2, CO3**
12.	Contrast Injector – Working & Safety	**CO2, CO4**
13.	Troubleshooting Pacemaker Alarms,Safety Precautions, Daily Checklist	**CO3**
14.	Biomedical Maintenance Protocols,Sterilization/Disinfection of Equipment	**CO4, CO5**
15.	Equipment Logs and Maintenance Sheets	**CO5**

Open Educational Resources (OER):

1. ECG Learning Center – Tulane University
   https://ecg.utah.edu/
2. National Heart, Lung, and Blood Institute (NHLBI)
   https://www.nhlbi.nih.gov
3. SkillStat – ECG Simulator
   https://www.skillstat.com/tools/ecg-simulator/

SEMESTER III					
Course Code BPCVT303	**Course Title** Basic Echocardiography	**L**	**T**	**P**	**C**
Version	2025	**3**	**0**	**0**	**3**
Category of Course	Minor				
Total Contact Hours	45 Hours				
Pre-Requisites/ Co-Requisites	Pre-requisite: Foundational knowledge in human anatomy and physiology, especially cardiovascular system and its disorder, medical physics, ECG interpretation and basic diagnostic procedures . Co-requisite: The course can be taken alongside subjects such as Cardiovascular Diagnostics, Medical Imaging Techniques, or Clinical Cardiology.				

Course Perspective :

It serves as an essential diagnostic tool in cardiovascular medicine, providing real-time imaging of heart structures and function. This course is designed to equip students with foundational skills in echocardiographic techniques, interpretation of normal and abnormal findings, and clinical application in common cardiac conditions. It emphasizes the integration of anatomical knowledge with imaging principles, preparing learners to assist in cardiac assessments, enhance patient care, and contribute effectively in clinical and diagnostic settings.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: TO **Remember** the fundamental concepts of ultrasound and echocardiographic terminology.
CO 2: TO **Understand and Explain** the principles of ultrasound wave propagation and image formation.
CO 3: TO **Remember** the List of the standard imaging planes used in basic echocardiography.
CO 4: TO **Apply** the Operate basic echocardiography equipment and perform standard image acquisition techniques.

Course Outline:

Unit number-1	**Title:** Fundamentals of Echocardiography: An Introductory Guide	**No. of hours-10**
Definition and principles of echocardiography, Types of echocardiography (TTE, TEE, stress echo, contrast echo), Applications of echocardiography (diagnosis of heart diseases, evaluating cardiac function)		
Unit number-2	**Title:** Imaging Techniques in Echocardiography: A Clinical Approach	**No. of hours-08**
Transducer positioning (parasternal, apical, suprasternal notch), Echocardiography views (parasternal long axis, parasternal short axis, apical views), Image acquisition techniques, Measurement of cardiac dimensions (left ventricular ejection fraction, end-diastolic volume, end-systolic volume).		
Unit number-3	**Title:** Echocardiography in Clinical Practice: Applications and Implications	**No. of hours-10**
Echocardiography in Coronary artery disease (identification of stenoses, assessment of myocardial perfusion), valvular heart disease (evaluation of valve function, regurgitation, stenosis), cardiomyopathies (dilated, hypertrophic, restrictive), arrhythmias (evaluation of atrial fibrillation, ventricular function), guided interventions (ablation procedures, valve repair/replacement).		
Unit number-4	**Title:**Modern Echocardiography:	**No. of hours-08**

	Innovations Enhancing Cardiac Care	
Three-dimensional echocardiography, Strain imaging, Speckle tracking imaging, Contrast echocardiography, Echocardiography with artificial intelligence.		
Unit number-5	**Title:** Cardiac Care Technicians: Frontline Support in Cardiovascular Health	**No. of hours-09**
Role of cardiac care technicians in assisting cardiologists, Independent performance of echocardiography examinations, Ethical considerations in echocardiography, Professional development in echocardiography		

Learning Experience:

The Basic Echocardiography course offers essential theoretical and practical training, focusing on standard views, clinical interpretation, and hands-on use of echocardiography equipment. It prepares students to assist effectively in cardiovascular diagnostics.

Textbooks:

"The Echo Manual", by **Jae K. Oh, James B. Seward, A.J. Tajik, 4th Edition,** Published by **Lippincott Williams & Wilkins**

Suggested Readings:

- **"Clinical Echocardiography Review: A Self-Assessment Tool",** by Allan L. Klein, Craig R. Asher**,** 2nd Edition(2017)— Wolters Kluwer
- **"Textbook of Clinical Echocardiography",** by Catherine M. Otto, 6th Edition— Elsevier
- **"ASE's Comprehensive Echocardiography" ,** by Roberto M. Lang, Steven A. Goldstein et al., 2nd Edition (2015)— Elsevier

Open Educational Resources (OER):

1.OpenAnesthesia – Ultrasound and Echo Resources
https://www.openanesthesia.org
2.ASE Learning Hub – American Society of Echocardiography
https://learn.asecho.org
3. Radiopaedia – Cardiac Imaging Section
https://radiopaedia.org

SEMESTER III					
Course Code	**Course Title**	**L**	**T**	**P**	**C**

BPCVT353	Basic Echocardiography				
Version	2025	**0**	**0**	**2**	**1**
Category of Course	Major (Practical)				
Total Contact Hours	30 Hrs				
Pre-Requisites/Co-Requisites	Pre-requisite: Basic understanding of cardiovascular anatomy, cardiac function, disorders, ECG interpretation, and cardiac instrumentation. Co-requisite: Should be studied alongside or after Cardiac Physiology, Cardiovascular Disorders, or Non-Invasive Cardiology theory for effective echocardiographic application.				

Course Perspective :

The Basic Echocardiography practical course offers hands-on training in 2D echo imaging for non-invasive cardiac assessment. It builds skills in operating echocardiographic equipment, identifying standard views, and interpreting basic parameters. This course bridges theoretical cardiac knowledge with clinical imaging, preparing students for roles in cardiac diagnostics and monitoring.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: Explain the functioning of echocardiographic equipment and image acquisition.
CO2: Analyze normal and abnormal echocardiographic findings in basic clinical cases.
CO3:Demonstrate standard views in transthoracic echocardiography (TTE).
CO4:**Recall** basic principles of ultrasound physics and cardiac anatomy.

Practical Outline:

S/NO	Lab Task	Mapped CO/COs
1	Identification and functions of echo machine components	**CO1**
2	Recall Basic knobology: gain, depth, TGC, focus, freeze, store	**CO4**
3	Explain Transducer types: phased array, pediatric, TEE probe	**CO1**
4	Patient identity verification and consent	**CO2**

5	Demonstrate ECG lead placement for echo synchronization	**CO3**
6	Demonstrate Left lateral decubitus positioning for transthoracic echo (TTE)	**CO3**
7	Review of Echo Machine Controls and Knobology:Gain, depth, focus, time gain compensation (TGC)	**CO4**
8	Explain Transducer Types and Frequencies:Phased array, TEE, pediatric probes	**CO1**
9	Recall Image Optimization Techniques:Sector width, frame rate, zoom, harmonics	**CO4**
10	Demonstrate Acquisition of Standard 2D Views:Parasternal Long Axis (PLAX),Parasternal Short Axis (PSAX),Apical (4-chamber, 2-chamber, 3-chamber),Subcostal and Suprasternal Views	**CO3**
11	Assessment of Left and Right Ventricular Function:EF calculation (Teichholz, Simpson's method)	**CO2**
12	Analyse Pulsed Wave, Continuous Wave, and Color Doppler Techniques	**CO2**
13	Demonstrate Spectral Doppler for Valvular Flow Assessment:Aortic stenosis, mitral regurgitation, tricuspid regurgitation	**CO3**
14	Explain Measurement of Pressures and Gradients:Peak and mean pressure gradients,Pulmonary artery pressure estimation.	**CO1**

Open Educational Resources (OER):

1. American Society of Echocardiography (ASE) Learning Hub
   https://www.asecho.org
2. SonoSite Institute – Free Ultrasound Education
   https://www.sonosite.com/education
3. OpenStax – Anatomy & Physiology
   https://openstax.org/books/anatomy-and-physiology/pages/19-1-heart-anatomy

SEMESTER III					
Course Code	**Course Title**	**L**	**T**	**P**	**C**
BPAH304	Accounting and finance				

Version	2025	**3**	**0**	**0**	**3**
Category of Course	MDP				
Total Contact Hours	45 Hours				
Pre-Requisites/ Co-Requisites	Pre-requisite: Basic understanding of mathematics and general economics or completion of an introductory economics or business studies course. Co-requisite: Concurrent enrollment in an introductory economics, accounting, or business foundations course is recommended for enhanced understanding.				

Course Perspective :

This course provides an in-depth understanding of financial accounting principles, systems, and reporting standards. It explores concepts from basic accounting to the analysis of financial statements and valuation of financial assets, aiming to prepare students to effectively interpret, analyze, and apply financial information in business and healthcare environments.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: Students will understand and apply basic financial accounting principles and systems.
CO2: Students will be able to prepare and interpret key financial statements including income statements, balance sheets, and cash flow statements.
CO3: Students will analyze financial statements using financial ratios and evaluate organizational performance.

Course Outline:

Unit number-1	**Title:** Basics of financial Accounting	**No. of hours-8**
Introduction, significance of financial accounting, scope and prospects, evaluation scheme of the course, understanding business, Why we invest, financial statement users, analyzing financial statements, double entry accounting systems, debits and credits. Accounting rules and procedures, assumptions in financial reporting, GAAP, IFRS, Indian GAAP, Accounting methods, analyzing transactions and accounting process		
Unit number-2	**Title:** Accounting: The Language of Business and recording transactions	**No. of hours-8**
Accounting system: traditional versus modern, Analyzing and journalizing transactions, posting transactions to ledger, accounting rules, Preparing the trail balance, effects of errors; accounting system, some basic accounting concepts,		

Revenue and expense transactions, depreciation, and prepaid transactions, accumulated depreciation, adjusted vs unadjusted trail balance, financial statements from trial balance, Closing the accounts, capital vs revenue, types of errors, ethics		
Unit number-3	**Title: Measuring Income to Assess Performance**	**No. of hours-8**
Basics of income measurement, operating cycle, concepts related to income, recognition of revenue, the income statement, understanding income statement, cash dividends and retained earnings, Four popular financial ratios with real-world cases. critical thinking problems and real-world cases		
Unit number-4	**Title:** Adjustments, sales and Financial Statements	**No. of hours-13**
Adjustments to the accounts. four types of four types of adjustments (cont), classified balance sheet , Income statement and profitability evaluation ratios Critical thinking problems using financial statements. Recording the sales using contra account and internal controls Measuring of uncollectible accounts Assessing the level of account receivable, Internal control.		
Unit number-5	**Title:** Statement of cash flows	**No. of hours-8**
Overview the cash flow statement, preparing the clash flow statement, types of cash flow activities, inflows and outflows of cash flows Preparation of cash flow statements using direct and indirect methods and its 4importance Cash flow statement and balance sheet, examples of cash flow s4tatements Methods of preparing cash flow statements, accounting rules, th4e importance of cash flow statements		

Learning Experience:

Students engage in interactive activities, real-life case studies, and simulations to apply financial concepts. The course emphasizes practical learning through budgeting exercises, financial planning projects, and decision-making scenarios, fostering confidence in managing personal finances.

Textbooks:

"Principles of Accounting" by Jerry J. Weygandt, Paul D. Kimmel, and Donald E. Kieso

Suggested Readings:

- **Financial Accounting" by Robert Libby, Patricia A. Libby, and Frank Hodge**
- **"Principles of Corporate Finance" by Richard A. Brealey, Stewart C. Myers, and Franklin Allen**

- **Fundamentals of Financial Management" by James C. Van Horne and John M. Wachowicz Jr.**

Open Educational Resources (OER):

1. "Personal Finance" – OpenStax, Rice University
https://openstax.org/books/personal-finance/pages/1-introduction
2. "Introduction to Personal Finance" – Saylor Academy
https://learn.saylor.org/course/view.php?id=65
3. Next Gen Personal Finance (NGPF)
https://www.ngpf.org/

SEMESTER III					
Course Code BPAH305	**Course Title** Mental Health & Holistic Well Being	**L**	**T**	**P**	**C**
Version	2025	**2**	**0**	**0**	**2**
Category of Course	AEC				
Total Contact Hours	30 Hours				
Pre-Requisites/ Co-Requisites	Pre-requisite: Foundational knowledge in human anatomy and physiology, basic psychology, and principles of public health. Co-requisite: Students concurrently study subjects such as community health, behavioral science, or health promotion strategies.				

Course Perspective :

This course offers an integrated approach to understanding mental health by exploring the emotional, psychological, social, and spiritual dimensions of well-being. It emphasizes the importance of early identification, prevention, and intervention strategies, while also addressing holistic approaches such as lifestyle modification, mindfulness, and supportive environments.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: TO **Remember and Define** key concepts related to mental health, psychological well-being, and holistic health.
CO 2: TO **Understand and** Explain the relationship between mental health and overall wellness, including emotional, social, and spiritual aspects**.**
CO 3: TO **Apply and Demonstrate** the use of basic mental health strategies and holistic practices to promote individual and community well-being.

CO 4: TO **Remember and Identify** key terms and basic principles related to mental health, emotional well-being, and holistic approaches to wellness."

Course Outline:

Unit number-1	**Title:** Mental Health: A Comprehensive Overview	**No. of hours-06**
Define mental health and its components (emotional, psychological, and social well-being), Identify common mental health challenges (anxiety, depression, bipolar disorder, schizophrenia, etc.), Explain the impact of stigma and discrimination on mental health.		
Unit number-2	**Title:** Emotional Intelligence: Understanding and Managing Emotions	**No. of hours-06**
Define emotional intelligence and its components (self-awareness, self-regulation, social awareness, relationship management), Discuss the role of emotional intelligence in personal and professional success, Develop strategies for enhancing emotional intelligence.		
Unit number-3	**Title:** Managing Stress: Techniques and Coping Mechanisms	**No. of hours-06**
Define stress and its types (acute, chronic), Identify common stress management techniques (relaxation, meditation, time management), Develop coping strategies for handling stress and adversity.		
Unit number-4	**Title:** Strategies for Promoting Mental Health and Preventing Disorders	**No. of hours-06**
Discuss the importance of mental health promotion and prevention, Identify risk and protective factors for mental health, Develop strategies for promoting mental well-being in individuals and communities..		
Unit number-5	**Title:** Approaches to Mental Health Care and Support Systems	**No. of hours-06**
Explain different mental health treatment approaches (psychotherapy, medication, etc.), Discuss the role of support systems in mental health recovery, Identify resources for mental health support and crisis intervention.		

Learning Experience:

Students will explore fundamental concepts of mental health, including definitions, common disorders, and factors affecting psychological well-being. Through case studies, discussions, and reflective activities, learners will develop awareness of mental health issues and the importance of early identification and support. Practical exercises will enhance empathy, reduce stigma, and encourage strategies for promoting mental wellness in individuals and communities.

Textbooks:

"Holistic Health and Happiness", by **Prof. Madhurima Pradhan and Dr. Naghma Javed, 1st Edition(2022),** Published by **ANU Books.**

Suggested Readings:

- **"Mental Health and Wellbeing: Intercultural Perspectives",** by Charles Watters**,** First Edition (2019)— Bloomsbury Academic
- **"Mental Health and Well-Being: Alternatives to the Medical Model",** by Neil Thompson,First Edition (2018)— Routledge

SEMESTER III					
Course Code BPAH306	**Course Title** Preventive and Social Medicine	**L**	**T**	**P**	**C**
Version	2025	**2**	**0**	**0**	**2**
Category of Course	SEC				
Total Contact Hours	30 Hours				
Pre-Requisites/ Co-Requisites	Pre-requisite: A basic understanding of human biology, anatomy, and physiology, mechanisms of disease, health determinants, and the biological basis of prevention strategies. Co-requisite: Simultaneous study of epidemiology, biostatistics, and public health principles is recommended to support learning in disease surveillance, data analysis, and health program planning in community settings.				

Course Perspective :

Preventive and Social Medicine focuses on promoting health and preventing disease through community-based approaches. It equips students to plan and implement public health interventions, emphasizing health education, sanitation, immunization, and national health programs.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: TO **Remember and Recall** key concepts of epidemiology, disease prevention, and public health systems.
CO 2: TO **Understand and Explain** the principles of health promotion, immunization, and environmental sanitation in community settings**.**
CO 3: TO **Understand and Explain** the structure and function of health systems and the importance of national health programs in disease control and prevention.
CO 4: TO **Apply** the basic epidemiological methods to analyze health trends and disease outbreaks..

Course Outline:

Unit number-1	**Title:** Foundations of Preventive Medicine: Strategies and Applications	**No. of hours-06**
Definition, scope, and history of preventive care, levels of prevention, and its role in public health, primary prevention (immunization, health education, sanitation, nutrition), Secondary prevention (screening, early diagnosis, surveillance), and tertiary prevention (rehabilitation, chronic disease management). Impact on disease burden, cost-effectiveness, health policy integration, national programs, legislation, and community participation, case studies and discussions.		
Unit number-2	**Title:** Fundamentals of Public Health Issues and Population Health Outcomes	**No. of hours-06**
Definition, scope, and evolution of public health, community needs assessments (types, methods, stakeholders), and key health determinants—social, economic, environmental, and behavioral, Population health outcomes, health disparities, and the role of policies and programs, Case studies and discussions on public health solutions.		
Unit number-3	**Title:** Effective Strategies in Public Health Program Development	**No. of hours-06**
Fundamentals of public health programs, goals, types of interventions, and planning steps. It addresses implementation strategies, community involvement, monitoring and evaluation methods, and the use of health indicators. Evidence-based decision-making, showcases case studies and best practices, and explores integration, challenges, and future directions in public health initiatives.		
Unit number-4	**Title:** Applied Ethics and Professional Conduct in Practice	**No. of hours-06**
Key ethical principles in healthcare, professional standards, and the importance of		

integrity and accountability. Cultural competence and effective communication across diverse populations. Ethical interactions with patients and communities, and also real-world case studies and reflection on best practices and personal growth.		
Unit number-5	**Title:** Applied Critical Thinking and Problem-Solving Strategies	**No. of hours-06**
Critical thinking in public health, key challenges, and opportunities for improvement. It includes problem-solving models, innovative interventions, and strategies for implementation. Collaborative approaches, evaluation, and sustaining solutions with practical exercises for skill development.		

Learning Experience:

Learning Experience for Principles of Preventive Medicine includes understanding the foundational concepts of disease prevention and health promotion, applying strategies for primary, secondary, and tertiary prevention, recognizing the role of public health policies, and developing skills to design and evaluate preventive interventions aimed at improving community health outcomes.

Textbooks:

"Preventive Medicine and Public Health", by **Justin D. Silverman and Robert S. Brachman , 14th Edition(2023),** Published by **McGraw-Hill Education**

Suggested Readings:

- **"Epidemiology: An Introduction,",** by Kenneth J. Rothman**,** 3rd Edition (2017)—Oxford University Press
- **"Public Health: What It Is and How It Works",** by Bernard J. Turnock, 6th Edition (2019)— Jones & Bartlett Learning
- **"Global Health 101" ,** by Richard Skolnik, 5th Edition (2021)— Jones & Bartlett Learning

Open Educational Resources (OER) :

1. OpenWHO by WHO (World Health Organization) https://openwho.org
2.Public Health Textbook by Health Knowledge (UK) https://www.healthknowledge.org.uk/public-health-textbook
3. CDC Public Health Learning Navigator https://www.phlearningnavigator.org

SEMESTER III					
Course Code BPAH307	**Course Title** Managing People and Organizations	**L**	**T**	**P**	**C**
Version	2025	**2**	**0**	**0**	**2**

Category of Course	VAC
Total Contact Hours	30 Hours
Pre-Requisites/ Co-Requisites	Pre-requisite: Basic knowledge of Principles of Management, Organizational Behavior, and Communication Skills.. Co-requisite: Human Resource Management, Business Ethics, or Organizational Communication to enhance understanding of people and processes within organizations.

Course Perspective :

This course provides essential insights into managing individuals and teams, focusing on leadership, motivation, communication, and organizational behavior. It prepares students to handle workplace challenges effectively and lead with confidence.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1:Recall the fundamental concepts of organizational behavior and its relevance to healthcare and allied health systems.
CO 2: Understand leadership theories and apply appropriate leadership styles in various organizational situations.
CO 3: Apply team dynamics and implement effective communication and conflict resolution strategies in a healthcare environment.
CO 4: Evaluate basic human resource management practices including motivation, recruitment, performance management, and staff development in healthcare organizations.

Course Outline:

Unit number-1	**Title: Introduction to Organizational Behavior**	**No. of hours-**
Definition and importance of Organizational Behavior (OB), Key elements: people, structure, technology, and environment, Levels of OB: individual, group, and organizational, OB in healthcare and allied health settings, Case studies in organizational behavior		
Unit number-2	**Title: Leadership and Management Styles**	**No. of hours-**
Difference between leadership and management, Classical and contemporary leadership theories (Transformational, Transactional, Situational, etc.), Leadership styles in healthcare organizations, Qualities of effective leaders in patient-centered care, Ethical and emotional leadership		
Unit number-3	**Title: Team Dynamics and Communication**	**No. of hours-**
Types of teams: functional, cross-functional, self-managed, Stages of team development (Tuckman's model), Effective team building and collaboration,		

Interpersonal communication skills, Conflict resolution and negotiation techniques		
Unit number-4	**Title: Motivation and Performance Management**	**No. of hours-**
.Theories of motivation (Maslow's Hierarchy, Herzberg, McClelland), Factors influencing employee motivation in healthcare, Goal-setting and performance feedback, Job satisfaction and employee engagement, Introduction to appraisal systems		
Unit number-5	**Title: Human Resource Practices in Healthcare Organizations**	**No. of hours-**
Role of HR in healthcare, Recruitment, selection, and induction process, Training and development of healthcare staff, Managing diversity and workplace ethics, Legal and professional standards in healthcare HR		

Learning Experience:

Students will engage in case studies, group discussions, role-plays, and real-world scenarios to understand management practices and human behavior in organizations. The course promotes critical thinking, teamwork, and problem-solving through interactive and experiential learning methods.

Textbooks:

"Management: Leading & Collaborating in a Competitive World", by **Thomas S. Bateman , 14th Edition(2021),** Published by **McGraw-Hill Education**

Suggested Readings:

- **"Good to Great,",** by Jim Collins**,** 1st Edition (2001)—Oxford University Press
- **"Public Health: What It Is and How It Works",** by Bernard J. Turnock, 6th Edition (2019)— Jones & Bartlett Learning
- **"Global Health 101" ,** by Richard Skolnik, 5th Edition (2021)— Jones & Bartlett Learning

Open Educational Resources (OER) :

1. OpenWHO by WHO (World Health Organization)
   https://openwho.org
2. Public Health Textbook by Health Knowledge (UK)
   https://www.healthknowledge.org.uk/public-health-textbook
3. CDC Public Health Learning Navigator
   https://www.phlearningnavigator.org

SEMESTER-IV

SEMESTER IV					
Course Code **BPCVT401**	**Course Title** **Pediatric Cardiovascular Disorder**	**L**	**T**	**P**	**C**
Version	2025	**3**	**1**	**0**	**4**
Category of Course	Major				
Total Contact Hours	45 Hours				
Pre-Requisites/ Co-Requisites	Pre-requisite: Basics of Pediatric Nursing / Child Health Co-requisite:Understand Pediatric Pathophysiology or Clinical Pediatrics				

Course Perspective :

This course offers foundational and clinical insights into congenital and acquired cardiovascular disorders in the pediatric population. It bridges theoretical knowledge with real-world pediatric cardiology scenarios, providing a platform for early clinical reasoning, patient monitoring, and interdisciplinary collaboration in pediatric cardiac care units (PICU, NICU, pediatric wards).

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: **Describe** the anatomical and physiological differences in the pediatric cardiovascular system compared to adults

CO2:Identify and classify common congenital and acquired pediatric cardiovascular disorders

CO3:Explain clinical manifestations and formulate basic management plans for common pediatric cardiac conditions

Course Outline:

Unit number-1	**Title:**Tools for Diagnosing Cardiac Conditions in Children	**No. of hours- 09**
Cardiovascular history taking (chief complaint, presenting signs) Understand the principles of obtaining a comprehensive cardiovascular history in children. ,Vital signs assessment Perform a thorough physical examination, including vital signs and cardiac examination,Cardiac examination techniques Interpret laboratory		

examinations relevant to pediatric cardiology, Laboratory examinations (e.g., blood tests, echocardiogram),Integration of diagnostic tools Integrate history, physical examination, electrocardiogram (ECG), and chest X-ray to diagnose cardiac conditions.		
Unit number-2	**Title:** Cardiac Defect Closure Devices	**No. of hours-10**
Understand the principles and applications of device closure procedures, Device closure procedures, Discuss the indications and contraindications for device closure in Patent foramen ovale (PFO), Atrial septal defect (ASD), Ventricular septal defect (VSD), Patent ductus arteriosus (PDA), and left atrial appendage (LAA), PFO closure, ASD closure, VSD closure, PDA closure, LAA closure. Evaluate the risks and benefits of device closure procedures.Indications and contraindications,Risks and benefits.		
Unit number-3	**Title**:Percutaneous Valve Commissurotomy, Repair, and Replacement	**No. of hours-10**
Understand the principles and techniques of percutaneous valve commissurotomy, repair, and replacement.Percutaneous valve commissurotomy.Percutaneous valve commissurotomy o Percutaneous valve repair o Percutaneous valve replacement o Mitral stenosis, mitral regurgitation, aortic stenosis, pulmonary stenosis, tricuspid stenosis. Discuss the indications and contraindications for these procedures.Indications and contraindications for valve interventions. Understand the treatment options for these valvular diseases.Risks and benefits of valve interventions.		
Unit number-4	**Title:** Pediatric Interventional Cardiology and Recent Advances	**No. of hours- 08**
Understand the principles and techniques of pediatric interventional cardiology. Pediatric interventional cardiology overview,Differentiate between general anesthesia and sedation/analgesia in pediatric procedures.General anesthesia vs. sedation/analgesia.Discuss the role of diagnostic procedures in pediatric cardiology.Diagnostic procedures (e.g., catheterization, echocardiography). Interventional procedures (e.g., balloon angioplasty, stent placement, valve interventions) Explore recent advancements in pediatric interventional cardiology.Recent		

advancements in pediatric interventions		
Unit number-5	**Title:**Clinical Management and Monitoring	**No. of hours- 08**
Pediatric cardiac examination techniques,Medical management of heart failure in children,Role of prostaglandins in duct-dependent lesions,Surgical and interventional options,ICU care for pediatric cardiac patients. **Pediatric Cardiac Emergencies:**Recognition and initial management of shock,Arrhythmias in children (bradycardia, SVT, VT),Cyanotic spells in TOF,Management of congestive heart failure,Cardiac arrest and resuscitation in children (PALS overview).		

Learning Experience:

Hands-on sessions with rhythm strip interpretation.Presentations on disorders (e.g., TOF, Kawasaki).Self-reflection on clinical exposure and case learning.

Textbooks:

1. Invasive Cardiology: A Manual for Cath Lab Personnel (3rd Edition) Sandy Watson, Kenneth A. Gorski.

Suggested Readings:

2. Pediatric Cardiology: The Essential Pocket Guide (3rd Edition) Walter H. Johnson Jr., James H. Moller.

Open Educational Resources (OER) :

1.OpenPediatrics (Online Modules) openpediatrics.org
2.MedEdPORTAL www.mededportal.org
3.Khan Academy - Pediatric Heart Disease www.khanacademy.org

SEMESTER IV					
Course Code **BPCVT451**	**Course Title** **Pediatric Cardiovascular Disorder**	**L**	**T**	**P**	**C**
Version	2025	**0**	**0**	**2**	**1**
Category of Course	Major				
Total Contact Hours	30 Hours				
Pre-Requisites/Co-Requisites	Pre-requisite: Basics of Pediatric Nursing / Child Health Co-requisite: Pediatric Pathophysiology or Clinical Pediatrics				

Course Perspective :

This course offers foundational and clinical insights into congenital and acquired cardiovascular disorders in the pediatric population. It bridges practical knowledge with real-world pediatric cardiology scenarios, providing a platform for early clinical reasoning, patient monitoring, and interdisciplinary collaboration in pediatric cardiac care units (PICU, NICU, pediatric wards).

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: Demonstrate understanding of pediatric cardiac anatomy, congenital heart defects (e.g., ASD, VSD, TOF), and hemodynamics using models, images, and diagnostic tools.
CO2:Observe and interpret pediatric cardiac signs, symptoms, and diagnostic findings from ECG, echocardiography, and imaging studies.
CO3:Practice pediatric cardiovascular assessments, including vitals, ECG placement, pulse oximetry, emergency response, and basic life support.
CO4:Adapt and apply emergency management protocols, medication administration principles, and infection control strategies in pediatric cardiac care.

Practical Outline:

S/No	Lab Task	Mapped CO/COs
1	Demonstrate Growth Monitoring:Measuring weight, height/length, head and chest circumference.	**CO1**
2	Identify Age-appropriate Communication and Handling Techniques	**CO1, CO4**
3	Identify Pain Assessment Scales in Pediatrics (FLACC, Wong-Baker, NIPS)	**CO2**
4	Practise Normal Pediatric Ranges by Age Group,Pediatric Vital Signs & Monitoring,SpO_2 Monitoring and Pediatric Alarms	**CO2, CO3**
5	Practise of Measurement of Pediatric:Temperature (axillary, tympanic),Pulse (apical/radial),Respiratory Rate,BP (with appropriate cuff size) in Pediatric Units	**CO3**
6	Monitoring in NICU/PICU Setup (Demo) & Sensory Stimulation in NICU	**CO2, CO4**
7	Adapt the Pediatric Basic Life Support (PBLS) – AHA/ERC Protocol	**CO3, CO4**
8	Identify Emergency Management in Pediatric Seizures, Asthma, and	**CO3, CO4**

	Fever,Choking Rescue – Infants and Children	
9	Medication Administration – Syrup, Nebulization, IM, IV (demo only),Oxygen Therapy in Children – Methods (nasal cannula, mask)	**CO3**
10	Identify Pediatric Nebulization Setup and Technique & Chest Physiotherapy in Children (Percussion, Vibration, Positioning)	**CO3**
11	IdentifyBasics of Pediatric ECG Electrode Placement & Recording	**CO3**
12	Demo: Use of Pediatric Defibrillator and AED (Simulated)	**CO3, CO4**
13	Demonstrate Feeding Techniques: Breastfeeding, Bottle Feeding (Positioning),Tube Feeding (Nasogastric) – Observation and Understanding	**CO1, CO3**
14	Thermal Care in Neonates – Kangaroo Mother Care (KMC) & Incubator Use,Identify Fluid Management – Pediatric IV Line Setup (Demo)	**CO3, CO4**
15	Early Intervention Therapy (Demo/Roleplay),Play Therapy and Emotional Support for Hospitalized Children	**CO4**
16	Adapt Infection Control and Aseptic Techniques in Pediatric Units	**CO4**

Open Educational Resources (OER):

1.OpenPediatrics – Simulation Videos https://www.openpediatrics.org

2.Heart Sounds Audio Library https://www.easyauscultation.com

SEMESTER IV					
Course Code **BPCVT402**	**Course Title** **Advanced Echocardiography**	**L**	**T**	**P**	**C**
Version	2025	**3**	**1**	**0**	**4**
Category of Course	Major				

Total Contact Hours	45 Hours
Pre-Requisites/ Co-Requisites	Pre-requisite: Familiarity with standard echocardiographic views and measurements Co-requisite: Clinical Cardiology or Cardiac Imaging Techniques

Course Perspective :

This course offers an in-depth exploration of advanced echocardiographic techniques and their clinical applications. Learners will develop expertise in complex imaging modalities such as Doppler, 3D echocardiography, and strain imaging. Emphasis is placed on integrating echocardiographic findings with clinical scenarios to support accurate diagnosis and treatment planning.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: To **recall** advanced echocardiographic modalities and their principles.

CO2: To **explain** the use and interpretation of Doppler and 3D echocardiography.

CO3: To perform and **interpret** advanced echocardiographic studies in various cardiac conditions.

CO4: To **analyze** echocardiographic data for assessing cardiac function and pathology.

Course Outline:

Unit number-1	**Title:** Heart Failure, Myocardium, and Pericardium	**No. of hours-10**
Heart failure (types, causes, symptoms), Left ventricular systolic function (ejection fraction, wall motion), Coronary artery disease (stenosis, myocardial infarction), Cardiomyopathies(dilated, hypertrophic,restrictive), Myocarditis, Diastolic function , Right ventricular function, Pericardial diseases (effusion, tamponade), Cardiac resynchronization therapy.		
Unit number-2	**Title:**Transesophageal Echocardiography	**No. of hours-10**
TEE principles and applications,TEE transducer positioning,TEE views (transgastric, bicaval, esophageal, suprasternal notch),TEE image acquisition and interpretation,Advantages and disadvantages of TEE,Patient preparation and post-procedure care.		
Unit number-3	**Title:** Special Situations and Conditions	**No. of hours-10**
Echocardiography in pregnancy,Echocardiography in rhythm disturbances (e.g., atrial fibrillation, ventricular tachycardia),Echocardiography in syncope and palpitations		

Echocardiography in left ventricular hypertrophy,Echocardiography in stroke, TIA, and thromboembolism,Echocardiography in patients with HIV, Chagas disease, Lyme disease, and rheumatic heart disease.		
Unit number-4	**Title:** Recent Advances in Echocardiography	**No. of hours-6**
3D echocardiography,4D echocardiography,Tissue Doppler imaging,Contrast echocardiography		
Unit number-5	**Title:** Coronary Artery Disease (CAD) and Stress Echocardiography	**No. of hours-9**
Wall motion abnormalities.Stress echo protocols (exercise and pharmacologic).Myocardial viability assessment **Clinical Integration and Reporting:**Structured echo reporting.Image archiving (DICOM).Clinical decision-making based on findings.		

Learning Experience:

Participants will engage in lectures, hands-on ultrasound practice, and case study analyses. The course includes interactive sessions on image acquisition, optimization, and advanced measurement techniques. Simulation tools and real patient data will be used for applied learning. Evaluation methods include practical demonstrations, image interpretation quizzes, and case presentations.

Textbooks:

Echo Made Easy Sam Kaddoura 3rd Edition.

Suggested Readings:

- Echocardiography Technician - The Comprehensive Guide: Mastering Cardiac Imaging in Modern Healthcare Linda D.Gillam, Catherine M.Otto 1st Edition
- Feigenbaum's Echocardiography William F. Armstrong, Thomas Ryan 8th edition
- The Echo Manual Jae K. Oh, James B. Seward, A. Jamil Tajik

Open Educational Resources (OER):

1.ASE Guidelines & Recommendations www.asecho.org

2.Imaging, Interpretation, and Diagnostics https://www.asecho.org/education/

SEMESTER IV					
Course Code **BPCVT452**	**Course Title** **Advanced Echocardiography**	**L**	**T**	**P**	**C**
Version	2025	**0**	**0**	**2**	**1**

Category of Course	Major
Total Contact Hours	30 Hours
Pre-Requisites/Co-Requisites	Pre-requisite:Familiarity with standard echocardiographic views and measurements Co-requisite: Clinical Cardiology or Cardiac Imaging Techniques

Course Perspective :

This course offers an in-depth exploration of advanced echocardiographic techniques and their clinical applications. Learners will develop expertise in complex imaging modalities such as Doppler, 3D echocardiography, and strain imaging. Emphasis is placed on integrating echocardiographic findings with clinical scenarios to support accurate diagnosis and treatment planning.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: Demonstrate the use of advanced echocardiographic techniques including Doppler imaging, 3D echo, and contrast echo.
CO2:Observe and interpret complex echocardiographic findings in valvular, myocardial, and pericardial diseases.
CO3:**Practice** measurement of hemodynamic parameters, ventricular function, shunt calculations, and pressure gradients.
CO4:**Adapt** and **apply** echocardiographic techniques for clinical decision-making, interventional guidance, and case reporting.

Practical Outline:

S.No	Lab Task	Mapped CO/COs
1.	Demonstrate **Valvular Heart Diseases** (Detailed Doppler Evaluation): Mitral, Aortic, Tricuspid, Pulmonary valves	**CO2,CO3**
2.	Demonstrate findings in **Cardiomyopathies** – Dilated, Hypertrophic, Restrictive	**CO2**
3.	Identify signs of **Pericardial Effusion and Tamponade**	**CO2**
4.	Analyze **Regional Wall Motion Abnormalities** in Ischemic Heart Disease	**CO2**
5.	Perform **Stress Echocardiography** (Exercise & Pharmacological) – Demonstration	**CO1,CO4**

6.	Observe **Transesophageal Echocardiography (TEE)** – Protocol and Video Demonstration	**CO1,CO4**
7.	Perform **Contrast Echocardiography** – Indications and Technique (Demo)	**CO1,CO4**
8.	Demonstrate **3D Echocardiography** – Introduction and Interpretation (Demo/Video)	**CO1,CO4**
9.	Acquire **Basic Pediatric Echo Views** and Adjust Image Settings	**CO1,CO3**
10.	Identify **Common Congenital Defects on Echo** (ASD, VSD, TOF – Observation)	**CO2**
11.	Perform **Measurement of Shunt Flow and RVSP** in Congenital Cases	**CO3,CO4**
12	Create structured **Reporting of Echo Findings** in Standard Format	**CO4**
13	Execute **Measurement Techniques and Report Entry**	**CO3,CO4**
14	Conduct **Case Review and Interpretation of Stored Echo Cases**	**CO4**
15	Implement **Quality Control, Ethics, and Patient Privacy** Practices in Echo Labs	**CO4**

Open Educational Resources (OER):

1.LibreTexts – Cardiovascular Diagnostics https://med.libretexts.org

2.OpenStax – Anatomy & Physiology https://openstax.org

3.EchoSim – (Simulation-based Echo Practice) https://echosim.io

SEMESTER IV					
Course Code **BPCVT403**	**Course Title** **Fetal & Neonatal - Cardiovascular System**	**L**	**T**	**P**	**C**
Version	2025	**3**	**1**	**0**	**4**

Category of Course	Major
Total Contact Hours	45 Hours
Pre-Requisites/ Co-Requisites	Pre-requisite:Understanding of general cardiovascular physiology Co-requisite: Pediatric Cardiology Fundamentals

Course Perspective :

This course focuses on the development, structure, and function of the fetal and neonatal cardiovascular system. It covers physiological adaptations during the transition from fetal to neonatal circulation and common cardiovascular disorders in newborns. Emphasis is placed on diagnostic techniques and management strategies tailored for this vulnerable population.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: To **recall** the anatomy and physiology of the fetal and neonatal cardiovascular system.

CO2: To **explain** the physiological changes occurring during the transition from fetal to neonatal circulation.
CO3: To **apply** diagnostic methods for assessing cardiovascular function in fetuses and neonates.
CO4: To **analyze** common congenital and acquired cardiovascular disorders in neonates.

Course Outline:

Unit number-1	**Title:** Early Development of the Cardiovascular System	**No. of hours-10**
Early embryonic development,Blood vessel formation (intra-embryonic, extra-embryonic),Heart tube formation and positioning,Heart looping mechanism,Formation of embryonic ventricles,Development of the sinus venosus,Cardiac septation (atrial, ventricular, truncus arteriosus). **Congenital Heart Defects and Embryological Basis:**Atrial septal defects (ASD), ventricular septal defects (VSD),Tetralogy of Fallot, transposition of great arteries,Persistent truncus arteriosus, truncus division failure,Common AV canal and associated syndromes (e.g., Down syndrome)		
Unit number-2	**Title:**Formation of Cardiac Valves and Great Systemic Veins	**No. of hours-8**
Formation of cardiac valves (atrioventricular, semilunar),Development of cardiac veins,Development of vitelline vein, Development of umbilical veins,Formation of the vena cava. **Developmental Defects and Clinical Correlations:**Congenital valve diseases: stenosis, atresia, regurgitation,Venous malformations: IVC anomalies, persistent embryonic veins,Imaging correlation: 2D echo, CT angiography, cardiac		

MRI,Syndromes associated: Trisomy 21 (AVSD), Noonan syndrome (pulmonary valve defect).		
Unit number-3	**Title:** Fetal and Neonatal Circulation	**No. of hours-8**
Blood flow pattern in fetal circulation,Oxygenation and venous return,Cardiac output and its distribution,Intra-cardiac vascular pressures,Myocardial function and energy metabolism, Characteristics of fetal circulation,Changes at birth,Postnatal circulation. **Pathophysiology and Clinical Conditions:**Persistent Pulmonary Hypertension of the Newborn (PPHN),Patent Ductus Arteriosus (PDA),Hypoxemia due to transitional failure,Congenital heart defects affecting neonatal circulation,Screening and diagnostic techniques (pulse oximetry, echocardiography).		
Unit number-4	**Title:** Etiology of Cardiovascular Malformations and Adult Circulation	**No. of hours- 9**
Etiology of cardiovascular malformations (genetic, environmental factors), Congenital anomalies (e.g., atrial septal defect, ventricular septal defect, patent ductus arteriosus),Systemic circulation (anatomy, blood flow),Pulmonary circulation (anatomy, blood flow).		
Unit number-5	**Title:** Neonatal Cardiovascular Physiology	**No. of hours-10**
Hemodynamics in the neonate:Heart rate, blood pressure, and oxygenation patterns,Ventricular function in the newborn,Regulation of cardiac output in neonates,Normal cardiovascular findings in neonatal examination. **Diagnostic and Monitoring Techniques:**Clinical signs of cardiac distress in neonates,Pulse oximetry and pre- & post-ductal SpO_2 measurement,Neonatal ECG basics,Chest X-ray and echocardiography in neonates,Fetal echocardiography (introductory concepts).		

Learning Experience:

Students will experience a blend of lectures, imaging reviews, and clinical case discussions. include fetal echocardiography and neonatal cardiovascular monitoring techniques. Interactive problem-solving and simulation-based learning will enhance diagnostic and management skills. Assessments will consist of quizzes, case evaluations, and practical demonstrations.

Textbooks:

Ross and Wilson Anatomy & Physiology in Health and Illness, 12th Edition by Anne

Waugh and Allison Grant

Suggested Readings:

Principles of Anatomy & Physiology ,12th Edition by Gerard J. Tortora & Bryan

Derrickson

Human Embryology; Inderbir Singh

Open Educational Resources (OER):

1.LibreTexts – Anatomy & Physiology https://med.libretexts.org

2.Saylor Academy – Human Anatomy Course https://learn.saylor.org

3.WHO eLearning: Neonatal Health https://openwho.org

SEMESTER IV					
Course Code **BPAH404**	**Course Title** **Disaster Management & Environmental Sciences**	**L**	**T**	**P**	**C**
Version	2025	**3**	**0**	**0**	**3**
Category of Course	MDP				
Total Contact Hours	45 Hours				
Pre-Requisites/ Co-Requisites	Pre-requisite: Basic Public Health and Community Medicine Co-requisite: Epidemiology and Health Systems Management				

Course Perspective :

This course explores the interrelation between environmental health and disaster preparedness. It equips learners with knowledge and skills to identify environmental hazards, assess disaster risks, and implement effective responses in healthcare and community settings. Emphasis is placed on public health implications, emergency planning, and sustainability practices

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: To **recall** key concepts of disaster types, phases, and environmental health hazards.
CO2: To **explain** the impact of environmental factors and disasters on public health and healthcare systems.
CO3: To **apply** disaster response protocols and environmental safety measures in simulated and real scenarios.
CO4: To **analyze** risk factors and assess preparedness levels in various disaster-prone settings.

Course Outline:

Unit number-1	**Title:** Introduction to Disaster Management	**No. of hours- 8**

Introduction, Distinguishing between an emergency and a disaster situation, Types of natural and non-natural disasters, Implications of disasters on your region and environment.		
Unit number-2	**Title**: Disaster Management Cycle – Phase I: Mitigation	**No. of hours- 8**
Disaster Management Cycle. Disaster Mitigation, Mitigation strategies Hazard identification and vulnerability analysis, Mitigation strategies or measures Disaster Mitigation and Infrastructure Considerations,		
Unit number-3	**Title**: Disaster Management Cycle – Phase II: Preparedness	**No. of hours- 8**
Introduction Disaster Preparedness, Disaster Risk Reduction (DRR), The Emergency Operation,Plan (EOP), Developing and Writing the EOP, Mainstreaming Child Protection and Gender in Emergency Planning		
Unit number-4	**Title:** Disaster Management Cycle – Phases III and IV: Response and Recovery	**No. of hours- 11**
Introduction Disaster Preparedness, Disaster Risk Reduction (DRR), The Emergency Operation,Plan (EOP), Developing and Writing the EOP, Mainstreaming Child Protection and Gender in Emergency Planning		
Unit number-5	**Title:** Disaster And Development	**No. of hours-10**
Disaster and Development The impact of disasters on development programs Vulnerabilities caused by development, Development programs can decrease vulnerability, Developing a draft country-level disaster and development policy.		

Learning Experience:

Students will engage in interactive lectures, field-based learning, simulations, and disaster drills. Group projects and community surveys will provide hands-on experience in hazard assessment and response planning. Real-world case studies and reflective discussions will deepen understanding. Assessment methods include practical evaluations, presentations, and written assignments.

Textbooks:

Disaster Management R. B. Singh

Suggested Readings:

Disaster Management: A Comprehensive Approach : N. V. S. Raju

Open Educational Resources (OER):

1.OER Commons – Natural Hazards

https://www.oercommons.org/browse?f.keyword=natural-hazards

2.UNDRR – United Nations Office for Disaster Risk Reduction

https://www.undrr.org

3.NDMA India (National Disaster Management Authority)

https://ndma.gov.in

SEMESTER IV					
Course Code **BPCVT405**	**Course Title** **Advanced Electrocardiography**	**L**	**T**	**P**	**C**
Version	2025	**2**	**0**	**0**	**2**
Category of Course	Skill Enhancement Course				
Total Contact Hours	30 Hours				
Pre-Requisites/ Co-Requisites	**Pre-requisite**: Recognition of normal rhythms and basic arrhythmias **Co-requisite**:To enable better correlation between ECG findings and underlying cardiac conditions				

Course Perspective :

The Advanced Electrocardiography course is designed to build upon foundational ECG skills and deepen students' understanding of cardiac electrophysiology through the lens of complex rhythm analysis, clinical correlations, and real-world interpretation. This course equips allied health professionals, especially those in cardiology and critical care, with the expertise required to accurately identify and interpret advanced ECG patterns in varied clinical scenarios.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: To **explain** the advanced concepts of cardiac electrophysiology and the basis of ECG waveform alterations in various pathologies.

CO2: To **analyze** and **interpret** complex ECG patterns including arrhythmias, axis deviations, and conduction blocks.

CO3: To **differentiate** between normal and abnormal ECG findings and correlate them with clinical conditions.

Course Outline:

Unit number-1	**Title:** Anatomy of the Conduction System and Electrophysiology	**No. of hours-5**
Anatomy of the conduction system.Electrophysiology basics (depolarization, repolarization).ECG resting interval measurements.EP study techniques and management of arrhythmias		
Unit number-2	**Title:** Genesis of Cardiac Arrhythmias and Management	**No. of hours-6**
.Arrhythmogenesis mechanisms.ECG artifacts and interference.Explain the use of implantable electrical devices for arrhythmia treatment.Antiarrhythmic agents (class I, II, III, IV).Implantable electrical devices (pacemakers, defibrillators). .ECG changes in ischemic heart disease and myocardial infarction..Stress tests (indications, contraindications, protocols, interpretation)		
Unit number-3	**Title:** Disorders of Impulse Conduction	**No. of hours-6**
Reentry mechanism,Tachycardia caused by reentry,Electrical remodeling of atria.Sinus reentry, atrial reentry, AV node reentry.Pre-excitation syndromes .Cardiac pacing (indications, temporary/permanent pacing, NBG codes, types of pacing).		
Unit number-4	**Title:** Cardiac Pacing and Radiofrequency Ablation Therapy	**No. of hours-6**
Indications for pacing and ablation therapy. Pacing techniques (temporary, permanent).Radiofrequency ablation techniques.Complications of pacing and ablation. Effectiveness of pacing and ablation in managing arrhythmias.		
Unit number-5	**Title:** Radiofrequency Ablation Therapy	**No. of hours-7**
Radiofrequency ablation therapy (indications, common ablation sites).Management of atrial flutter, ventricular tachycardia, atrial fibrillation, AVNRT.		

Learning Experience:

Students will engage with diverse ECG scenarios including arrhythmias, conduction blocks, ischemic changes, and chamber enlargements. Through hands-on sessions, students practice 12-lead ECG recording, extended lead placements (posterior and right-sided leads), and use of signal-averaged ECG. Emphasis is placed on understanding vectorcardiography (VCG), axis determination, and correlation of ECG findings with anatomical and pathophysiological changes in the heart.

Textbooks:

ECG Made Easy Atul Luthra (6th Edition) Jaypee Brothers Medical Publishers.

Suggested Readings:

PGDCC – IGNOU Handbooks for ECG, ECHO, and Stress Test Indira Gandhi National Open University (IGNOU) IGNOU

The ECG Made Easy John R. Hampton (6th Edition) Churchill Livingstone

An Introduction to Electrocardiography C. Colin Schamroth (7th Edition) Wiley-Blackwell

Clinical Electrocardiography: A Simplified Approach Ary L. Goldberger 7th Edition) Mosby

Open Educational Resources (OERs):

1.Life in the Fast Lane (LITFL) – ECG Library
🔗 https://litfl.com/ecg-library/

2.ChalkTalks – Advanced ECG Interpretations (via YouTube)
🔗 https://youtu.be/xkpukLpSYEM

3.Internet Archive – 12-Lead ECG: The Art of Interpretation
🔗 https://archive.org/details/1garciatomasbed12leadecgtheartofinterpretation

4.Goldberger's Clinical Electrocardiography (PDF)
🔗https://drive.uqu.edu.sa//nursing/files/Goldberger%E2%80%99s%20Clinical%20electrocardiography%2C%20A%20simplified%20approach%2C%20ninth%20Edition.pdf

5.Practical Clinical Skills – ECG Training & Quizzes
🔗 https://www.practicalclinicalskills.com/ecg

6.BIOPAC – Introductory ECG Guide (PDF)
🔗 https://www.biopac.com/wp-content/uploads/ECG-Guide.pdf

SEMESTER IV					
Course Code **BPCVT453**	**Course Title** **Advanced Electrocardiography**	**L**	**T**	**P**	**C**
Version	2025	**0**	**0**	**2**	**1**
Category of Course	Skill Enhancement Course(Practical)				
Total Contact Hours	30 Hours				
Pre-Requisites/Co-Requisites	Pre-requisite: Recognition of normal rhythms and basic arrhythmias Co-requisite: To enable better correlation between ECG findings and underlying cardiac conditions				

Course Perspective :

The course prepares students to function effectively in high-dependency environments such as ICUs, emergency departments, and cardiology units by integrating ECG data with patient symptoms, history, and real-time cardiac events. It encourages clinical decision-making, rapid rhythm recognition, and accuracy in using digital ECG technologies. Ethics, patient safety, and clinical correlation form an essential part of the learning framework.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: : **Demonstrate** knowledge and handling of advanced ECG equipment and techniques.

CO2: **Identify** and interpret complex ECG patterns, including arrhythmias and systemic indicators.

CO3: **Troubleshoot** artifacts and analyze telemetry/monitoring data effectively.

CO4: **Apply** ECG interpretation skills in clinical decision-making, emergencies, and ACLS scenarios

Practical Outline:

S.No	Lab Task	Mapped CO/COs
1.	Demonstrate Additional Lead Placement Techniques (V7–V9, V3R–V6R)&Perform Signal-Averaged ECG – Theory and Demonstration	**CO1,CO3**
2.	Introduction and Basic Interpretation of Vectorcardiography (VCG)	**CO1,CO2**
3.	Interpret Arrhythmias: AF, Flutter, AV Blocks, VT/VF, SVT, WPW	**CO2,CO3**
4.	Analyze Bundle Branch Blocks & Fascicular Blocks: RBBB, LBBB, Hemiblocks	**CO2**
5.	Identify ECG Changes in Acute Coronary Syndromes: STEMI, Reciprocal, Posterior MI	**CO2,CO4**
6.	Interpret Pacemaker ECG Patterns: Atrial/Ventricular, Fusion/Capture Beats	**CO2,CO4**
7.	Recognize Systemic Condition ECG Patterns: Electrolyte Imbalance, Pericarditis, PE	**CO2**

8.	Identify QT Prolongation – Congenital and Drug-Induced	**CO2**
9.	Recognize ECG Clues in Brugada Syndrome, HCM, ARVD	**CO2**
10.	Solve Case Studies Using ECG-Based Clinical Decision-Making	**CO4**
11.	Operate Advanced ECG Machines – Digital Systems, Interpretation Software	**CO1**
12.	Set Up and Analyze Holter Monitor Data & Rhythm Strips	**CO1,CO3**
13.	Apply Telemetry Monitoring: ICU Rhythm Capture, Alarms, Artifacts	**CO1,CO3**
14.	Troubleshoot ECG Artifacts: Tremor, Lead Reversal, Electrical Interference	**CO1**
15.	Interpret Code Blue ECG in Real-Time Simulation,Recognize Pulseless Rhythms: Asystole, PEA, VF, VT	**CO4**
16.	Identify ECG Changes Pre- and Post-Defibrillation	**CO4**
17.	Practice ECG Interpretation for ACLS Algorithms and Emergency Decisions	**CO4**

Open Educational Resources (OER):

1. Life in the Fast Lane (LITFL) – ECG Library
🔗 https://litfl.com/ecg-library/

2. ChalkTalks – Advanced ECG Interpretations (via YouTube)
🔗 https://youtu.be/xkpukLpSYEM

3. Internet Archive – 12-Lead ECG: The Art of Interpretation
🔗 https://archive.org/details/1garciatomasbed12leadecgtheartofinterpretation

4. Goldberger's Clinical Electrocardiography (PDF)
🔗https://drive.uqu.edu.sa//nursing/files/Goldberger%E2%80%99s%20Clinical%20electrocardiography%2C%20A%20simplified%20approach%2C%20ninth%20Edition.pdf

5. Practical Clinical Skills – ECG Training & Quizzes
🔗 https://www.practicalclinicalskills.com/ecg

6. BIOPAC – Introductory ECG Guide (PDF)

🔗 https://www.biopac.com/wp-content/uploads/ECG-Guide.pdf

SEMESTER IV					
Course Code **BPAH406**	**Course Title** **Entrepreneurship in Allied Healthcare**	**L**	**T**	**P**	**C**
Version	2025	**2**	**0**	**0**	**2**
Category of Course	VAC				
Total Contact Hours	30 Hours				
Pre-Requisites/ Co-Requisites	Pre-requisite: Awareness of Allied Health Professions Co-requisite: Managing People and Organizations				

Course Perspective :

This course introduces the fundamentals of entrepreneurship within the context of allied healthcare. It focuses on identifying opportunities, developing business plans, and launching healthcare ventures. Emphasis is placed on innovation, ethical practices, financial planning, and sustainable healthcare delivery models tailored for allied health professionals.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: To **recall** key concepts in entrepreneurship, including business models, funding, and regulatory requirements.
CO2: To **explain** the unique challenges and opportunities in starting healthcare ventures in the allied sector.
CO3: To **design** a basic business plan and apply entrepreneurial principles to healthcare-related problems.
CO4: To **analyze** market trends, customer needs, and operational risks in allied healthcare entrepreneurship.

Course Outline:

Unit number-1	**Title:** Introduction to Entrepreneurship & Healthcare Landscape	**No. of hours-7**

.**A. Fundamentals of Entrepreneurship:**Definition, characteristics of an entrepreneur, entrepreneurial mindset.Types of entrepreneurship.Innovation vs. Invention**,**Overview of the healthcare industry in India..Role of allied healthcare professionals in the ecosystem.Current trends and future outlook for allied health services**.**

B. Entrepreneurship in Allied Healthcare: Why allied health professionals should consider entrepreneurship.Opportunities for startups in diagnostic services, rehabilitation, home healthcare, specialized clinics, health tech, medical device distribution, etc.Challenges unique to healthcare entrepreneurship.Expansion strategies.Technology adoption for growth.

Unit number-2	**Title:** Opportunity Identification & Idea Generation	**No. of hours-6**

A. Identifying Market Needs:Market research techniques: primary and secondary data.Understanding patient needs, gaps in services, and technological advancements.Analyzing competition and market size.Brainstorming, mind mapping, SCAMPER.Design Thinking principles for healthcare innovation.Value Proposition Canvas: Defining the value offered to customers.

B. **Feasibility Analysis:**Technical, economic, operational, and legal feasibility.SWOT analysis.Key Performance Indicators (KPIs) for healthcare businesses.Social impact and community engagement.

Unit number-3	**Title**:Business Planning & Legal Aspects	**No. of hours- 6**

A. Components of a Business Plan:Executive Summary, Company Description, Products/Services, Market Analysis, Marketing & Sales Strategy, Management Team, Operations Plan, Financial Plan, Appendix.Developing a Lean Canvas/Business Model Canvas.Sole Proprietorship, Partnership, LLP, Private Limited Company.Registration processes and compliance requirements.

C. Regulatory & Ethical Considerations in Allied Healthcare:Licenses and permits required for healthcare facilities/services (e.g., clinical establishment acts, state-specific regulations).NABH/NABL accreditation .Patient confidentiality and data privacy .Ethical marketing practices in healthcare

Unit number-4	**Title:** Funding & Financial Management	**No. of hours-5**

A. Sources of Funding for Startups: Bootstrapping, FFF (Friends, Family, Fools).Angel Investors, Venture Capital, Bank Loans, Government Schemes.Crowdfunding.Revenue, expenses, profit, loss.Understanding balance sheets, income statements, and cash flow statements (basic level).Pricing strategies for healthcare services.

B. Financial Projections: Estimating startup costs, operating expenses, and revenue.Break-even analysis.Identifying and mitigating business risks.Insurance for

healthcare businesses (e.g., professional indemnity).		
Unit number-5	**Title:** Marketing, Sales & Operations	**No. of hours- 6**
A. Sources of Funding for Startups: Bootstrapping, FFF..Angel Investors, Venture Capital, Bank Loans, Government Schemes (e.g., Startup India, Mudra Yojana, scheme.Crowdfunding.Revenue, expenses, profit, loss.Understanding balance sheets, income statements, and cash flow statements (basic level).Pricing strategies for healthcare services. **B Financial Projections:**Estimating startup costs, operating expenses, and revenue.Break-even analysis.Selling the business, merging, passing it on.		

Learning Experience:

Students will engage in lectures, case studies, business plan development workshops, and guest sessions from healthcare entrepreneurs. Team-based activities and simulations will enhance innovation and strategic thinking. Continuous assessment includes presentations, entrepreneurial project work, and pitch evaluations to develop real-world business competencies.

Open Educational Resources(OERS):

1.UHV Library – Allied Health OERs
🔗 https://library.uhv.edu/oer/health-sciences

2.Adelaide University – Allied Health OER Guide
🔗 https://libguides.adelaide.edu.au/OER/allied

3.OER Commons – Healthcare & Entrepreneurship Resources
🔗 https://www.oercommons.org/

4.Doctorpreneurs Startup Guide (PDF Resource)
🔗https://www.healthinnowest.net/wp-content/uploads/2023/05/The-Ultimate-Doctorpreneurs-Startup-Guide.pdf

5.ICN – Entrepreneurial Practice for Nurses (PDF)
🔗https://www.icn.ch/sites/default/files/2023-06/2012_Handbook_entrepreneurial_practice_eng.pdf

6.University of Minnesota – Healthcare Entrepreneurship Curriculum (PDF)
🔗https://pubs.lib.umn.edu/index.php/jrmc/article/download/3564/2669

SEMESTER–V

SEMESTER V					
Course Code	**Course Title**	**L**	**T**	**P**	**C**

BPCVT501	**Cardiac Catheterization**				
Version	2025	**3**	**1**	**0**	**4**
Category of Course	Major				
Total Contact Hours	45 Hours				
Pre-Requisites/ Co-Requisites	Pre-requisite: Introduction to Cardiac Care Technology Co-requisite: Invasive Cardiology Procedures				

Course Perspective :

This course focuses on the techniques, principles, and clinical significance of cardiac catheterization. It prepares learners to support diagnostic and interventional cardiac procedures by providing theoretical knowledge and practical experience in catheter lab operations, patient safety, and post-procedure care.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: To **recall** the anatomy, instrumentation, and procedural steps involved in cardiac catheterization.
CO2: To **describe** the indications, contraindications, and physiological basis of cardiac catheter procedures.
CO3: To **assist** in patient preparation, equipment handling, and intra-procedural support in the catheterization lab.
CO4: To **interpret** hemodynamic data and angiographic findings from cardiac catheterization

Course Outline:

Unit number-1	**Title:** Asepsis in the Cardiovascular Catheterization Laboratory	**No. of hours-10**
Aseptic technique principles,Sources of contamination (e.g., personnel, equipment, environment),Sterile field setup and maintenance,Infection control protocols. **Basics of Asepsis and Infection Control:** Definition of asepsis, antisepsis, and sterilization,Chain of infection and modes of transmission,Common pathogens encountered in cath lab settings,Healthcare-associated infections (HAIs) and prevention,Overview of standard precautions and hand hygiene (WHO 5 Moments)		
Unit number-2	**Title:** Atherectomy and Thrombectomy	**No. of hours-10**
Atherectomy devices (directional coronary atherectomy, rotational atherectomy),Atherectomy procedure,Atherectomy complications,Thrombectomy devices (angiojet, manual aspiration devices),Thrombectomy procedure. **Pathophysiology & Lesion Morphology:**Atherosclerotic plaque characteristic,Thrombus formation and types (white vs. red thrombus),Coronary, peripheral, and carotid lesion anatomy,Importance of lesion assessment before intervention.		

Unit number-3	**Title3:** Foreign Body Retrieval	**No. of hours-10**
Foreign body retrieval instruments (Amplatz goose neck snare, Curry intravascular retriever, Dotter intravascular retriever, vascular retrieval forceps, Welter retrieval loop, biopsy forceps),Foreign body retrieval techniques,Challenges and complications. **Indications and Contraindications:**Clinical symptoms prompting retrieval,Silent foreign bodies: when to intervene,Contraindications and procedural considerations,Urgency and triage for retrieval.		
Unit number-4	**Title:4:** Emergencies in the Cardiac Catheterization Laboratory	**No. of hours-6**
Common complications in the catheterization laboratory (e.g., bleeding, arrhythmias, contrast reactions),ACLS and BLS algorithms,Emergency management strategies,Response to cardiac arrest, anaphylaxis, and bleeding.		
Unit number-5	**Title**: Post-Procedure Care & Complications	**No. of hours-9**
Patient recovery and observation,Hemostasis management (manual, closure devices),Contrast-induced nephropathy,Bleeding, hematoma, arrhythmias, stroke,Management of vascular complications. **Infection Control & Safety Protocols:**Aseptic techniques and sterilization,Handling biohazardous materials,Universal precautions,Cath lab disinfection protocols,Waste disposal norms (Biomedical Waste Management Rules)		

Learning Experience:

Students will participate in lectures, simulation-based labs, and live case observations in cardiac cath labs. Emphasis is placed on sterile techniques, use of contrast agents, catheter manipulation, and real-time ECG and pressure monitoring. Learning is reinforced through hands-on training, case presentations, skill assessments, and structured clinical evaluations.

Textbooks:

Grossman & Baim's Cardiac Catheterization, Angiography, and Intervention (9th Edition) Mauro Moscucci, MD, MBA Lippincott Williams & Wilkins (LWW)

Suggested Readings:

Textbook of Interventional Cardiology (8th Edition) Eric J. Topol, MD; Paul S. Teirstein, MD Elsevier

Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine (12th Edition)Douglas P. Zipes, MD; Peter Libby, MD; Robert O. Bonow, MD; Douglas L. Mann, MD; Gordon F. Tomaselli, MD 12th : Elsevier

ACC/AHA Guidelines for Cardiac Catheterization Laboratories American College of Cardiology/American Heart Association Task Force on Practice Guidelines Circulation,

Open Educational Resources(OERS):

1.Boston University – Cath Lab Fellow Manual
🔗https://www.bumc.bu.edu/cardiovascular-medicine/files/2013/06/BMC-Cath-Lab-Fellow-Manual-2013.doc
2.UNC Medical Center – Infection Control in Cath Labs
🔗https://spice.unc.edu/wp-content/uploads/2022/06/Cardiac-Catheterization-Laboratories.pdf

3.Cleveland Clinic – Procedure Overview
🔗https://my.clevelandclinic.org/health/diagnostics/16832-cardiac-catheterization

4.Johns Hopkins Medicine – Cath Explanation

🔗https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/cardiac-catheterization

5.Mayo Clinic – About Cardiac Catheterization

🔗https://www.mayoclinic.org/tests-procedures/cardiac-catheterization/about/pac-20384695

SEMESTER V					
Course Code **BPCVT551**	**Course Title** **Cardiac Catheterization**	**L**	**T**	**P**	**C**
Version	2025	**0**	**0**	**2**	**1**
Category of Course	Major(Practical)				
Total Contact Hours	30 Hrs				
Pre-Requisites/Co-Requisites	Pre-requisite: Understand Medical Instrumentation or Biomedical Equipment Basics Co-requisite: Hemodynamics and Monitoring Techniques				

Course Perspective :

This practical course provides hands-on exposure to the principles and procedures of cardiac catheterization. It emphasizes sterile techniques, equipment setup, patient preparation, radiation safety, contrast media usage, pressure waveform interpretation, and assisting in diagnostic and interventional procedures. The course aims to bridge theoretical understanding with clinical skills in a cath lab setting.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: Understand the structure, workflow, and safety principles of the cardiac catheterization lab.

CO2: Demonstrate competency in equipment handling, tray setup, and procedural assistance.

CO3: Interpret anatomical, physiological, and hemodynamic data during invasive procedures.

CO4: Apply skills in assisting diagnostic and interventional cardiac procedures, emergency support, and post-procedure care.

Practical Outline:

S/NO	Lab Task	Mapped CO/COs
1	Introduction to Invasive Cardiology Suite & Team Roles	CO1
2	Demonstrate Sterile Technique & Infection Control in Cath Lab,Follow Radiation Protection and Safety Protocols	CO1,CO3
3	Perform Cath Lab Documentation and Informed Consent Procedures	CO1,CO4
4	Prepare Angioplasty Tray and Balloon/Stent Systems & Assist in Trans-radial and Transfemoral Access Techniques	CO2
5	Handle Fluoroscopy Equipment (C-arm, Controls, DICOM archiving)	CO2
6	Demonstrate Handling of Interventional Tools (Balloons, Wires, Sheaths)	CO2,CO3
7	Maintain Sterile Field and Troubleshoot Equipment Malfunctions	CO2,CO3
8	Review Coronary Anatomy Relevant to Cath Procedures &Differentiate Normal vs. Diseased Coronary Anatomy	CO1,CO3, CO4
9	Understand Coronary Angiographic Projections (RAO/LAO/Cranial/Caudal)	CO3
10	Demonstrate Hemodynamic Monitoring & Interpret Pressure Waveforms	CO3
11	Use Swan-Ganz Catheter for Cardiac Output Measurement	CO3
12	Understand Coronary Physiology: FFR/IFR (Demonstration)	CO3,CO4
13	Assist in Coronary Angiography, Aortography and Ventriculography Procedures	CO4
14	Assist in Right and Left Heart Catheterization,Percutaneous Coronary Intervention (PCI)	CO4
15	Introduction to Electrophysiology (EP) Studies – Catheter Placement,Guide Catheter and Guidewire Manipulation (Supervised)	CO4
16	Assist in Temporary Pacemaker Insertion, Pericardiocentesis	C4
17	Perform Continuous Monitoring: ECG, SpO_2, BP, $ETCO_2$	CO3
18	Perform Post-Procedure Monitoring and Recognize Complications,Recognize & Manage Arrhythmias During Procedures	CO4

Open Educational Resources(OERS):

1.BYU Cardiac Catheterization Handbook (Free PDF)
🔗https://celibrarydev.byu.edu/browse/2143724885/105408/cardiac%20catheterization%20handbook_4th-edition.pdf

2.Boston University – Cath Lab Fellow Manual
🔗https://www.bumc.bu.edu/cardiovascular-medicine/files/2013/06/BMC-Cath-Lab-Fellow-Manual-2013.doc

3.Cleveland Clinic – Procedure Overview
🔗https://my.clevelandclinic.org/health/diagnostics/16832-cardiac-catheterization

4.Johns Hopkins Medicine – Cath Explanation
🔗https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/cardiac-catheterization

5.Mayo Clinic – About Cardiac Catheterization
🔗https://www.mayoclinic.org/tests-procedures/cardiac-catheterization/about/pac-20384

SEMESTER V					
Course Code **BPCVT502**	**Course Title** **Invasive Cardiology**	**L**	**T**	**P**	**C**
Version	2025	**3**	**1**	**0**	**4**
Category of Course	Major				
Total Contact Hours	45HRS				
Pre-Requisites/ Co-Requisites	Pre-requisite: Introduction to Cardiac Care and Patient Monitoring Co-requisite:Cardiac Catheterization				

Course Perspective :

This course provides comprehensive knowledge of invasive diagnostic and therapeutic procedures used in cardiology. It equips learners with the theoretical background and practical skills to support interventional procedures such as angiography, angioplasty, and electrophysiological studies, with a strong focus on safety, precision, and clinical judgment.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: To **identify** the tools, techniques, and procedural protocols used in invasive cardiology.
CO2: To **explain** the physiological and clinical rationale behind invasive cardiac procedures.
CO3: To **assist** in preparation, execution, and monitoring of patients during invasive cardiovascular procedures.

CO4: To **differentiate** between various invasive techniques and **interpret** clinical data obtained during interventions.

Course Outline:

Unit number-1	**Title:** Contrast Media and Hemodynamics	**No. of hours-10**
Contrast media (types, properties, applications),Contrast media reactions (mild, moderate, severe, allergies),Contrast-induced nephropathy,Hemodynamics		

(pressure measurement, sources of error, artifacts),Hemodynamic waveforms,Gradient and valve area calculations,Cardiac output formulas.

Introduction to Contrast Media:Definition and role in cardiovascular diagnostics,Historical evolution of contrast agents,Physical and chemical properties: osmolality, viscosity, iodine content,Types: high-osmolar, low-osmolar, iso-osmolar contrast agents.

Unit number-2	**Title:** Intravascular Ultrasound (IVUS) and Functional Assessment	**No. of hours-8**

Angiography vs. IVUS,IVUS systems and applications, IVUS complications, Intravascular pressure measurement, Coronary pressures and fractional flow reserve **Complications and Troubleshooting:** Wire kinking, signal drift, damping,Artifact in IVUS imaging,Risk of vessel injury, vasospasm, or dissection,Technical errors in physiological measurements.

Unit number-3	**Title:** Percutaneous Coronary Intervention (PCI)	**No. of hours-7**

PCI history and indications,Angioplasty balloons (OTW, SOE, fixed-wire),Stent implantation, Interventional cardiology hardware (stents, guidewires, catheters), IABP (principles, indications, contraindications, timing, complications),Percutaneous ventricular assist devices (e.g., tandem heart, Impella)

Unit number-4	**Title:** Peripheral Carotid Angiography and Cardiac Pharmacology	**No. of hours-10**

Peripheral carotid angiography (indications, procedure, post-procedure care),Cerebrovascular anatomy and pathology,Local anesthetics, analgesics, and sedatives,Vasodilators (nitroglycerine, sodium nitroprusside),Beta-blockers (metoprolol, propranolol, esmolol, labetalol),Calcium channel blockers (diltiazem, verapamil, nicardipine), Anticoagulation agents (platelet aggregation inhibitors, aspirin, clopidogrel,glycoprotein IIb/IIIa inhibitors, tirofiban, heparin, warfarin, thrombolytics).

Unit number-5	**Title:** Complications and Emergency Management	**No. of hours-10**

Arrhythmias, hypotension, tamponade,Coronary dissection and perforation,Contrast reaction and renal failure,Cardiogenic shock, arrest protocols,Sterile field breaches and infection control.

Quality Assurance and Cath Lab Audits: Key performance indicators (KPI) in interventional cardiology,Radiation exposure tracking and minimization strategies,Inventory control and contrast management,Audit reports and clinical outcome analysis.

Learning Experience:

Students will undergo interactive lectures, catheterization lab demonstrations, and hands-on simulation training. Practical sessions include assisting in coronary angiography, PCI, stent deployment, and electrophysiological procedures. Clinical case discussions, imaging interpretation, and structured assessments will reinforce learning and clinical decision-making.

Textbooks:

The Interventional Cardiac Catheterization Handbook (3rd Edition) Morton J. Kern, MD Saunders (Elsevier)

Suggested Readings:

Invasive Cardiology: A Manual for Cath Lab Personnel (3rd Edition) Sandy Watson, Kenneth A. Gorski: Jones & Bartlett Learning

Open Educational Resources(OERS):

1.ESC (European Society of Cardiology) – Interventional Cardiology Curriculum
🔗https://www.escardio.org/Sub-specialty-communities/European-Association-of-Percutaneous-Cardiovascular-Interventions-(EAPCI)/Education/Core-curriculum

2.OpenStax (Basic Cardiovascular Physiology)
🔗https://openstax.org/books/anatomy-and-physiology/pages/19-introduction
3.NBE (India) – FNB Interventional Cardiology Curriculum
🔗https://natboard.edu.in/viewNBEprogram?NBE=Interventional%20Cardiology
4.UC Davis Interventional Cardiology Fellowship Curriculum (Sample OER)
🔗https://health.ucdavis.edu/internalmedicine/fellowships/interventional-cardiology

SEMESTER V					
Course Code **BPCVT552**	**Course Title** **Invasive Cardiology**	**L**	**T**	**P**	**C**
Version	2025	**0**	**0**	**2**	**1**
Category of Course	Major(Practical)				
Total Contact Hours	30 Hrs				
Pre-Requisites/Co-Requisites	Pre-requisite: Medical Instrumentation or Diagnostic Equipment Basics Co-requisite: Invasive Cardiology (Practical)				

Course Perspective :

This course is designed to provide hands-on experience in invasive cardiology procedures, including preparation, assistance, and post-procedural care in a catheterization lab. It integrates theoretical knowledge with applied clinical skills such as vascular access, pressure monitoring, angiography, sterile technique, and

radiation safety. Emphasis is placed on real-time monitoring, equipment handling, patient care, and assisting in interventions under supervision.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: Understand the organization, roles, protocols, and safety regulations in an invasive cardiology setting.
CO2: Interpret coronary anatomy, angiographic views, and hemodynamic parameters essential to diagnostic procedures.
CO3: Demonstrate procedural support skills, equipment setup, and patient monitoring during cardiac catheterization.
CO4: Apply clinical and technical competencies in assisting advanced diagnostic and interventional procedures including emergencies.

Practical Outline:

S/No.	Lab Task	Mapped CO/COs
1	Introduction to Invasive Cardiology Suite: Roles of Cardiologist, Technologist, Nurse	CO1,CO3
2	Demonstrate Sterile Technique & Infection Control in Cath Lab	CO1,CO3, CO4
3	Implement Radiation Protection and Safety Protocols	CO1,CO3
4	Conduct Cath Lab Documentation and Consent Procedures	CO1,CO4
5	Review Coronary Anatomy Relevant to Cath Procedures,Recognize Normal vs. Diseased Coronary Anatomy	CO1,CO2, CO4
6	Understand Coronary Angiographic Projections (RAO/LAO/Cranial/Caudal)	CO1,CO2, CO4
7	Perform Hemodynamic Monitoring & Interpret Pressure Waveforms (Aortic, LV, RA, RV, PA)	CO2,CO3, CO4

8	Assist in Coronary Angiography,Right and Left Heart Catheterization,Provide Support in Aortography and Ventriculography	CO2,CO3, CO4
9	Operate Swan-Ganz Catheter & Measure Cardiac Output,Prepare Angioplasty Tray and Balloon/Stent Systems	CO2,CO3, CO4
10	Assist in PCI: Balloon Inflation and Stent Deployment,Practice Trans-radial and Transfemoral Access Techniques	CO2,CO3, CO4
11	Manipulate Guide Catheter and Guidewire Under Supervision	CO3,CO4
12	Introduction to EP Studies – Catheter Placement and Fluoroscopy Views,Assist in Temporary Pacemaker Insertion,Pericardiocentesis	CO3,CO4
13	Demonstrate Coronary Physiology: FFR/IFR,Continuous Monitoring: ECG, SpO_2, BP, $ETCO_2$	CO2,CO3, CO4
14	Recognition and Management of Arrhythmias During Procedures	CO2,CO3, CO4
15	Participate in Code Blue Mock Drills in Cath Lab,Post-Procedure Monitoring and Complication Recognition	CO2,CO3, CO4
16	Handle Fluoroscopy Equipment: C-arm, Controls, DICOM	CO1,CO3, CO4
17	Care and Handling of Interventional Tools: Balloons, Wires, Sheaths &Maintain Sterile Field & Troubleshoot Equipment Malfunctions	CO1,CO3, CO4

Open Educational Resources (OER):

1.ESC (European Society of Cardiology) – Interventional Cardiology Curriculum
🔗https://www.escardio.org/Sub-specialty-communities/European-Association-of-Percutaneous-Cardiovascular-Interventions-(EAPCI)/Education/Core-curriculum

2.OpenStax (Basic Cardiovascular Physiology)
🔗https://openstax.org/books/anatomy-and-physiology/pages/19-introduction
3.NBE (India) – FNB Interventional Cardiology Curriculum
🔗https://natboard.edu.in/viewNBEprogram?NBE=Interventional%20Cardiology
4.UC Davis Interventional Cardiology Fellowship Curriculum (Sample OER)
🔗https://health.ucdavis.edu/internalmedicine/fellowships/interventional-cardiology/

SEMESTER V					
Course Code **BPCVT503**	**Course Title** **TMT & Holter Monitoring**	**L**	**T**	**P**	**C**
Version	2025	**3**	**0**	**0**	**3**
Category of Course	Minor				
Total Contact Hours	45HRS				
Pre-Requisites/ Co-Requisites	Pre-requisite: Understanding of Cardiac Cycle and Rhythm Interpretation Co-requisite:Clinical Cardiology or Diagnostic Cardiac Procedures				

Course Perspective :

This course focuses on the principles, procedures, and clinical relevance of Treadmill Testing (TMT) and Holter Monitoring in the diagnosis and management of cardiac conditions. It prepares learners to conduct these non-invasive diagnostic tests, analyze findings, and contribute to patient care planning in cardiology settings.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: To **recall** the indications, protocols, and safety measures related to TMT and Holter Monitoring.
CO2: To **describe** the physiological basis and diagnostic value of ambulatory ECG and exercise stress testing.
CO3: To **operate** equipment, prepare patients, and conduct TMT and Holter tests in clinical settings.
CO4: To **interpret** recorded ECG data to identify arrhythmias, ischemic changes, and abnormal responses.

Course Outline:

Unit number-1	Title: Treadmill Exercise Stress Testing	No. of hours-10
Treadmill components and functions,:Emergency Stop Button & Safety Clip ECG Monitoring System,BP Monitor (Automatic or Manual),Data Storage & Printing Unit. Exercise stress testing principles:Physiological Basis,Workload Increments,Indications and contraindications for exercise stress testing:Absolute Contraindications,Relative Contraindications, Patient preparation for exercise stress tests,Exercise stress test protocols:Bruce Protocol,Modified Bruce Protocol etc.Interpretation of exercise stress test results (ECG changes, ST segment analysis):ECG Changes, ST Segment Analysis,Arrhythmias etc.		
Unit number-2	**Title:ST Segment Changes**	**No. of hours-10**
ST segment anatomy,Normal ST segment changes during exercise, Clinical Implication:Abnormal ST segment elevations and depressions,Interpretation of ST segment changes in myocardial ischemia and infarction.Positive Stress Test:High-Risk Patterns,False Positives,False Negatives,Leads Involved.ST Segment in Special Conditions.		
Unit number-3	**Title:Cardiac Arrhythmias and Conduction Disturbances**	**No. of hours-9**
Common arrhythmias during stress testing (e.g., atrial fibrillation, ventricular tachycardia),Conduction disturbances (e.g., heart blocks),Relationship between arrhythmias and coronary artery disease, Risk factors for arrhythmias and conduction disturbances.		
Unit number-4	**Title: Holter Monitoring**	**No. of hours-8**
Holter recording principles,Holter recording procedure (electrode placement, recording duration),Holter recording analysis (rhythm identification, arrhythmia detection),Holter recording report interpretation.Arrhythmia Episodes,ST Segment Analysis,Clinical Significance.		
Unit number-5	**Title:Safety, Risk Stratification & Test Supervision**	**No. of hours-7**
Emergency protocols during stress testing,Pretest screening and informed consent,Use of crash cart and defibrillator,Termination criteria (absolute vs relative),Role of technologist vs physician.		

Learning Experience:

Students will engage in structured lectures, live demonstrations, and supervised practical sessions. They will gain hands-on experience in preparing patients, applying leads, oTMT and Holter systems, and analyzing data outputs. Clinical case discussions and reporting exercises will develop

interpretation and decision-making skills. Assessments include OSCEs, data interpretation tests, and reflective logs.

Textbooks:

Advanced Cardiovascular Life Support (ACLS) Provider ManualAmerican Heart Association (AHA) American Heart Association

Open Educational Resources (OERs):

1.ESC Working Group 10: Curriculum & Syllabus for Interventional Cardiology Training
PDF: ESC WG 10 Curriculum (2006) acc.org+15escardio.org+15escardio.org+15

2.ESC/EAPCI: Core Curriculum for Percutaneous Cardiovascular Interventions
PDF: Updated Core Curriculum (2020) escardio.org+6

SEMESTER V					
Course Code **BPCVT552**	**Course Title** **TMT & Holter Monitoring**	**L**	**T**	**P**	**C**
Version	2025	**0**	**0**	**2**	**1**
Category of Course	Minor (Practical)				
Total Contact Hours	30 Hrs				
Pre-Requisites/Co-Requisites	Pre-requisite: Introduction to Non-invasive Cardiology procedures (ECG, ECHO, TMT) Co-requisite: Cardiovascular Physiology and Electrocardiography (ECG) Interpretation.				

Course Perspective :

The course provides students with knowledge and skills to perform and interpret cardiac stress tests and continuous ECG monitoring. It emphasizes principles, procedures, clinical applications, and patient safety. Learners gain competence in detecting arrhythmias, ischemic changes, and other cardiac abnormalities to support accurate diagnosis and treatment.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1:Understand the indications, contraindications, and protocols of TMT, Holter, and ABPM.

CO2:Set up, calibrate, and operate exercise testing and ambulatory monitoring equipment.

CO3:Perform and monitor TMT and Holter procedures, ensuring patient safety and accurate data.

CO4:Interpret and document findings from TMT, Holter, and ABPM, including emergency preparedness.

Practical Outline:

S/No.	Lab Task	Mapped CO/COs
1	Pre-Test Preparation: Patient selection, indications, contraindications for stress testing,Obtaining informed consent and explaining the TMT procedure	CO1,CO3,CO 4
3	Recording resting ECG, BP, and pre-exercise vitals	CO2,CO3
4	Introduction to TMT equipment and software setup,Electrode placement for exercise ECG monitoring	CO2,CO3
5	Understanding Bruce, Modified Bruce, and Naughton protocols	CO1,CO2
6	Executing the stress test: Monitoring ECG, BP, HR response	CO3
7	Identifying criteria for test termination (max HR, symptoms, ECG changes)	CO3,CO4
8	Emergency preparedness in lab: Recognizing angina, arrhythmias, hypotension	CO3,CO4
9	Post-test: Cool-down monitoring, post-exercise ECG and vitals, patient post-test instructions	CO3,CO4

10	Assisting interpretation of ST changes, HR recovery, and arrhythmias	CO4
11	Understanding true vs. false positive/negative TMT results	CO4
12	Holter Setup: Device introduction, electrode placement, patient instruction,Data retrieval and review from Holter system	CO2,CO3,CO4
13	Identification of arrhythmias (PACs, PVCs, AF, pauses, ST changes),Preparing Holter reports under supervision	CO4
14	ABPM Setup: Cuff selection, device programming, patient education	CO2,CO3
15	Data download from ABPM, plotting variations, identifying abnormal patterns,Differentiating dipper vs. non-dipper BP profiles	CO4
16	Emergency management: Crash cart setup, defibrillator, code blue in TMT lab	CO3,CO4
17	Documenting test findings, event logs, and generating reports	CO4
18	Addressing ethical issues: informed consent, patient communication, data privacy	CO1,CO4

Open Educational Resources (OER):

1.ESC Working Group 10: Curriculum & Syllabus for Interventional Cardiology Training
PDF: ESC WG 10 Curriculum (2006) acc.org+15escardio.org+15escardio.org+15

2.ESC/EAPCI: Core Curriculum for Percutaneous Cardiovascular Interventions
PDF: Updated Core Curriculum (2020) escardio.org+6

SEMESTER V					
Course Code **BPCVT504**	**Course Title** **Advanced Intensive Care (BLS, ACLS, PALS & NALS)**	**L**	**T**	**P**	**C**
Version	2025	**2**	**0**	**0**	**2**
Category of Course	SEC				
Total Contact Hours	30HRS				
Pre-Requisites/ Co-Requisites	Pre-requisite: Introduction to Emergency and Critical Care. Co-requisite: Clinical Practicum in Critical or Emergency Care.				

Course Perspective :

This course integrates advanced life-saving protocols for adult, pediatric, and neonatal populations. It emphasizes high-level clinical decision-making, emergency interventions, and critical care teamwork. The course prepares learners to respond effectively in life-threatening situations using internationally recognized standards like ACLS, PALS, and NALS.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: To **recall** protocols and algorithms for BLS, ACLS, PALS, and NALS.
CO2: To **explain** the pathophysiological basis of life-threatening conditions and their emergency management.
CO3: To **perform** advanced resuscitation techniques and emergency interventions in simulated and clinical scenarios.
CO4: To **assess** patient conditions and identify priorities for intensive and emergency care.

Course Outline:

Unit number-1	**Title:** Advanced Cardiac Life Support Algorithms	**No. of hours-6**
ACLS algorithm,Cardiac rhythm recognition,Advanced airway management (intubation, cricothyrotomy),ACLS medications (e.g., epinephrine, amiodarone, vasopressin),Post-arrest care (temperature management, sedation,Neurologic assessment.		
Unit number-2	**Title:** Pharmacology in ACLS	**No. of hours-6**
ACLS medications (e.g., epinephrine, amiodarone, vasopressin, atropine),Indications, dosages, and administration routes,Mechanisms of action and side effects,Drug calculations, Adverse drug reaction management.		
Unit number-3	**Title:** Advanced Airway Management	**No. of hours-6**
Endotracheal intubation techniques, Difficult airway management, Cricothyrotomy, Airway complications (e.g., aspiration, tube dislodgement).		
Unit number-4	**Title:** Defibrillation and Pacing	**No. of hours-6**
Defibrillation principles (biphasic, monophasic),Defibrillation technique,Pacemaker modes (e.g., fixed-rate, demand),Pacing indications and complications.		
Unit number-5	**Title:** Post-Arrest Care and Neurologic Assessment	**No. of hours-6**
Post-arrest care (temperature management, sedation),Neurologic assessment (GCS, pupil response),Targeted temperature management.		

Learning Experience:

Students will engage in hands-on training, high-fidelity simulations, and team-based emergency drills. Skills labs will provide practice in airway management, defibrillation, and pediatric/neonatal resuscitation. Continuous assessments, scenario-based testing, and certification evaluations will ensure clinical readiness and competence.

Textbooks:

The Interventional Cardiac Catheterization Handbook Morton J. Kern, MD (3rd Edition**)**

Suggested Readings:

1.**Textbook of Neonatal Resuscitation (NRP),** by **Gary M. Weiner, Jeanette Zaichkin,** edition **8th Edition, 2021** published by **American Academy of Pediatrics**

2. **Critical Care Medicine: Principles of Diagnosis and Management in the Adult,** by **Joseph E. Parrillo, R. Phillip Dellinger**, edition **5th Edition, 2019** published by **Elsevier**

3.**Manual of Emergency Airway Management**, by **Ron M. Walls, Michael F. Murphy**, edition **5th Edition, 2018**, published by **Wolters Kluwer**

Open Educational Resources (OER):

1. Save a Life by NHCPS (Disque Foundation) – Free certified courses & resources https://nhcps.com/free-resources/
2. 🔗 ACLS, PALS, BLS Algorithms & Tools (from ACLS-PALS-BLS.com) https://www.acls-pals-bls.com/algorithms/pals/
3. 🔗 American Heart Association – ACLS/BLS/PALS Course Info https://cpr.heart.org
4. 🔗 ACLSNow – Study tools, practice tests, algorithm downloads https://aclsnow.com/

SEMESTER V					
Course Code **BPCTC554**	**Course Title** **Advanced Intensive Care (BLS, ACLS, PALS & NALS)**	**L**	**T**	**P**	**C**
Version	2025	**0**	**0**	**2**	**1**
Category of Course	Major (Practical)				
Total Contact Hours	30 Hrs				
Pre-Requisites/Co-Requisites	Pre-requisite: Familiarity with ECG interpretation and pharmacology Co-requisite: Cardiac Rhythm Interpretation Lab				

Course Perspective :

The course aims to train healthcare professionals in recognizing and responding to life-threatening emergencies through Basic Life Support (BLS), Advanced Cardiovascular Life Support (ACLS), Pediatric Advanced Life Support (PALS), and Neonatal Advanced Life Support (NALS). The practical training integrates resuscitation skills, emergency algorithms, team dynamics, and clinical judgment in high-pressure scenarios to improve patient survival outcomes.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: Identify and demonstrate the use of basic and advanced airway equipment and ventilation techniques appropriate for adult, pediatric, and neonatal patients.

CO2:Practice high-quality CPR and resuscitation techniques following BLS, ACLS, PALS, and NALS protocols across all age groups.

CO3:Demonstrate the setup and application of emergency equipment, monitoring devices, and drug administration techniques in critical care scenarios.

CO4:Adapt assessment approaches, clinical algorithms, and team-based response strategies to effectively manage emergency and resuscitation situations.

Practical Outline:

S/NO	Lab Task	Mapped CO/COs
1	Demonstrate Basic and Advanced Airway Equipment Identification: OPA, NPA, BVM,Bag-Valve-Mask Ventilation Techniques.	CO1
2	Practise High-Quality Adult CPR – Compression Techniques & Feedback Devices,Pediatric BLS and CPR Techniques	CO1,CO3
3	Practise Chest Compression Technique for Neonates,Initial Steps of Neonatal Resuscitation (Drying, Stimulation, Positioning)	CO3
4	Identify Positive Pressure Ventilation Techniques (PPV) in Neonates,Oxygen Delivery and Thermoregulation	CO3
5	Demonstrate Emergency Crash Cart Setup – Adult & Pediatric,Basic ICU Monitoring Parameters: HR, BP, SpO_2, RR, ECG, $ETCO_2$	CO1
6	Adapt ACLS Survey: Airway, Breathing, Circulation, Differential Diagnosis,Endotracheal Intubation – Adult (on Manikins)	CO4
7	Demonstration of Use of Supraglottic Devices (LMA, i-gel),Defibrillation – Manual, AED, Synchronized Cardioversion	CO1

8	Practise ACLS Algorithms for Bradycardia, Tachycardia, Asystole, PEA, VF/pulseless VT	CO2
9	IV/IO Access & Emergency Drug Administration (Demo),Mega Code Simulations with Team Dynamics,Mock Code Blue Drills in ICU Setup	CO1
10	Demonstrate Debriefing and Error Management in Critical Scenarios	CO1
11	PALS Assessment: Initial, Primary, Secondary, Tertiary,PALS Algorithms for Bradycardia, Tachycardia, Cardiac Arrest	CO3
12	Identification and Recognition & Management of Shock and Respiratory Distress	CO3
13	Pediatric Drug Dosage Calculation and Administration (Demo),Team-Based PALS Resuscitation Scenarios	CO1
14	Practise Pediatric BLS and CPR Techniques,Pediatric Emergency Crash Cart Setup,Endotracheal Intubation – Pediatric (on Manikins)	CO3

Open Educational Resources (OER):

1.Save a Life by NHCPS (Disque Foundation) – Free certified courses & resources
https://nhcps.com/free-resources/
2.ACLS, PALS, BLS Algorithms & Tools (from ACLS-PALS-BLS.com)
https://www.acls-pals-bls.com/algorithms/pals/
3.American Heart Association – ACLS/BLS/PALS Course Info
https://cpr.heart.org

4.ACLSNow – Study tools, practice tests, algorithm downloads
https://aclsnow.com/

SEMESTER VI					
Course Code **BPCVT601**	**Course Title** **Perfusion Technology**	**L**	**T**	**P**	**C**
Version	2025	**3**	**1**	**0**	**4**
Category of Course	Major				
Total Contact Hours	45 Hours				
Pre-Requisites/ Co-Requisites	Pre-requisite: Introduction to Medical Equipment and Instrumentation Co-requisite:Applied Physiology in Perfusion				

Course Perspective :

This course provides comprehensive knowledge and hands-on training in the principles and practices of clinical perfusion. It focuses on the operation of heart-lung machines, extracorporeal circulation techniques, and intraoperative patient management. The course equips learners with critical skills to assist in open-heart surgeries and other procedures requiring cardiopulmonary bypass.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: To **identify** key perfusion equipment, components of the heart-lung machine, and circuit layouts.
CO2: To **explain** the physiological effects of extracorporeal circulation and the principles of oxygenation and perfusion.
CO3: To **perform** standard perfusion techniques under supervision and manage bypass procedures according to protocols.
CO4: To **monitor** and **interpret** perfusion parameters and respond to intraoperative changes in patient status.

Course Outline:

Unit number-1	**Title:** Development of Cardiopulmonary Bypass	**No. of hours-8**
History of CPB,Key researchers in CPB,Development of pumps, oxygenators, and heat exchangers,Blood pump theory (pulsatile vs. centrifugal pumps).		

Unit number-2	**Title:** Blood Pumps, Circuitry, and Cannulation Techniques	**No. of hours-9**
Types of blood pumps (centrifugal, roller, peristaltic),CPB circuit components (reservoir, oxygenator, heat exchanger, pump),Cannulation techniques (arterial, venous),Blood handling (heparinization, priming, temperature control).		
Unit number-3	**Title** Principles of Oxygenator Function	**No. of hours-8**
Gas exchange in oxygenators (diffusion, convection),Heat transfer in oxygenators,Membrane vs. bubble oxygenators,Chemistry and physics of heat exchange, Miniaturization of oxygenators.		
Unit number-4	**Title:4:** Myocardial Protection	**No. of hours-9**
Myocardial protection strategies,Blood vs. crystalloid cardioplegia,Types of cardioplegia solutions (cold, warm, buffered),Routes of cardioplegia administration (coronary ostia, aortic root),Ischemic preconditioning, Reperfusion injury.		
Unit number-5	**Title:** Pediatric Cardiopulmonary Bypass	**No. of hours-11**
Pediatric CPB considerations (smaller size, different anatomy),Cannulation techniques in children, DHCA (indications, techniques).Anticoagulation in pediatric CPB. **Recent Advances in Cardiopulmonary Bypass :** Recent advancements in CPB (e.g., miniaturized circuits, hybrid CPB),Mechanical circulatory support devices (IABP, ECMO, VADs),Applications of mechanical circulatory support, Advantages and limitations of new CPB techniques.		

Learning Experience:

Students will participate in didactic lectures, hands-on lab training, and clinical observations. Simulation-based sessions will reinforce circuit setup, priming, troubleshooting, and emergency response. Clinical rotations in cardiac surgery units will provide real-time experience. Assessments will include practical exams, logbook submissions, and reflective case reviews.

Textbooks:

Cardiopulmonary Bypass: Principles and Practice (4th Edition) Glenn P. Gravlee, Richard F. Davis, John Hammon, Barry Kussman Lippincott Williams & Wilkins

Suggested Readings:

Cardiopulmonary Bypass: Principles and Techniques of Extracorporeal Circulation Christina T. Mora Springer-Verlag

Cardiopulmonary Bypass (2nd Edition) Sunit Ghosh Cambridge University Press

Open Educational Resources(OERS):

1.MSOE Library – Perfusion Resources Guide

https://libguides.msoe.edu/perfusion-resources

2.Lipscomb University Perfusion Sciences Textbook Guide

https://libguides.lipscomb.edu/perfusion

3.American Society of ExtraCorporeal Technology (AmSECT)

https://amsect.org

4.PerfusFind – Perfusion Education & Calculations

https://perfusfind.com

SEMESTER VI					
Course Code **BPCVT651**	**Course Title** **Perfusion Technology**	**L**	**T**	**P**	**C**
Version	2025	**0**	**0**	**2**	**1**
Category of Course	Major(Practical)				
Total Contact Hours	30 Hrs				
Pre-Requisites/Co-Requisites	Pre-requisite: Basic medical instrumentation and safety Co-requisite: Understand Perfusion Equipment & Instrumentation				

Course Perspective :

This practical course is designed to develop *hands-on skills* in setting up, operating, and troubleshooting perfusion equipment during cardiac surgeries. Students will also learn to monitor patient parameters, assist in extracorporeal circulation, and manage emergencies during bypass.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: Demonstrate the setup, priming, and operation of a heart-lung machine, including monitoring parameters and safety checks during extracorporeal circulation

CO2:Identify the structure and function of the heart, lungs, and circulatory system relevant to extracorporeal circulation and explain the physiological principles of cardiopulmonary bypass.

CO3:Practice safe handling, sterilization, and maintenance of perfusion equipment, and participate in interprofessional communication to enhance team-based patient care.

CO4:Adapt perfusion techniques and responses based on intraoperative emergencies, blood conservation strategies, and patient-specific physiological variations

Practical Outline:

S/No.	Lab Task	Mapped CO/COs
1	The learner will **identify and explain the components and basic operation of the heart-lung machine**.	**CO1, CO2**
2	The learner will **identify and describe the function of CPB components**, including oxygenator, roller pump, and reservoir.	CO1,CO2
4	The learner will **demonstrate priming solutions and heparinization procedures**, considering patient-specific requirements.	CO2,CO4
3	The learner will **identify and connect tubing and cannulae** used in CPB setup,**demonstrate the correct steps for assembling the CPB circuit**.	CO1,CO2
4	The learner will **perform circuit priming, debubbling, and pre-run safety checks**,**de-airing techniques and air embolism prevention measures**.	CO2,CO4
5	The learner will **perform & Demonstraqte calibration and safety checks** before initiating CPB, **cardiopulmonary bypass** by connecting cannulae and starting the pump	CO1,CO2

6	The learner will **monitor parameters such as arterial pressure, venous return, and oxygenation** during CPB.	**CO2, CO4**
7	The learner will **manage perfusion during cross-clamping and cardioplegia delivery**,**regulate patient temperature** using hypothermia or normothermia techniques	CO4
8	The learner will **monitor ABG results and make adjustments during bypass**,**Demostrate hematocrit and hemodilution concepts** in perfusion.	CO1,CO4
9	The learner will **demonstrate the use of filters and hemoconcentrators**,**erform the steps for weaning a patient from CPB**.	CO2,CO4
10	The learner will **assess cardiac function post-bypass** to determine readiness for weaning,**explain the basics and demonstrate setup** of the intra-aortic balloon pump (IABP).	CO1,CO2,CO4
11	The learner will **describe the indications and principles** of ECMO,**monitor ACT and demonstrate anticoagulation reversal with protamine**	CO1,CO2,CO4
12	The learner will **terminate CPB and safely remove cannulae**.	CO2,CO4
13	The learner will **clean, sterilize, and document CPB circuit handling** following protocol.	CO3
14	The learner will **familiarize with the OT layout and**	CO3

	cardiovascular surgery environment	
15	The learner will **explain the roles and responsibilities of the perfusionist** in the surgical team	CO3
16	The learner will **coordinate effectively with the surgical team** during CPB procedures,**follow sterile techniques and OT safety**	CO3
17	The learner will **respond to emergency CPB initiation and apply troubleshooting strategies**.	CO3,CO4

Open Educational Resources (OERs):

1.MERLOT (Multimedia Educational Resource for Learning and Online Teaching)

https://www.merlot.org

2.Hands-On Procedural Guides

https://www.elso.org

3.OpenAnesthesia (IARS)

https://www.openanesthesia.org

SEMESTER VI					
Course Code **BPCVT602**	**Course Title** **Principles of Ultrasonography**	**L**	**T**	**P**	**C**
Version	2025	**3**	**1**	**0**	**4**
Category of Course	Major				
Total Contact Hours	45 Hours				
Pre-Requisites/ Co-Requisites	Pre-requisite: Fundamentals of Medical Imaging Co-requisite:Clinical Applications of Ultrasonography				

Course Perspective :

This course introduces the foundational principles of ultrasonography, focusing on ultrasound physics, instrumentation, image formation, and safety. It prepares learners for further clinical training by building a strong conceptual and technical base in diagnostic sonography used across various medical specialties.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO: To **identify** basic concepts of ultrasound physics, components of ultrasound machines, and terminology.
CO2:: To **explain** the principles of sound wave generation, propagation, and interaction with human tissues.
CO3: To **operate** ultrasound equipment for basic scanning techniques and image optimization.

CO4: To **distinguish** between normal and artifact images and assess quality based on technical parameters.

Course Outline:

Unit number-1	**Title:** Principles of Ultrasonography	**No. of hours-8**
Definition and applications of ultrasound,Physical principles (sound waves, propagation, reflection, attenuation),Technical principles (transducers, image formation),Ultrasound terminology (e.g., echogenicity, anechoic, hypoechoic, hyperechoic)		
Unit number-2	**Title:** Examination Techniques and Sonographic Phenomena	**No. of hours-8**
Ultrasound examination techniques (scanning planes, transducer manipulation) ,Sonographic phenomena (aliasing, reverberation, shadowing, enhancement),Artifact reduction techniques, Image optimization (gain, time-gain compensation, depth).		
Unit number-3	**Title**: Ultrasound of the Thoracic Cavity and Heart	**No. of hours-8**
Ultrasound of the diaphragm and pleura,Echocardiography (2D, M-mode, Doppler),Normal heart anatomy and function, Cardiac diseases (e.g., coronary artery disease, valvular heart disease,cardiomyopathies),Echocardiographic findings in cardiac diseases		
Unit number-4	**Title:** Ultrasound of the Vascular System	**No. of hours-11**
Ultrasound of carotid vessels (carotid intima-media thickness, plaque assessment),Ultrasound of vertebral artery,Ultrasound of the aorta (aneurysms,		

dissections), Ultrasound of blood vessels of the lower limb (deep vein thrombosis, arterial occlusive diseases),Doppler ultrasound (velocity measurements, flow direction).		
Unit number-5	**Title**: Special Diagnostic Procedures	**No. of hours-10**
Ultrasound-guided biopsy (fine-needle aspiration, core biopsy),Ultrasound-guided interventions (drainage, cyst puncture), Monitoring bone healing with ultrasound,3D and 4D ultrasound, Interventional ultrasound (e.g., ablation procedures, vascular interventions)		

Learning Experience:

Students will learn through a combination of lectures, video demonstrations, and supervised lab sessions. They will gain hands-on experience with ultrasound simulators and machines to practice image acquisition and parameter adjustment. Learning will be reinforced through case discussions, peer reviews, and practical skill assessments.

Textbooks:

Diagnostic Imaging: Ultrasound Anil T. Ahuja, James F. Griffith, K. T. Wong, Gregory E. Antonio Elsevier

Suggested Readings:

Manual of Ultrasound (3rd Edition) G. S. Garkal

Textbook of Diagnostic Sonography: 2-Volume Set (9th Edition) Sandra L. Hagen-Ansert, MS, RDMS, RDCS, FASE, FSDMS Elsevier

Open Educational Resources (OER):

1.OpenWHO (World Health Organization) 🔗 https://openwho.org

2.Global Library of Women's Medicine (GLOWM) 🔗 https://www.glowm.com

3.Vanderbilt University Global Surgical Atlas 🔗 https://www.vumc.org/global-surgical-atlas

4.NCBI Bookshelf – US National Library of Medicine 🔗 https://www.ncbi.nlm.nih.gov/books/

SEMESTER VI					
Course Code **BPCVT652**	**Course Title** **Principles of Ultrasonography**	**L**	**T**	**P**	**C**
Version	2025	**0**	**0**	**2**	**1**
Category of Course	Major (Practical)				

Total Contact Hours	30 Hrs
Pre-Requisites/Co-Requisites	Pre-requisite: Biomedical Instrumentation Basics Co-requisite: Pharmacology related to cardiovascular procedures

Course Perspective :

This practical course aims to equip learners with hands-on skills in handling the heart-lung machine, CPB circuit setup, and intraoperative monitoring during cardiac surgeries. It emphasizes teamwork, safety, documentation, and effective communication in the Operation Theater.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: Identify the structure and function of perfusion-related equipment and components used in cardiopulmonary bypass (CPB).

CO2: Demonstrate the setup, initiation, and monitoring of cardiopulmonary bypass procedures with emphasis on accuracy and safety**.**

CO3:Adapt perfusion strategies based on patient-specific parameters and surgical conditions, including emergencies and physiological variations.

CO4: Practice sterile techniques, equipment maintenance, and interprofessional coordination in a surgical environment.

Practical Outline:

S/No.	Lab Task	Mapped CO/COs
1	The learner will identify and explain the function of the heart-lung machine.	CO1
2	The learner will describe the components of CPB, including the venous reservoir, oxygenator, heat exchanger, and pump.	CO1

4	The learner will identify the types and uses of tubing and cannulae used in CPB	CO1
5	The learner will explain the principles and applications of intra-aortic balloon pump (IABP).	CO1
6	The learner will describe the principles and indications of ECMO	CO1
7	The learner will demonstrate prime solutions and heparinization procedures	CO2
8	The learner will perform the steps in assembling the CPB circuit.	CO2
9	The learner will carry out circuit priming, debubbling, and system checks.	CO2
10	The learner will apply de-airing techniques and prevent air embolism.	CO2
11	The learner will perform calibration and safety checks before initiation	CO12
12	The learner will initiate CPB by connecting cannulae and starting the pump.	CO2
13	The learner will monitor arterial pressure, venous return, flow, gas exchange, and temperature during CPB	CO2

14	The learner will perform ABG monitoring and adjust parameters accordingly.	CO2
15	The learner will demonstrate the use of filters and hemoconcentrators.	CO2
16	The learner will follow the steps for weaning from bypass and assess cardiac function post-bypass.	CO2
17	The learner will safely terminate CPB and remove cannulae.	CO2
18	The learner will regulate patient temperature using hypothermia or normothermia techniques.	CO3
19	The learner will manage perfusion during cross-clamping and cardioplegia delivery.	CO3
20	The learner will interpret hematocrit levels and adjust for hemodilution.	CO3
21	The learner will monitor and reverse anticoagulation using ACT and protamine.	CO3
22	The learner will respond to emergency bypass initiation and apply troubleshooting strategies.	CO3
23	The learner will demonstrate sterile techniques and operating theater (OT) safety protocols.	CO4
24	The learner will clean, sterilize, and document the	CO4

	maintenance of the CPB circuit.	
25	The learner will familiarize with the cardiovascular surgery OT setup.	CO4
26	The learner will understand and perform the roles and responsibilities of a perfusionist.	CO4
27	The learner will coordinate effectively with the surgical team during CPB procedures.	CO4

Open Educational Resources (OER):

OpenWHO (World Health Organization)

🔗 https://openwho.org

Global Library of Women's Medicine (GLOWM)

🔗 https://www.glowm.com

Vanderbilt University Global Surgical Atlas

🔗 https://www.vumc.org/global-surgical-atlas

NCBI Bookshelf – US National Library of Medicine

🔗 https://www.ncbi.nlm.nih.gov/books/

SEMESTER VI					
Course Code **BPCVT603**	**Course Title** **Advanced Cardiac Catheterization**	**L**	**T**	**P**	**C**
Version	2025	**3**	**1**	**0**	**4**
Category of Course	Major				
Total Contact Hours	45 Hours				
Pre-Requisites/ Co-Requisites	Pre-requisite: Fundamentals of Cardiac Catheterization Co-requisite: Advanced Hemodynamics				

Course Perspective :

This course provides an in-depth understanding of advanced techniques and technologies used in cardiac catheterization laboratories. It focuses on complex diagnostic and interventional procedures, interpretation of pressure waveforms and angiograms, and management of procedural risks, preparing learners for specialized roles in cardiac cath labs.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: To **recall** specialized instruments, contrast agents, and procedural protocols in advanced catheterization.

CO2: To **explain** the physiological principles behind complex diagnostic and interventional catheter-based procedures.
CO3: To **assist** in complex coronary and peripheral interventions, pressure measurements, and contrast imaging techniques.
CO4: To **interpret** real-time hemodynamic data, angiographic findings, and recognize procedural complications

Course Outline:

Unit number-1	**Title:** Advanced Concepts in Cath Lab Operation	**No. of hours-6**
Cath lab workflow and zoning,Sterile techniques and infection control in invasive procedures,Roles of cath lab personnel in advanced procedures,Emergency preparedness and crash cart management.		
Unit number-2	**Title:** Hemodynamics and Cardiac Physiology	**No. of hours-7**
Pressure waveforms and interpretation: RA, RV, PA, PCWP, LV, Aorta,Fick principle and thermodilution technique for cardiac output,Oxygen saturation runs and shunt calculations,Hemodynamic changes in congenital and acquired heart diseases.		
Unit number-3	**Title**:Advanced Coronary Interventions	**No. of hours-8**
Percutaneous Coronary Intervention (PCI): indications, types, steps,Chronic Total Occlusion (CTO) management,Rotational Atherectomy and plaque modification techniques,Drug-eluting balloons and stents: types and deployment,Complications of PCI: no-reflow, perforation, restenosis		

Unit number-4	Title:4:Structural Heart Interventions	No. of hours-12
Balloon valvuloplasty (mitral, aortic, pulmonary),Percutaneous closure of ASD, VSD, and PDA,Basics of TAVI (Transcatheter Aortic Valve Implantation),Left atrial appendage closure and septal ablation. **Pacemakers and Electrophysiology Integration :** Temporary and permanent pacemaker indications and insertion,ICD and CRT: overview and implantation basics,Overview of Electrophysiology Study (EPS) and ablation,Cath lab preparation for device therapy procedures.		
Unit number-5	**Title**:Imaging Modalities in Interventions	**No. of hours-12**
Fluoroscopy principles and safety,Intravascular Ultrasound (IVUS),Optical Coherence Tomography (OCT),Use of contrast agents: types, reactions, precautions,3D reconstruction and road-mapping in interventions. **Radiation Safety & Legal Considerations** ALARA principle and dose management,PPE and shielding protocols,Recording fluoroscopy time and cumulative dose,Legal documentation and consent in interventional cardiology,Ethical issues and patient communication		

Learning Experience:

Learners will engage in interactive lectures, cath lab rotations, and simulation-based training. Emphasis is placed on hands-on practice with advanced catheter techniques, interpretation of case studies, and emergency protocol management. Evaluation includes logbook documentation, skill demonstrations, case presentations, and practical exams.

Textbooks:

Grossman & Baim's Cardiac Catheterization, Angiography, and Intervention (9th Edition) Mauro Moscucci, MD, MBA Lippincott Williams & Wilkins (LWW)

Suggested Readings:

1. Textbook of Interventional Cardiology (8th Edition) Eric J. Topol, MD; Paul S. Teirstein, MD Elsevier
2. Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine (12th Edition) Douglas P. Zipes, MD; Peter Libby, MD; Robert O. Bonow, MD; Douglas L. Mann, MD; Gordon F. Tomaselli, MD : Elsevier
3. ACC/AHA Guidelines for Cardiac Catheterization Laboratories American College of Cardiology/American Heart Association Task Force on Practice Guidelines Circulation.

Open Educational Resources (OER):

1.Boston University Medical Center – Cath Lab Fellow Manual

https://www.bumc.bu.edu/cardiovascular-medicine/files/2013/06/BMC-Cath-Lab-Fellow-Manual-2013.doc

2.Mount Sinai Hospital – Patient Guide for Cardiac Catheterization & Stents

https://www.mountsinai.org/files/MSHealth/Assets/HS/Care/Heart/StructuralHeart/MtSinai_PatientGuide.pdf

3.Weill Cornell Medicine – Cath & Angioplasty Guide

https://cardiology.weillcornell.org/sites/default/files/downloads/Guide%20to%20Cardiac%20Catheterization%2C%20Angioplasty%2C%20and%20Stent%20Implantation%20FINAL.pdf

4.University of Rochester Medical Center (URMC)
https://www.urmc.rochester.edu/encyclopedia/content?contentid=p07964

SEMESTER VI					
Course Code **BPCVT653**	**Course Title** **Advanced Cardiac Catheterization**	**L**	**T**	**P**	**C**
Version	2025	**0**	**0**	**2**	**1**
Category of Course	Major (Practical)				
Total Contact Hours	30 Hrs				
Pre-Requisites/Co-Requisites	Pre-requisite:Basic understanding of cardiovascular anatomy and physiology Co-requisite: Radiation Safety & Imaging Techniques				

Course Perspective :

This practical course aims to develop technical proficiency in advanced cardiac catheterization procedures, enhance clinical decision-making through hemodynamic assessments, and instill safety and ethical practices in a cath lab setting. It emphasizes hands-on experience, teamwork, and integration of diagnostic and interventional techniques.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO 1: Identify cath lab equipment, zoning, and safety protocols essential for maintaining sterility and radiation protection.

CO2: Demonstrate patient preparation, vascular access setup, and participation in high-risk and interventional cardiac procedures.

CO3:Apply specialized tools and methods for assessing and modifying complex cardiac lesions under supervision.

CO4: Practice cath lab documentation, equipment handling, inventory control, and interprofessional communication.

Practical Outline:

S/No.	Lab Task	Mapped CO/COs
1	The learner will identify cath lab zones, workflow patterns, and apply sterility maintenance techniques.	CO1
2	The learner will describe principles of radiation protection including lead apron use and fluoroscopy time reduction.	CO1
4	The learner will recognize emergency situations and apply basic protocols for anaphylaxis, cardiac arrest, and tamponade.	CO1
5	The learner will identify pacemaker components and assist in temporary and permanent pacemaker insertion.	CO1
6	The learner will recognize instruments used in balloon valvuloplasty and transcatheter valve procedures (TAVI – overview).	CO1
7	The learner will prepare high-risk patients for cardiac catheterization procedures	CO2
8	The learner will assist in IV line setup, sedation monitoring, and crash cart preparedness.	CO2

9	The learner will assist in stepwise coronary angiography and left/right heart catheterization procedures.	CO2
10	The learner will assist in pressure monitoring and waveform interpretation (RA, RV, PA, PCWP).	CO1
11	The learner will demonstrate contrast administration techniques and monitor for adverse reactions.	CO2
12	The learner will support stepwise PCI including ballooning, stenting, and post-dilation techniques.	CO2
13	The learner will observe percutaneous device closure for ASD, VSD, and PDA.	CO2
14	The learner will assist in chronic total occlusion (CTO) procedures and advanced interventions.	CO2
15	The learner will assist in rotational atherectomy and use of plaque modification devices.	CO3
16	The learner will apply Fick method and thermodilution for cardiac output measurement.	CO3
17	The learner will interpret data from IVUS and OCT imaging for lesion assessment and stent optimization.	CO3
18	The learner will assist in balloon valvuloplasty procedures for mitral, aortic, and pulmonary valves.	CO3

19	The learner will operate the cath lab console and troubleshoot basic issues.	CO4
20	The learner will manage inventory of catheters, sheaths, guidewires, and stents.	CO4
21	The learner will perform cleaning, sterilization, and maintenance of cath lab instruments.	CO4
22	The learner will document procedures and store angiographic data digitally.	CO4
23	The learner will maintain a logbook and write structured procedure reports.	CO4
24	The learner will collaborate with the cath lab team for workflow coordination and patient safety	CO4

Open Educational Resources (OER):

1.Boston University Medical Center – Cath Lab Fellow Manual https://www.bumc.bu.edu/cardiovascular-medicine/files/2013/06/BMC-Cath-Lab-Fellow-Manual-2013.doc

2.Mount Sinai Hospital – Patient Guide for Cardiac Catheterization & Stents

https://www.mountsinai.org/files/MSHealth/Assets/HS/Care/Heart/StructuralHeart/MtSinai_PatientGuide.pdf

3.Weill Cornell Medicine – Cath & Angioplasty Guide

https://cardiology.weillcornell.org/sites/default/files/downloads/Guide%20to%20Cardiac%20Catheterization%2C%20Angioplasty%2C%20and%20Stent%20Implantation%20FINAL.pdf

4.University of Rochester Medical Center (URMC)
https://www.urmc.rochester.edu/encyclopedia/content?contentid=p07964

5.Johns Hopkins Medicine
https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/cardiac-catheterization

SEMESTER VI					
Course Code **BPCVT604**	**Course Title** **Hospital Administration**	**L**	**T**	**P**	**C**
Version	2025	**3**	**0**	**0**	**3**
Category of Course	Minor				
Total Contact Hours	45Hours				
Pre-Requisites/ Co-Requisites	Pre-requisite: Introduction to Public Health or Healthcare Services Co-requisite:Health Information Systems				

Course Perspective :

This course provides comprehensive knowledge of administrative functions in hospital settings, including planning, organizing, staffing, directing, and controlling healthcare operations. It prepares learners to manage hospital departments, enhance service delivery, ensure regulatory compliance, and support quality improvement initiatives in healthcare institutions.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: To **identify** administrative structures, hospital departments, and relevant healthcare regulations.
CO2: To **explain** the principles of healthcare management, hospital organization, and interdepartmental coordination.
CO3: To **perform** basic administrative functions such as resource allocation, scheduling, and documentation.
CO4: To **evaluate** workflow systems, identify inefficiencies, and propose process improvements.

Course Outline:

Unit number-1	**Title:** Introduction to Hospital Management	**No. of hours-8**

Definition, departments, types of hospital, hierarchy, roles and responsibilities of hospital administrators.Importance: hospital administration in healthcare delivery.		
Unit number-2	**Title:** Healthcare Policies and Regulations	**No. of hours-12**
Introduction, compliance requirements (e.g., accreditation, licensing). Ethical considerations in healthcare management. **Financial Management in Healthcare Principles**: financial management in healthcare organizations, Budgeting, revenue cycle management, and financial reporting. Cost containment strategies in healthcare.		
Unit number-3	**Title**:Human Resource Management in Healthcare	**No. of hours-8**
HR Policy: Recruitment, training, and retention of healthcare personnel,Employee relations and performance management: Legal and ethical issues in human,resource management in healthcare.		
Unit number-4	**Title:**Quality Improvement and Patient Safety	**No. of hours-9**
Concepts: methodologies of quality improvement in healthcare. Patient safety: Initiatives and adverse event reporting systems. Implementing quality improvement projects in hospitals.NABH: Introduction, definition, 5 Patient Topic, 5 hospital Staff Topics.		
Unit number-5	**Title:** Information Technology in Healthcare	**No. of hours-8**
Introduction: Role of information technology in healthcare administration. Electronic health records (EHRs): implementation and interoperability, Data security and privacy in healthcare IT systems.		

Learning Experience:

Students will participate in lectures, role-play activities, and real-time observations in hospital settings. They will engage in case-based discussions, administrative simulations, and quality audit exercises. Evaluations include project reports, viva, presentations, and reflective journals focused on real-world problem-solving in hospital environments.

Textbooks:

Hospital Administration and Management D.C. Joshi, Mamta 2nd Joshi Jaypee Brothers Medical Publishers

Suggested Readings:

Principles of Hospital Administration and Planning B.M. Sakharkar 2nd Jaypee Brothers Medical Publishers

Textbook of Hospital Administration C.M. Francis, Mario C. de Souza 3rd Jaypee Brothers Medical Publishers

Open Educational Resources (OERS):

1. OpenStax / University of Minnesota Press

https://open.umn.edu/opentextbooks/textbooks/the-fundamentals-of-healthcare-administration-navigating-challenges-and-coordinating-care

2.Fundamentals of Health Care Administration https://ung.edu/university-press/books/fundamentals-of-healthcare-administration.php

3.Principles of Hospital Administration and Planning – B. M. Sakharkar

https://www.dca.org.sa/downloads/dca/quality_gate/04_E-Library/Healthcare%20Management/Principles-of-Hospital-Administration-and-Planning.pdf

SEMESTER VI					
Course Code **BPCVT654**	**Course Title** **Hospital Administration**	**L**	**T**	**P**	**C**
Version	2025	**0**	**0**	**2**	**1**
Category of Course	Major				
Total Contact Hours	30 Hrs				
Pre-Requisites/Co-Requisites	Pre-requisite: Basic understanding of healthcare systems and services Co-requisite: Healthcare Quality Management				

Course Perspective :

This practical component aims to provide hands-on exposure to the administrative operations of a healthcare facility. Learners will gain experience in hospital workflows, department coordination, resource and records management, patient relations, and application of quality and safety standards. The course fosters administrative efficiency, professional communication, and leadership skills in a clinical context.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1: Identify hospital departments, administrative structure, and interdepartmental coordination essential for efficient healthcare delivery.

CO2: Demonstrate administrative processes related to human resources, documentation, and patient admission-discharge cycle.

CO3: Practice hospital resource and support service management, ensuring hygiene, safety, and supply chain efficiency.

CO4: Apply quality assurance frameworks, communication skills, and safety protocols in hospital governance.

Practical Outline:

S/No.	Lab Task	Mapped CO/COs
1	The learner will identify and describe the functions and layout of hospital departments including Medical, Surgical, ICU, OPD, Casualty, and Radiology.	CO1
2	The learner will explain the organizational structure and the role of hospital administration in day-to-day operations.	CO1
4	The learner will visit administrative wings such as Medical Records, HR, Finance, and Purchase to understand their interlinked roles.	CO1
5	The learner will observe CSSD workflow and identify sterilization safety measures.	CO1
6	The learner will describe the functions of the Laundry and Transport Services in hospital logistics	CO1
7	The learner will describe HR practices including recruitment, roster planning, and leave management.	CO2
8	The learner will explain staff appraisal, training systems, and grievance redressal mechanisms.	CO2

9	The learner will observe payroll basics and demonstrate how shift allocation is managed.	CO2
10	The learner will follow the protocols for patient registration and admission.	CO2
11	The learner will handle IPD/OPD documentation and manage patient file maintenance.	CO2
12	The learner will perform billing procedures and understand the insurance claims process (TPA).	CO2
13	The learner will complete steps in the discharge process and summarize medical documentation.	CO2
14	The learner will observe hospital store functions and explain inventory handling procedures.	CO3
15	The learner will assist in procurement of medical supplies through tender and purchase processes.	CO3
16	he learner will demonstrate stock maintenance techniques and reorder tracking systems.	CO3
17	The learner will understand biomedical waste disposal protocols and housekeeping responsibilities.	CO3
18	The learner will assess dietary services and contribute to nutritional planning in patient care.	CO3

19	The learner will practice effective communication with patients and staff through verbal and written interactions.	CO4
20	The learner will identify emergency codes (Code Blue, Red, etc.) and explain response mechanisms.	CO4
21	The learner will describe NABH, NABL, and JCI accreditation protocols.	CO4
22	The learner will interpret patient safety indicators and audit reporting tools.	CO4
23	The learner will participate in activities involving clinical governance, infection control, fire drills, and hospital disaster management plans.	CO4

Open Educational Resources (OER):

1.OpenStax / University of Minnesota Press

https://open.umn.edu/opentextbooks/textbooks/the-fundamentals-of-healthcare-administration-navigating-challenges-and-coordinating-care

2.Fundamentals of Health Care Administration

https://ung.edu/university-press/books/fundamentals-of-healthcare-administration.php

3.Principles of Hospital Administration and Planning – B. M. Sakharkar https://www.dca.org.sa/downloads/dca/quality_gate/04_E-Library/Healthcare%20Management/Principles-of-Hospital-Administration-and-Planning.pdf

4.Healthcare Operations Management

https://www.dca.org.sa/downloads/dca/quality_gate/04_E-Library/Healthcare%20Management/Healthcare-Operations-Management.pdf

SEMESTER VI					
Course Code	**Course Title**	**L**	**T**	**P**	**C**

BPCVT605	**Research Methodology & Biostatistics**				
Version	2025	**3**	**0**	**0**	**3**
Category of Course	Minor				
Total Contact Hours	45HRS				
Pre-Requisites/ Co-Requisites	Pre-requisite: Introduction to Healthcare Sciences Co-requisite:Ethics in Research and Publication				

Course Perspective :

This course introduces students to the fundamentals of scientific research and statistical methods relevant to healthcare. It emphasizes designing research studies, collecting and analyzing data, and interpreting results for evidence-based decision-making. It fosters critical thinking, ethical research practices, and scientific communication.

Course Outcomes:

Upon completion of the course the learner will be able to:

CO1:To **define** key terms and basic concepts in research methodology and biostatistics.
CO2: To **explain** different types of research designs, sampling techniques, and data collection methods.
CO3: To **design** simple research proposals and apply appropriate statistical tools for data analysis.
CO4: To **interpret** research findings and assess the validity, reliability, and significance of results.

Course Outline:

Unit number-1	**Title:** Sampling Methods	**No. of hours-12**
Sampling methods, Probability rules & Probability distributions (Normal & Binomial) Collection of relevant data: sampling methods. Construction of study: population, sample, normality and its beyond (not design of study, perhaps), Summarizing data on the pretext of underlined study, Understanding of statistical analysis (not methods)		
Unit number-2	**Title:** Counselling in Diverse Settings	**No. of hours-5**
Developing a research proposal-Models by engaging patients' information and data-base of the diagnostic approaches		

Unit number-3	**Title**: Use of Advanced Search Tools	**No. of hours-6**
Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism		
Unit number-4	**Title**: Study Designs	**No. of hours-11**
Interventional vs. observational studies,Cross-sectional, cohort, case-control, and longitudinal designs,Randomized Controlled Trials (RCTs),Quasi-experimental designs,Systematic reviews & meta-analysis: overview and process.		
Unit number-5	**Title**: Research Design & Advanced Methodology	**No. of hours-11**
Recap: Steps of scientific research,Defining objectives, hypotheses & variables (dependent/independent/confounding,Concept of validity and reliability, Research questions vs. problem statements,Mixed-method research approaches,Advanced protocol writing techniques.		

Learning Experience:

Learners will attend interactive lectures, statistical software workshops, and research proposal development sessions. Hands-on activities include designing questionnaires, data entry and analysis using SPSS/R, and critical appraisal of journal articles. Assessments include quizzes, mini-projects, group work, and a final research proposal or paper presentation.

Textbooks:

Introduction to Biostatistics and Research Methods (5th Edition) P.S.S. Sundar Rao, J. Richard PHI Learning Pvt. Ltd.

Suggested Readings:

Biostatistics & Research Methodology (Semester 3) : Dr. Ashok A. Hajare Nirali Prakashan

Biostatistics & Research Methodology (BP801T – Final Year BPharm, Semester 8) Prof. Chandrakant R. Kokare 4th Nirali Prakashan

Research Methodology: Methods, Techniques, Practices Rabi Narayan Subudhi, Sumita Mishra, Malabika Sahoo Taxmann Publications Pvt. Ltd.

Open Educational Resources (OERs):

1.OpenIntro Statistics

https://www.openintro.org/book/os/

2.An Intuitive and Interactive Introduction to Biostatistics (Univ. of Iowa)
https://open.umn.edu/opentextbooks/textbooks/an-intuitive-interactive-introduction-to-biostatistics

3.MERLOT Biostatistics Module

https://www.merlot.org/merlot/viewMaterial.htm?id=773418205

4.cxv Fundamentals of Biostatistics (Bernard Rosner)

https://www.unilus.ac.zm/lms/e-books/books/Basic_Sciences/Behavioural%20sciences%20and%20public%20health/Fundamentals%20of%20Biostatistics%20%287th%20Edition%29.pdf