



Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020

COURSE CODE	CATE-GORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
	GE	Maintenance of Medical Equipment	60	20	20	0	0	3	0	0	3

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit.

***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. Understand troubleshooting of electrical and electronic equipment.
2. Learn the troubleshooting of medical equipment.
3. Apply the tools in design, testing and developing, maintenance of medical equipment

Course Outcomes (COs):

1. Identify the reasons for equipment failure.
2. Interpret the need for grounding aspects, maintenance, and troubleshooting.
3. Construct the test bench, tools, and methods for troubleshooting
4. Compare various standards and specifications.
5. Decide quality and safety standards

Syllabus

UNIT I

7 Hrs.

Testing of Electrical Equipment

AC, DC power supply, Grounding, shielding, Guarding, insulation testing, insulation resistance measurement, Types of Circuit Breakers, Rating, Testing of circuit breakers, Transformer testing, Earthing, Earth wires, Earthing of appliances, relay testing, CT and PT, Panel wiring.

UNIT II

7 Hrs.

Testing of Electronic Components

Troubleshooting of PCB boards, Calibration of analog and digital sensor probe, Display interface, DC Power supply design, testing, Safe electrical practice, Cables and standard, Fuse.

UNIT III

8 Hrs.

Medical Device Function and Performance Testing

Performance Testing, Materials Testing, Biocompatibility Testing, The Importance of Maintaining Surgical Instruments, Testing and Inspecting Surgical Instruments,

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Types of Medical Device Design Testing: Verification, Validation, Black box, White box, Hardware testing, Software testing, Functional testing, Robustness testing, Stress testing, Safety testing, Regression testing.

Troubleshooting of Equipment: X-ray machines, Troubleshooting of ECG recorders, incubator, baby warmer, infusion pumps, annual maintenance, safety standards.

UNIT IV

8 Hrs.

Medical Device Risk, Regulation and Governance

Medical Device Risks: Frequency, Legal and Financial Consequences

Risk Management: Risk Categories, Perception of Risk, Practical Approaches to Risk Management, Risks in the Hospital Context

Governance, Standards and Best Practice: Clinical Governance, Quality Systems, Records and Document Control.

UNIT V

9 Hrs.

Life Cycle Management of Medical Equipment

Equipment Management Processes, Cost of the medical equipment, maintenance cost, replacement analysis, managing equipment service, decision making, extracting optimal benefit from medical equipment over its life cycle.

Risk Management and Governance in the Equipment Life Cycle: Procurement, Installation, Acceptance and Commissioning, Risks during Equipment Operation, Operating Risks, Maintenance, Hazard and Incident Reporting and Management, Modification, Clinical Trials, Research and Off-Label Use, Condemning and Disposal, Liability, Indemnity.

Text Books:

1. B.S. Dhillon, "Medical Device Reliability and Associated Areas", CRC Press, UK, 2000.
2. Joseph. J Carr, John M Brown, "Introduction to Biomedical Equipment Technology", John Wiley & Sons, New York, 4th edition, 2008.
3. Keith Willson, Keith Ison, Slavik Tabakov, "Medical equipment management", CRC Press, UK, 2014.

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References:

1. Jenny Dooley, John Lehnert Virginia Evans, “Career Paths: Medical Equipment Repair”, Express Publishing, UK, 2018
2. Shakti Chatterjee, Aubert Miller, “Biomedical Instrumentation systems”, Cengage Learning Technology & Engineering, 2010.
3. David Herres, “Troubleshooting and Repairing Commercial Electrical Equipment”, McGraw Hill Professional edition, 2013.
4. R. S. Khandpur, “Troubleshooting Electronic Equipment” 1st Edition, McGraw Hill, 2007.
5. R. Fries, “Reliable design of medical devices”, 2nd, CRC Press, 2006.

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