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| <b>Devi Ahilya University, Indore, India<br/>Institute of Engineering &amp; Technology</b> |  |          |          | <b>ME I Year Electronics<br/>(Sp. Digital Instrumentation)<br/>Semester- A</b> |          |          |              |
| <b>Subject Code &amp; Name</b>   | <b>Instructions<br/>Hours per Week</b> |          |          | <b>Credits</b>   |          |          |              |
| <b>DIR1G4: Medical Instrumentation</b>   | <b>L</b>                               | <b>T</b> | <b>P</b> | <b>L</b>   | <b>T</b> | <b>P</b> | <b>Total</b> |
| <b>Duration of Theory Paper: 3 Hours</b>   | <b>3</b>                               | <b>1</b> | <b>0</b> | <b>3</b>   | <b>1</b> | <b>0</b> | <b>4</b>     |

**Course Objective:** To understand the advanced biomedical instruments used in hospitals. To review the basic concept of medical Imaging systems. To understand the concept of various biomedical instruments and technologies.

### COURSE CONTENT

#### Unit I

Basic Medical Instrumentation system, General Constraints in design of medical instrumentation system, Patient Safety, Automated Drug Delivery Systems, Blood and its composition and function, Blood Cell Counters, Pulse Oximetry, Introduction to telemetry & Telemedicine .

#### Unit II

X-ray machines, Dental X-ray machines, Digital Radiography, Principles and, System components of Tomography, Principles of NMR, its components and biological effects. Ultrasonic & Thermal imaging systems. CT Scanning, basic CT scanning system, Types of gantries, image reconstruction techniques in tomography, image artefacts, EEG and ECG

#### Unit III

Pacemaker – general description and instrumentation details, Types of pacemakers: External & Internal, Defibrillators: AC & DC Defibrillator, Heart Lung Machine. Diathermy: Electro surgical diathermy (ESU), Short wave, Microwave. Artificial Kidney, Dialyzers, Haemodialysis machine. Stone disease problem, lithotripter systems, Anesthesia machine, Mechanism of artificial ventilation, Types of Ventilator

#### Unit IV

Interaction of Lasers with Tissues -Thermal and Non thermal, Basic Endoscopes system & its characteristics, Laser Applications in ophthalmology- Diabetic Retinopathy , Glaucoma and Retinal hole and detachment treatment , Dermatology- Tattoo, port wine treatment.

#### Unit V

Orthotics & Prosthetic devices, overview of various orthotics & prosthetic devices along with its materials. Wheelchair Types, Materials used in wheelchair.

#### Text and Reference Books:

- [1] Medicine and Clinical Engineering By Jacobsons & Webster, PHI
- [2] Introduction to Biomedical Equipment Technology By Carr & Brown
- [3] Biomedical Instrumentation and Measurements By Cromwell, PHI
- [4] Handbook of Biomedical Instrumentation By R. S. Khandpur, TMH
- [5] The Biomedical Engineering Handbook, Bronzino, IEEE Press
- [6] Applied Chemical Engineering Feenberg,
- [7] Principles of Medical Imaging.-By: K. Kirk Shung, Michael B. Smith, Benjamin Tsui.-Pub: Academic Press.
- [8] Medical Laser Applications -By Carruth
- [9] Medical Lasers & their safe Use By Sliney & Trokal