INTEGRAL UNIVERSITY, LUCKNOW

INTEGRAL INSTITUTE OF ALLIED HEALTH SCIENCES & RESEARCH

DEPARTMENT OF PARAMEDICAL SCIENCES

BACHELOR OF SCIENCE IN CARDIOVASCULAR TECHNOLOGY (B. Sc. CVT)

SYLLABUS

YEAR/ SEMESTER: III/V

Integral University, Lucknow
Department of Paramedical Sciences
Study and Evaluation Scheme

Program: BSc. CVT Semester-V

S. N.	Course code	Course Title	Type of Paper	Period Per hr/week/sem			Evaluation Scheme				Sub. Total	Credit	Total Credits
				L	T	P	CT	TA	Total	ESE			
THEORIES													
1	CV301	Basic Electrocardiography and Echocardiography	Core	2	1	0	40	20	60	40	100	2:1:0	3
2	CV302	Research methodology	Core	2	1	0	40	20	60	40	100	2:1:0	3
3	CV303	Basic Cardiac Catheterization	Core	2	1	0	40	20	60	40	100	2:1:0	3
4	CV304	Development of cardiovascular system fetal and neonatal	Core	3	1	0	40	20	60	40	100	3:1:0	4
5	CV305	Equipment and instrumentation in Cardiovascular technology	Core	3	1	0	40	20	60	40	100	3:1:0	4
PRACTICAL													
1	CV306	Basic Electrocardiography and Echocardiography Lab	Core	0	0	2	40	20	60	40	100	0:0:1	2
2	CV307	Equipment and instrumentation in Cardiovascular technology Lab	Core	0	0	2	40	20	60	40	100	0:0:1	2
3	CV308	OT Posting	Core	0	0	2	40	20	60	40	100	0:0:1	2
Total				**12**	**05**	**06**	**320**	**160**	**480**	**320**	**800**	**23**	**23**

S. N.	Course code	Course Title	Type of Paper	Attributes							United Nation Sustainable Development Goal (SDGs)
				Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
THEORIES											
1	CV301	Basic Electrocardiography and Echocardiography	Core	√	√	√			√	√	3,4
2	CV302	Research methodology	Core	√	√	√			√	√	3,4
3	CV303	Basic Cardiac Catheterization	Core	√	√	√			√	√	3,4
4	CV304	Development of cardiovascular system fetal and neonatal	Core	√	√	√			√	√	3,4
5	CV305	Equipment and instrumentation in Cardiovascular technology	Core	√	√	√			√	√	3,4
PRACTICAL											
1	CV306	Basic Electrocardiography and Echocardiography Lab	Core	√	√	√			√	√	3,4
2	CV307	Equipment and instrumentation in Cardiovascular technology Lab	Core	√	√	√			√	√	3,4
3	CV308	OT Posting	Core	√	√	√			√	√	3,4

L: Lecture **T:** Tutorials **P:** Practical **CT:** Class Test **TA:** Teacher Assessment **ESE:** End Semester Examination,
AE= Ability Enhancement, DSE- Discipline Specific Elective, **Sessional Total:** Class Test + Teacher Assessment **Subject Total:** Sessional Total + End Semester Examination (ESE)

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**CV301**	**Title of the Course**	**Basic Electrocardiography and Echocardiography**	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	V	**2**	**1**	**0**	**3**
Pre-Requisite	Nil	**Co-requisite**	Nil				
Course Objectives	This course aims to provide students with fundamental knowledge of **electrocardiography (ECG) and echocardiography (ECHO)**, covering principles, waveform interpretation, lead systems, and echocardiographic techniques for evaluating cardiac structure and function.						

Course Outcomes	
CO1	Students will be able to understand the principles, instrumentation, and display systems of ECG and echocardiography.
CO2	Students will be able to Explain cardiac electrical activity, wave propagation, and the principles of lead placement.
CO3	Students will be able to Interpret normal ECG waveforms and describe variations in ventricular activation and recovery.
CO4	Students will be able to Understand echocardiographic imaging techniques, including M-mode, 2D, and Doppler studies.
CO5	Students will be able to Apply echocardiography to assess cardiac function, valvular heart disease, and congenital heart abnormalities.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**INTRODUCTION AND PRINCIPLES OF ELECTROCARDIOGRAPHY**	• Definition and importance of ECG • Electrocardiographic processing and display systems • Fundamental principles of electrocardiography-Cardiac electrical field generation during activation, Cardiac wavefronts and propagation.	6	CO1
2	**ECG LEAD SYSTEMS AND INTERPRETATION**	• Electrocardiographic lead systems: Standard limb leads (I, II, III),Augmented limb leads (aVR, aVL, aVF),Precordial leads (V1–V6) and Wilson's central terminal. • Hex axial reference frame and electrical axis determination • Recording ECG in adults and pediatric patients	6	CO2
3	**NORMAL ECG WAVEFORMS AND VARIANTS**	• Normal electrocardiogram components: Atrial activation and the normal **P wave**, Atrial repolarization and atrioventricular (AV) node conduction, PR segment, ventricular activation, and QRS complex, Ventricular recovery: ST-T wave and **U wave** • Normal ECG variations	6	CO3
4	**BASICS OF ECHOCARDIOGRAPHY AND IMAGING TECHNIQUES**	• Introduction to echocardiography and transthoracic echocardiography (TTE) • M-mode and **2D transthoracic echocardiography** • Standard echocardiographic views used in transthoracic imaging • Doppler echocardiography: **pulsed-wave, continuous-wave, and color Doppler**	6	CO4
5	**Clinical Applications of Echocardiography**	• Measurement of cardiac dimensions and function • Echocardiography in Valvular Heart Disease • Echocardiography in Cardiomyopathies and Pericardial Conditions • Echocardiographic detection of congenital heart diseases (CHD)	6	CO5

Reference Books:

1. **Marriott's Practical Electrocardiography** – Wagner GS
2. **Electrocardiography for Healthcare Professionals** – Thaler MS
3. **Feigenbaum's Echocardiography** – Feigenbaum H

e-Learning Source:

1. https://www.youtube.com/watch?v=MnVgGTv6EW0
2. https://www.youtube.com/watch?v=sBoRKzc7pdY
3. https://ecgsolutions.com/
4. https://www.youtube.com/watch?v=S1kdYd4JGbg

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	-	3	-	2	-	-	1	2	-	1	**3**	-	**1**	**1**	-
CO2	3	3	-	2	-	2	-	-	2	3	-	1	**3**	-	**1**	**1**	-
CO3	3	3	-	3	-	2	-	-	1	2	-	1	**3**	-	**2**	**2**	-
CO4	3	3	-	3	-	2	-	-	1	2	-	1	**3**	-	**1**	**1**	-
CO5	3	3	-	2	-	2	-	-	1	3	-	1	**3**	-	**1**	**1**	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
CV301	BASICS OF ELECTROCARDIOGRAPHY AND ECHOCARDIOGRAPHY	√	√	√			√	√	**3,4**

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**CV302**	**Title of the Course**	**Research Methodology**	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	**V**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	This course introduces students to fundamental principles of research methodology, including study design, data collection, statistical analysis, and ethical considerations in scientific research. On completion of this course, students will be able to apply statistical tools in various fields in their practical life.						

Course Outcomes	
CO1	Students will be able to Understand the basics of research, types of research, and their significance.
CO2	Students will be able to Formulate research questions, hypotheses, and study designs.
CO3	Students will be able to gather and analyze data and creating effective graphs, charts, and tables to visually communicate data insights.
CO4	Students will be able to equip students with skills to analyze existing research within their field and writing a comprehensive literature review
CO5	Students will be able to equip students with the ability to develop a well-structured research proposal, including a thorough literature review, appropriate methodology, and a compelling presentation to effectively communicate

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1.	**INTRODUCTION OF RESEARCH METHODOLOGY**	• Meaning, objectives, characteristics & significance. • Types of research: qualitative & quantitative. • Basic elements of research: variables – types- independent, dependent, active, attribute, continuous and categorical, characteristic and relationships	6	CO1
2.	**RESEARCH DESIGN AND SAMPLING METHODS**	• Research design: meaning, features, types: Observational vs. Experimental research • Types of sampling: Probability and Non-probability sampling • Sample size calculation and statistical power • Sample test**:** use of distribution, test for single mean, equality of mean paired- t test, test for equality of variance, chi- square test	6	CO2
3.	**DATA COLLECTION AND ANALYSIS**	• Data collection: classification, tabulation and methods of collecting data. • Types of data: Primary vs. Secondary data • Methods of data collection: Surveys, Questionnaires, Interviews, and Observations. • Statistics: definition, aim, scope, importance and limitation of statistics	6	CO3
4.	**SCIENTIFIC WRITING AND LITERATURE REVIEW**	• Review of related literature: Importance of literature review and referencing. • Identification of the related literature. • Organizing the related literature.	6	CO4
5.	**RESEARCH PROPOSAL AND PRESENTATION SKILLS**	• Preparing a research proposal – Title, Objectives, Methodology, Budgeting • Research proposal: research proposal or synopsis, introduction, procedure for collecting and treating data, bibliography, time and budget schedule. • Writing a thesis/dissertation – Structure and formatting guidelines	6	CO5

Reference Books:

1. **Research Methodology Method and Techniques** – CR Kothari
2. **Research Fundamentals in Home Economics -** Joseph, William D Joseph
3. **WHO (2001) Health Research Methodology** – A Guide for Training in Research Methods.
4. **Methods in Social Research** - Goode, WJ and Hatt, PK (1981), McGraw Hill International Editions, Sociology Series

e-Learning Source:

1. https://paperpal.com/blog/academic-writing-guides/what-is-research-methodology
2. https://euacademic.org/bookupload/9.pdf
3. https://www.intechopen.com/chapters/68505

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	-	1	-	1	-	-	1	1	-	1	2	-	1	1	-
CO2	2	3	-	2	-	2	-	-	-	1	-	2	3	-	2	2	-
CO3	3	3	-	1	-	1	-	-	1	1	-	1	2	-	1	1	-
CO4	2	3	-	1	-	2	-	-	-	1	-	2	2	-	1	1	-
CO5	2	3	-	1	-	2	-	-	-	1	-	2	3	-	1	1	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation Attributes & SDGs

Course Code	**Course Title**	**Attributes**							**SDGs No.**
CV302	**RESEARCH METHODOLOGY**	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		√	√	√	√		√	√	**3,4**

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**CV303**	**Title of the Course**	**BASIC CARDIAC CATHETERIZATION**	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	**V**	**2**	**1**	**0**	**3**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	This course provides fundamental knowledge of **cardiac catheterization**, including procedural techniques, hemodynamic monitoring, contrast imaging, and clinical applications in diagnosing and treating cardiovascular diseases.						

Course Outcomes: After the successful course completion, learners will develop following attributes:	
CO1	Students will be able to Understand the principles, indications, and contraindications of cardiac catheterization.
CO2	Students will be able to Describe the procedural steps, vascular access sites, and patient preparation.
CO3	Students will be able to Explain hemodynamic measurements and their clinical significance
CO4	Students will be able to Understand the role of contrast media and fluoroscopic imaging in cardiac catheterization.
CO5	Students will be able to Apply knowledge of interventional procedures and post-procedure patient care.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**INTRODUCTION TO CARDIAC CATHETERIZATION**	• Definition, history, and importance of cardiac catheterization • Indications and contraindications • Right heart vs. left heart catheterization • Patient selection and pre-procedure preparation	8	CO1
2	**PROCEDURAL TECHNIQUES AND VASCULAR ACCESS**	• Percutaneous vascular access: Femoral, radial, brachial approaches • Catheter types and guidewires used in cardiac catheterization • Catheter manipulation and placement techniques • Monitoring vital parameters and sedation during the procedure	8	CO2
3	**HEMODYNAMIC MEASUREMENTS AND PRESSURE RECORDING**	• Principles of hemodynamic monitoring • Pressure measurements: Right atrial pressure (RAP), pulmonary artery pressure (PAP),Left ventricular end-diastolic pressure (LVEDP), aortic pressure • Cardiac output assessment using thermodilution and Fick principle • Oxygen saturation measurements and arteriovenous shunts	8	CO3
4	**CONTRAST IMAGING AND CORONARY ANGIOGRAPHY**	• Use of contrast media in cardiac catheterization • Principles of fluoroscopy • Coronary angiography techniques • Ventriculography and aortography	8	CO4
5	**INTERVENTIONAL PROCEDURES AND POST-CATHETERIZATION CARE**	• Percutaneous Coronary Intervention (PCI) • Balloon angioplasty and stenting • Post-procedure monitoring and complications • Patient recovery and discharge protocols	8	CO5

Reference Books:

1. **Grossman's Cardiac Catheterization, Angiography, and Intervention** – Grossman W
2. **Cardiac Catheterization Handbook** – Morton J. Kern
3. **Hemodynamic Monitoring: Invasive and Noninvasive Clinical Application** – Paul Ellis Marik
4. **Braunwald's Heart Disease** – Douglas L. Mann

e-Learning Source:

1. https://www.youtube.com/watch?v=-tvDLg-5Qy8
2. https://www.youtube.com/watch?v=XfVqnlkU3ZY
3. https://www.youtube.com/watch?v=vGh7VVk9Oeg
4. https://www.youtube.com/watch?v=Wu18mpI_62s

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	2	2	-	-	-	1	2	1	-	2	2	1	-	1	-
CO2	1	3	1	3	-	-	-	2	3	-	-	3	3	2	-	2	-
CO3	1	3	1	2	-	-	-	1	2	2	-	2	3	1	-	1	-
CO4	1	3	1	2	-	-	-	1	3	-	-	3	2	1	-	1	-
CO5	1	3	1	2	-	-	-	1	2	1	-	2	2	1	-	1	-

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
CV303	**BASIC CARDIAC CATHETERIZATION**	Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
		√	√	√	√		√	√	**3,4**

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**CV304**	**Title of the Course**	**DEVELOPMENT OF CARDIOVASCULAR SYSTEM: FETAL AND NEONATAL**	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	**V**	**3**	**1**	**0**	**4**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	This course aims to provide students with fundamental knowledge of the **development of the cardiovascular system** during fetal life and the neonatal period, including embryology, congenital anomalies, and circulatory adaptations at birth.						

Course Outcomes: After the successful course completion, learners will develop following attributes:	
CO1	Students will be able to Understand the embryological development of the cardiovascular system
CO2	Students will be able to Describe fetal circulation and its physiological significance
CO3	Students will be able to Explain the transition from fetal to neonatal circulation and changes at birth
CO4	Students will be able to Identify congenital heart defects and their clinical implications
CO5	Students will be able to Understand neonatal cardiovascular disorders and their management.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**EMBRYOLOGICAL DEVELOPMENT OF THE CARDIOVASCULAR SYSTEM**	• Formation of the primitive heart tube • Cardiac looping and septation • Development of major blood vessels • Aortic arch derivatives and their significance	8	CO1
2	**FETAL CIRCULATION AND HEMODYNAMICS**	• Fetal circulatory pathways: Placental circulation, Ductus venosus, foramen ovale, and ductus arteriosus • Oxygenation and nutrient exchange in fetal circulation	8	CO2
3	**NEONATAL CIRCULATORY ADAPTATIONS AT BIRTH**	• Closure of fetal shunts: ductus arteriosus, foramen ovale, and ductus venosus • Changes in pulmonary circulation after birth • Neonatal heart rate and blood pressure regulation	8	CO3
4	**CONGENITAL HEART DEFECTS AND THEIR IMPLICATIONS**	• Acyanotic defects: Atrial septal defect (ASD), Ventricular septal defect (VSD), Patent ductus arteriosus (PDA), Coarctation of the aorta • Cyanotic defects: Tetralogy of Fallot, Transposition of great arteries (TGA), Hypoplastic left heart syndrome (HLHS)	8	CO4
5	**NEONATAL CARDIOVASCULAR DISORDERS AND MANAGEMENT**	• Common neonatal cardiovascular conditions: Persistent pulmonary hypertension of the newborn (PPHN), Neonatal arrhythmias and heart failure • Congenital pericardial diseases • Medical and surgical management of neonatal heart diseases	8	CO5

Reference Books:

1. **Sadler TW** – Langman's Medical Embryology
2. **Moore KL, Persaud TVN** – The Developing Human: Clinically Oriented Embryology
3. **Rudolph AM** – Congenital Diseases of the Heart: Clinical-Physiological Considerations
4. **Neonatal Cardiology** – Richard A. Polin, Mervin C. Yoder

e-Learning Source:

1. https://www.youtube.com/watch?v=aXt1DbdeBXk
2. https://www.youtube.com/watch?v=esxafXkG6zk
3. https://www.youtube.com/watch?v=GDcoeWBxOjc
4. https://www.youtube.com/watch?v=vAL8H3idU6k

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	PO1	PO2	PO3	PO 4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	-	-	-	-	-	-	-	-	-	1	3	-	1	-	2
CO2	3	3	-	-	-	2	-	-	-	-	-	-	3	3	2	3	3
CO3	2	3	-	-	-	2	-	-	-	-	-	1	3	2	1	3	2
CO4	3	3	-	-	-	-	-	-	-	-	-	-	2	3	2	2	3
CO5	3	3	-	-	-	3	-	1	-	-	-	-	3	3	2	3	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
CV304	**DEVELOPMENT OF CARDIOVASCULAR SYSTEM: FETAL AND NEONATAL**	√	√	√			√	√	**3,4**

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**CV305**	**Title of the Course**	**EQUIPMENT AND INSTRUMENTATION IN CARDIOVASCULAR TECHNOLOGY**	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	**V**	**3**	**1**	**0**	**4**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	This course aims to provide students with fundamental knowledge of **cardiovascular diagnostic and therapeutic equipment**, including principles, functioning, calibration, and troubleshooting of medical devices used in cardiac care.						

Course Outcomes	
CO1	Students will be able to Understand the basic principles of biomedical instrumentation used in cardiovascular technology.
CO2	Students will be able to Explain the working of electrocardiography (ECG) and hemodynamic monitoring devices
CO3	Students will be able to Describe cardiac catheterization laboratory equipment and imaging modalities
CO4	Students will be able to Understand the operation of extracorporeal circulation systems, including pacemakers and defibrillators.
CO5	Students will be able to Apply knowledge of safety measures, calibration, and maintenance of cardiovascular equipment.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**BASICS OF MEDICAL INSTRUMENTATION**	• Introduction to biomedical equipment in cardiovascular technology • Principles of signal acquisition, amplification, and filtering • Transducers and sensors used in cardiovascular diagnostics • Electrical safety in medical instrumentation	6	CO1
2	**HEMODYNAMIC MONITORING DEVICES**	• Blood pressure monitoring devices: • Invasive and non-invasive methods • Arterial line monitoring • Pulse oximetry and respiratory monitoring	6	CO2
3	**CARDIAC CATHETERIZATION LABORATORY EQUIPMENT**	• Imaging modalities: • Fluoroscopy and Digital Subtraction Angiography (DSA) • Intravascular ultrasound (IVUS) and Optical Coherence Tomography (OCT) • Hemodynamic pressure monitoring systems • Coronary angiography and contrast media injectors	6	CO3
4	**EXTRACORPREAL CIRCULATION AND CARDIAC ASSIST DEVICES**	• Pacemakers: Types, indications, and functioning • Automated external defibrillators (AED) and implantable cardioverter defibrillators (ICD) • Cardiopulmonary bypass (CPB) machines • Ventricular assist devices (VAD) and intra-aortic balloon pumps (IABP)	6	CO4
5	**SAFETY, CALIBRATION, AND MAINTENANCE OF CARDIOVASCULAR EQUIPMENT**	• Electrical hazards and grounding in medical equipment • Preventive maintenance of biomedical instruments • Equipment calibration and quality assurance • Infection control and sterilization techniques in cardiovascular technology	6	CO5

Reference Books:

1. **Webster JG** – Medical Instrumentation: Application and Design
2. **Paul A. Iaizzo** – Handbook of Cardiac Anatomy, Physiology, and Devices

e-Learning Source:

1. https://www.youtube.com/watch?v=MnVgGTv6EW0
2. https://www.youtube.com/watch?v=sBoRKzc7pdY
3. https://www.youtube.com/watch?v=AuTlwFreqlc
4. https://www.youtube.com/watch?v=kJ3VsW4gnO0

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	-	1	-	1	-	-	1	1	-	1	2	-	1	1	-	3
CO2	2	3	-	2	-	2	-	-	-	1	-	2	3	-	2	2	-	2
CO3	3	3	-	1	-	1	-	-	1	1	-	1	2	-	1	1	-	3
CO4	2	3	-	1	-	2	-	-	-	1	-	2	2	-	1	1	-	2
CO5	2	3	-	1	-	2	-	-	-	1	-	2	3	-	1	1	-	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
CV305	EQUIPMENT AND INSTRUMENTATION IN CARDIOVASCULAR TECHNOLOGY	√	√	√	√		√	√	3,4

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**CV306**	**Title of the Course**	**BASIC ELECTROCARDIOGRAPHY AND ECHOCARDIOGRAPHY LAB**	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	**V**	**0**	**0**	**4**	**2`**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	This course aims to provide students with **hands-on training in electrocardiography (ECG) and echocardiography (ECHO),** focusing on techniques, machine handling, patient preparation, and interpretation of normal waveforms.						

Course Outcomes	
CO1	Students will be able to Operate ECG machines and perform proper electrode placement.
CO2	Students will be able to Record and interpret normal ECG waveforms.
CO3	Students will be able to Understand echocardiographic machine settings and imaging techniques.
CO4	Students will be able to Acquire basic transthoracic echocardiographic (TTE) views.
CO5	Students will be able to Demonstrate basic quality control and patient safety protocols in ECG and ECHO labs.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**ELECTROCARDIOGRAPHY – BASICS AND MACHINE HANDLING**	• Introduction to ECG machines – components, display system, and settings • Understanding leads and electrode placement (standard limb and precordial leads)	**6**	CO1-5
2	**ECG WAVEFORM INTERPRETATION AND VARIATIONS**	• Identification of normal ECG components • Heart rate and rhythm calculation from ECG tracings • Variations in normal ECG and identifying lead misplacement errors	6	CO1-5
3	**ECHOCARDIOGRAPHY – MACHINE HANDLING**	• Introduction to echocardiography machines – controls, transducers, and display • Patient preparation and proper positioning for transthoracic echocardiography (TTE)	6	CO1-5
4	**BASIC ECHOCARDIOGRAPHIC TECHNIQUES**	• M-Mode echocardiography • 2D echocardiography • Doppler echocardiography	6	CO1-5
5	**SAFETY, QUALITY CONTROL, AND TROUBLESHOOTING**	• Calibration and quality control of ECG and ECHO machines • Electrical safety in ECG/ECHO labs and infection control protocols • Common machine errors and troubleshooting techniques	6	CO1-5

Reference Books:

Marriott's Practical Electrocardiography – Wagner GS

2. **Electrocardiography for Healthcare Professionals** – Thaler MS
3. **Feigenbaum's Echocardiography** – Feigenbaum H

e-Learning Source:

1. https://www.youtube.com/watch?v=MnVgGTv6EW0
2. https://www.youtube.com/watch?v=sBoRKzc7pdY
3. https://ecgsolutions.com/
4. https://www.youtube.com/watch?v=S1kdYd4JGbg

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	1	2	-	-	-	1	2	-	-	2	-	1	-	1	-
CO2	1	3	1	3	-	-	-	1	3	-	-	3	-	2	-	2	-
CO3	1	3	1	2	-	-	-	1	2	-	-	2	-	1	-	1	-
CO4	1	3	1	2	-	-	-	1	3	-	-	3	-	1	-	1	-
CO5	1	3	1	2	-	-	-	1	2	-	-	2	-	1	-	1	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation Attributes & SDGs

Course Code	Course Title	Attributes							SDGs No.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
CV306	BASIC ELECTROCARDIOGRAPHY AND ECHOCARDIOGRAPHY LAB	√	√	√			√	√	**3,4**

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**CV307**	**Title of the Course**	**EQUIPMENT AND INSTRUMENTATION IN CARDIOVASCULAR TECHNOLOGY LAB**	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	**V**	**0**	**0**	**4**	**2**
Pre-Requisite	**Nil**	**Co-requisite**	**Nil**				
Course Objectives	This course provides **handling, operating, calibrating, and troubleshooting cardiovascular diagnostic and therapeutic equipment**, ensuring students gain practical exposure to various medical instruments used in cardiovascular care.						

Course Outcomes	
CO1	Students will be able to Understand the basic principles of biomedical instrumentation used in cardiovascular technology.
CO2	Students will be able to Explain the working of electrocardiography (ECG) and hemodynamic monitoring devices
CO3	Students will be able to Describe cardiac catheterization laboratory equipment and imaging modalities
CO4	Students will be able to Understand the operation of extracorporeal circulation systems, including pacemakers and defibrillators.
CO5	Students will be able to Apply knowledge of safety measures, calibration, and maintenance of cardiovascular equipment.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1.	**BASICS OF MEDICAL INSTRUMENTATION**	• Introduction to **biomedical instruments in cardiovascular technology** • Understanding **transducers and sensors** used in cardiovascular devices • Basics of **electrical safety and grounding in medical instrumentation**	30	CO1
2.	**HEMODYNAMIC MONITORING DEVICES**	• Non-invasive blood pressure (NIBP) and **invasive arterial pressure monitoring** • Pulse oximetry: **Working principle and clinical applications** • Central venous pressure (CVP) and pulmonary artery pressure (PAP) monitoring		CO2
3.	**CARDIAC CATHETERIZATION LABORATORY EQUIPMENT**	• Hands-on practice with **contrast injectors and hemodynamic monitoring systems** • Catheter types, guidewires, and pressure transducers used in cardiac catheterization • Radiation safety and **infection control protocols in the Cath Lab**		CO3
4.	**EXTRACORPREAL CIRCULATION AND CARDIAC ASSIST DEVICES**	• Introduction to **cardiopulmonary bypass (CPB) machines** • Handling of **temporary and permanent pacemakers** • Basics of **implantable cardioverter defibrillators (ICDs)** and **external defibrillators** • **intra-aortic balloon pump (IABP) and ventricular assist devices (VADs)**		CO4

Reference Books:

Webster JG – Medical Instrumentation: Application and Design

Paul A. Iaizzo – Handbook of Cardiac Anatomy, Physiology, and Devices

e-Learning Source:

5. https://www.youtube.com/watch?v=aXt1DbdeBXk
6. https://www.youtube.com/watch?v=esxafXkG6zk
7. https://www.youtube.com/watch?v=GDcoeWBxOjc
8. https://www.youtube.com/watch?v=vAL8H3idU6k

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	2	2	-	-	-	1	2	1	-	2	-	2	2	1	-
CO2	1	3	1	3	-	-	-	2	3	-	-	3	-	1	1	1	-
CO3	1	3	1	2	-	-	-	1	2	2	-	2	-	1	1	1	-
CO4	1	3	1	2	-	-	-	1	3	-	-	3	-	1	2	1	-
CO5	1	3	1	2	-	-	-	1	2	1	-	2	-	1	1	1	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation Attributes & SDGs

Course Code	**Course Title**	**Attributes**							**SDGs No.**
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
CV307	EQUIPMENT AND INSTRUMENTATION IN CARDIOVASCULAR TECHNOLOGY LAB	√	√	√			√	√	**3,4**

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**CV308**	**Title of the Course**	**OT POSTING**	**L**	**T**	**P**	**C**
Year	**III**	**Semester**	**V**	0	0	10	5
Pre-Requisite	Nil	**Co-requisite**	Nil				
Course Objectives	Students will engage in clinical practice in cardiovascular department in the catheter lab settings to enhance their clinical skills and apply contemporary knowledge gained during teaching sessions.						

Course Outcomes	
CO1	Students will be able to To learn the punctuality and interaction with colleague and supporting staff during clinical training.
CO2	Students will be able to To develop assessment skills.
CO3	Students will be able to To develop appropriate treatment protocol.
CO4	Students will be able to To understand the importance of documentation of the case record and case presentation.
CO5	Students will be able to To develop discipline and improve overall quality of clinical work.

CLINICAL POSTING ASSESSMENT FORM

Name of Student:		**Session:**	
Enrolment Number:		**Date:**	
Name of Subject:	**OT POSTING**	**Subject code:**	CV308
Topics:			

S. No.	Point to be Considered	Max. Marks	Marks Obtained
1.	Punctuality	4	
2.	Interaction with colleagues and supporting staff	2	
3.	Maintenance of case records	3	
4.	Presentation of case during rounds	2	
5.	Maintained OT records	2	
6.	OT Manners	2	
7.	Rapport with patients	2	
8.	Assistance during operative procedures	3	
9.	Discipline	2	
10.	Overall quality of clinical work	3	
	TOTAL SCORE	**25**	

(Name and signature of In-charge) **(Head, Paramedical)**

GUIDELINES FOR CLINICAL TRAINING PROGRAM

The students of Post Graduate BSc.CVT program must spend above mentioned allotted time period in the hospital based clinical training for specified clinical experiences to meet the objectives of the training program. This period of practical and theoretical experience will enable the students to acquire competency and experience to perform as an independent practice and will enable to adjust to the real practical life in different units in the hospital settings.

S.No.	Program Name	Year/Semester	Duration of Training
1.	BSc.CVT	II Year/ V Semester	4 Months
2.		II Year/ V Semester	4 Months
3.		III Year/ V Semester	4 Months
4.		III Year/ V Semester	4 Months

By the successful completion of this clinical training period, the student is expected to fulfil the objectives of the program and will be examination as given below:

S.No.	Program Name	Year/Semester	Case file	Practical on Case	Voice/Viva	Attendance
1.	BSc.CVT	II Year/ V Semester	10 Marks	10 Marks (1 Long Case and 2 Short Case)	25 Marks	5 Marks
2.		II Year/ V Semester				
3.		III Year/ V Semester				
4.		III Year/ V Semester				

EVALUATION OF CLINICAL POSTING

BSc CVT Students have to prepare 1 long case and 2 short cases during their clinical posting. The evaluation for internal clinical examination of 50 marks will be distributed:

Cases during clinical posting=**25 marks**. Viva voce =**20 marks** Attendance=**5 marks**

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)																
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	3	2	3	2	3	1	2	1	-	-	3	2	3	3	2
CO2	3	3	3	3	2	2	3	2	1	3	-	-	2	2	3	2	3
CO3	3	3	3	3	2	2	3	2	1	3	-	-	3	2	2	2	3
CO4	3	3	3	3	2	2	3	2	1	3	-	-	2	3	2	2	3
CO5	3	3	3	3	2	2	3	2	1	3	-	-	3	2	3	3	2

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation **Attributes & SDGs**

Course Code	Course Title	Attributes							SDGs No.
		Employability	Entrepreneurship	Skill Development	Gender Equality	Environment & Sustainability	Human Value	Professional Ethics	
CV308	OT POSTING	√	√	√			√	√	**3,4,11**