

GANPAT UNIVERSITY				
FACULTY OF DIPLOMA ENGINEERING				
Programme	Diploma in Biomedical Engineering			
Semester	II	Version	1.0.0.0	
Effective from Academic Year	2025-26	Effective for the batch Admitted in	JULY 2025	
Course Code	1BM2102	Course Name	Introduction to Medical Instruments	

I. TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Type	Course Code	Learning Scheme						Assessment Scheme								Total Marks		
		Actual Contact Hrs./Week			SLH	NLH	Credits	Theory				Practical			Based on SL			
		CL	TL	LL				FA-TH	SA-TH	TOTAL		FA-PR	SA-PR	TOTAL			SLA	
										MAX	MIN			MAX	MIN		MAX	MIN
DSC	1BM2102	3	-	2	3	8	4	40	60	100	40	30	20	50	20	20	8	170

Abbreviation:	CL - Classroom Learning	TL - Tutorial Learning	LL - Laboratory Learning
	SLH - Self Learning Hours	NLH - Notional Learning Hours	SLA - Self Learning Assessment
	FA - Formative Assessment (Term work +Mid Sem Exam +Attendance)		SA - Summative Assessment

II. PRE-REQUISITES

Basic knowledge of Class 10 science, biology and familiarity with the basic parts of the human body. Understanding of principles of physics.

III. INDUSTRY / EMPLOYER EXPECTED OUTCOMES

Identify and handle common medical instruments including those used in ICUs, ambulances, and outpatient clinics.

IV. COURSE LEARNING OUTCOMES

At the end of the course, students will be able to achieve the following course learning outcomes:
CO1. Describe the historical evolution and scope of medical instruments.
CO2. Categorize medical instruments based on function and application.
CO3. Explain the working principle of basic diagnostic and therapeutic instruments.
CO4. Recognize the role of medical devices in ICU, ambulance, and emergency care.
CO5. Explain sterilization methods and basic safety standards in biomedical instrumentation.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:

Name of Unit	Theory Learning outcomes (TLO's) aligned to CO's	Learning Content mapped with Theory Learning outcomes (TLO's) & CO's	Marks	Hours
Unit-1 Introduction & History of Medical Instruments	TLO 1.1 Outline the evolution of medical instruments. TLO 1.2 Describe scope of biomedical engineering. TLO 1.3 Difference between household equipment and medical equipment.	1.1 Historical developments. 1.2 Role of Biomedical Engineer in healthcare system. 1.3 Explain how medical equipment differs from household equipment.	5	5
Unit-2 Basic Concepts in Medical Instrumentation	TLO 2.1 Explain block diagram of instrumentation system. TLO 2.2 Describe bio-signals generated from	2.1 Basic principle of instrumentation & block diagram: Input (Sensor) → Amplifier → Processor → Display	12	8

	<p>human body.</p> <p>TLO 2.3 Explain man-instrument system</p> <p>TLO 2.4 Describe components of biomedical instrument system.</p>	<p>2.2 Identify different bio-signals from human body like: temperature, heartbeat, blood pressure, ECG, EMG, respiratory signals etc.</p> <p>2.3 Human communication with environment.</p> <p>2.4 Block diagram of man instrumentation system.</p> <p>2.5. Interaction of patient with measurement system.</p>		
<p>Unit-3 Classification of Medical Equipment</p>	<p>TLO 3.1 Classify medical equipment by their function and use.</p> <p>TLO 3.2 Portable and fixed devices.</p>	<p>3.1 Define and categorize diagnostic, therapeutic, monitoring, surgical, and imaging equipment.</p> <p>3.2 List out home use medical devices, OPD and ICU equipment.</p> <p>3.3 Understanding of portable and fixed medical equipment.</p>	6	6
<p>Unit-4 Temperature Measurement of Human Body</p>	<p>TLO 4.1 Function and types of thermometer.</p> <p>TLO 4.2 Describe working of thermometer.</p> <p>TLO 4.3. Mention advantages, disadvantages of different devices.</p>	<p>4.1 Define heat and temperature.</p> <p>4.2 Explain temperature scales.</p> <p>4.3 Understanding of strip thermometer, mercury thermometer, infrared thermometer, digital thermometer.</p> <p>4.4 Difference between non-contact and infrared thermometer.</p> <p>4.5 Advantages and disadvantages of different types of thermometer.</p> <p>4.6 Common ways for measurement of body temperature.</p> <p>4.7 Calibration of thermometer.</p>	13	9
<p>Unit-5 Stethoscope & Blood Pressure Measurement</p>	<p>TLO 5.1 Function, structure and use of stethoscope.</p> <p>TLO 5.2 Define pressure and its units.</p> <p>TLO 5.3 Methods of blood pressure measurement.</p> <p>TLO 5.4 Types of BP machines.</p>	<p>5.1 Use of stethoscope.</p> <p>5.2 Parts and working principle of stethoscope.</p> <p>5.3 Explain pressure and its units.</p> <p>5.4 Components of blood pressure – systolic and diastolic.</p> <p>5.5 Palpatory and auscultatory method.</p>	12	8

		5.6 Sphygmomanometer, Digital BP machine and its calibration		
Unit-6 ICU & Ambulance Equipment	TLO 6.1 List key ICU instruments. TLO 6.2 Identify ambulance equipment.	6.1 List out different. ICU equipment like: patient monitor, ventilator, infusion pump, defibrillator etc. 6.2 List out different equipment used in ambulance like suction machine, oxygen cylinder, stretcher, etc.	6	4
Unit-7 Sterilization & Basic Safety Aspects	TLO 7.1 Sterilization methods. TLO 7.2 Explain basic safety aspects.	7.1 Basics of autoclave, steam sterilization. 7.2 PPE kit, mechanical safety, electrical safety and radiation protection.	6	5

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL

Sr. No.	Practical/Laboratory Learning Outcome (LLO)	Practical Titles	Relevant COs
1	LLO 1.1 Demonstrate understanding of evolution and classification of medical instruments.	Study the history and classification of medical equipment.	CO1, CO2
2	LLO 2.1. Identify the components of a basic medical instrumentation system.	Demonstration of block diagram of man instrumentation system and biomedical instrumentation system.	CO2
3	LLO 3.1 Record and identify bio-signals such as pulse rate and respiration rate using basic devices.	Measurement of pulse rate and respiration rate using manual techniques.	CO2, CO3
4	LLO 4.1 Understanding of different temperature scales.	Study and Comparison of Different Temperature Scales	CO3
5	LLO 4.2 Handle and compare various thermometers used in clinical settings.	Hands-on demonstration of mercury, digital, and infrared thermometers.	CO2, CO3
6	LLO 5.1 Understand the structure, working principle, and functions of a stethoscope.	Demonstration of stethoscope: parts, working principle, and applications.	CO2, CO3
7	LLO 5.3 Measure blood pressure and understand the function of the stethoscope.	Measurement of blood pressure using sphygmomanometer with the use of stethoscope.	CO3
8	LLO 6.1 Identify and explain the function of common ICU and ambulance equipment.	Demonstration of common ICU and ambulance equipment.	CO4
9	LLO 7.1 Understand sterilization processes and demonstrate safety practices.	Demonstration of autoclave working, PPE usage, and explanation of basic electrical and radiation safety.	CO5

VII. SUGGESTED MICRO PROJECT / ASSIGNMENTS / ACTIVITIES FOR SELF LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

- Prepare a chart or poster on the history and evolution of medical instruments.

- Identify and document the use of any 5 medical instruments used in OPD or ICU through field visit or online research.
- Presentation on block diagram of man-instrument and biomedical instrumentation system.
- Comparison study between digital and mercury thermometer.
- Create a procedural flowchart for blood pressure measurement.
- Report on sterilization methods with real-life application examples.
- Survey Activity: Identify nearby hospitals/clinics and specialties of doctors available.

Mini projects

- Observe and record temperature and BP measuring devices.
- Field Activity: Visit nearby hospital/clinic and list the equipment used and classify instruments based on diagnostic, therapeutic, monitoring, or surgical categories.

VIII. LIST OF INSTRUMENTS / EQUIPMENT / TRAINER BOARD

1	Stethoscope
2	Mercury thermometer
3	Digital thermometer
4	Infrared thermometer
5	Sphygmomanometer
6	Digital BP machine
7	Multipara monitor
8	ECG machine
9	Ventilator
10	Defibrillator
11	Autoclave

IX. LIST OF REFERENCE BOOKS

Sr.No.	Title	Author	Publication
1	Handbook of Biomedical Instrumentation	R.S. Khandpur	McGraw Hill Education (India) Private Limited
2	Biomedical Instrumentation and Measurements	Leslie Cromwell	Prentice Hall
3	A Textbook of Medical Instruments	S. Ananthi	New Age International Publishers
4	A Complete Hospital Manual of Instruments and Procedures	MM Kapur	Jaypee Brothers Medical Publishers (P) Ltd

X. LINK OF LEARNING WEB RESOURCE

1	https://www.vecteezy.com/free-videos/thermometer-temperature?page=4
2	https://www.mayoclinic.org/diseases-conditions/high-blood-pressure/multimedia/how-to-measure-blood-pressure/vid-20084749
3	https://www.mayoclinic.org/diseases-conditions/high-blood-pressure/multimedia/how-to-measure-blood-pressure/vid-20084748
4	https://study.com/academy/lesson/video/thermometer-definition-types-examples.html
5	https://study.com/academy/lesson/video/degrees-celsius-definition-conversion-quiz.html
6	https://www.youtube.com/watch?v=pXaU4LnPILl
7	https://www.youtube.com/watch?v=367nNChJUO8

XI. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE							
Unit	Unit Title	Aligned COs	Learning Hours	R-Level	U-Level	A-Level	Total Marks
1	Introduction & History of Medical Instruments	CO1	5	2	2	1	5
2	Basic Concepts in Medical Instrumentation	CO1, CO2	8	3	5	4	12
3	Classification of Medical Equipment	CO3, CO4	6	1	3	2	6
4	Temperature Measurement of Human Body	CO3, CO4	9	3	4	6	13
5	Stethoscope & Blood Pressure Measurement	CO3, CO4	8	2	5	5	12
6	ICU & Ambulance Equipment	CO3, CO4	4	1	3	2	6
7	Sterilization & Basic Safety Aspects	CO5	5	2	2	2	6
Grand Total			45	14	24	22	60

XII. COs AND POs AND PSOs MAPPING										
Course outcome (Cos)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	1	0	1	0	2	2	1	1
CO2	3	2	2	1	1	1	2	2	2	2
CO3	3	3	3	3	1	1	2	3	3	3
CO4	2	2	2	2	3	2	2	3	3	3
CO5	2	2	2	2	3	2	3	2	2	3

Legends: - 3- High 2-Moderate/Medium 1-Slight/Low 0-None