DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

III YEAR

M SCHEME

VI SEMESTER

2015 – 2016 onwards

BIO MEDICAL INSTRUMENTATION

CURRICULUM DEVELOPMENT CENTRE

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

M - SCHEME

Course Name : Diploma in Electrical and Electronics Engineering

Subject code : 34082

Semester : VI Semester

Subject title : ELECTIVE THEORY - II :BIO MEDICAL INSTRUMENTATION

TEACHING AND SCHEME OF EXAMINATION:

Number of Weeks/ Semester : 15 weeks

Subject	Instruction		Examination			
			Marks			Duration
	Hrs./ Week	Hrs./ Semester	Internal Assessment	Board Examination	Total	
Bio Medical Instrumentation	5	75	25	75	100	3 Hrs

TOPICS AND ALLOCATION

Unit	Topic	Time (Hrs)
I	Bio - electric signals, electrodes and clinical measurement	13
II	Bio - medical recorders	13
III	Therapeutic instruments	13
IV	Biotelemetry and patient safety	14
V	Modern imaging techniques	12
Vi	Revision, Test	10
	TOTAL	75

RATIONALE

Bio medical engineering education is in the growing stage. But every year, there is a tremendous increase in the use of modern medical equipment in the hospital and health care industry therefore it is necessary for every student to understand the functioning of various medical equipments. This subject to enable the students to learn the basic principles of different biomedical instruments vizClinical measurement, Bio - medical recorders, Therapeutic instruments, Biotelemetry and Modern imaging techniques instruments.

OBJECTIVES

After learning this subject the student will be able to understand the about

- The generation of Bio-potential and its measurement using various electrodes.
- The measurement of blood pressure.
- The measurement of lung volume.
- The measurement of respiration rate.
- The measurement of body temperature and skin temperature.
- The principles of operations of ECG recorder.
- The principles of operations of EEG recorder.
- The principles of operations of ENG recorder.
- The working principles of audio meter.
- The principles of operations of pacemaker.
- The basic principle of dialysis.
- The basic principle of short wave diathermy.
- The basic principle of ventilators.
- The working principles of telemetry.
- The basic principle of telemedicine.
- To learn about patient safety.
- The various methods of accident prevention.
- The basic principle of various types of lasers.
- The basic principle of CT and MRI scanner.
- The principle of operation of various imaging techniques

34082 - BIO MEDICAL INSTRUMENTATION

DETAILED SYLLABUS

Units	Name of the topic	Hours
I	**BIO-ELECTRIC SIGNALS AND ELECTRODES** Elementary ideas of cell structure, Bio – potential and their generation – resting and action potential – propagation of action potential. Electrodes – Micro – Skin surface – needle electrodes. **CLINICAL MEASUREMENT:** Measurement of Blood pressure (direct, indirect) – blood flow meter (Electro magnetic& ultrasonic blood flow meter) – blood pH measurement - Measurement of Respiration rate – measurement of lung volume – heart rate measurement – Measurement of body and skin temperature - Chromatography, Photometry, Flurometry.	13
II	**BIO - MEDICAL RECORDERS:** Electro cardiograph (ECG) – Lead system – ECG electrodes – ECG amplifiers – ECG recording units – analysis of ECG curves. Nervous system – EEG recorder – 10-20 lead system – recording techniques – EEG wave types – Clinical use of EEG – brain tumour Electro – myograph (EMG) – EMG waves – measurement of conduction velocity – EMG recording techniques – Electro – retinograph (ERG) Audiometer – principle – types – Basics audiometer working.	13
III	**THERAPEUTIC INSTRUMENTS:** Cardiac pacemaker – classification – External pace makers – implantable pacemaker – pacing techniques – programmable pacemaker – Cardiac defibrillators – types – AC and DC defibrillators - Heart lung machine with Block diagram. Dialysis – Hemo dialysis – peritoneal dialysis. Endoscopes Endoscopic laser coagulator and applications – physiotherapy equipment – short wave diathermy – micro wave diathermy – ultrasonic therapy unit (block / circuit) – Ventilators – types – modern ventilator block diagram.	13

IV	**BIOTELEMETRY AND PATIENT SAFETY:** Introduction to biotelemetry – physiological – adaptable to biotelemetry – components of a biotelemetry system – application of telemetry – elements of biotelemetry; AM, FM transmitter and receiver – requirements for biotelemetry system – radio telemetry with sub carrier – single channel and multi channel telemetry – Telemedicine; introduction, working, applications. Patient safety: Physiological effects of electric current – Micro and macro shock – leakage current – shock hazards from electrical equipment. Methods of Accident Prevention – Grounding – Double Insulation – Protection by low voltage – Ground fault circuit interrupter – Isolation of patient connected parts – Isolated power distribution system. Safety aspects in electro surgical units – burns, high frequency current hazards, Explosion hazards.	14
V	**MODERN IMAGING TECHNIQUES:** LASER beam properties – block diagram – operation of CO2 and NDYag LASER – applications of LASER in medicine. X ray apparatus – block diagram – operation – special techniques in X-ray imaging – Tomogram – computerized Axial tomography – Ultrasonic imaging techniques – Echo cardiography – Angiography – CT scanner - Magnetic resonance imaging techniques.	12
	Revision and Test	10

Text Book:

Dr.M. Arumugam – Biomedical Instrumentation ,Anuradha publications, chennai (Page no. 1-15, 21-33, 117-136,142-159,164-179, 182-195, 202-209, 212-215, 255 – 256, 274-277, 285-286, 266-268, 293-297, 299- 310, 319-320, 329 – 340, 347-358, 360-367, 374-390, 390-400)

Reference Books.

- Leslie Cromwell –Fred j. Wibell, Erich A.P Feither – Bio medical Instrumentation and measurements, II Edition.
- (Page no. 49-64, 63-76, 93-97, 106-149,195-205, 260-276, 296-303, 316 – 339, 363- 383,430-439)
- Jacobson and Webstar – Medicine and clinical Engineering.
- R.S .Khandpur – Hand book of Bio –Medical Instrumentation.
- Medical Electronics - Kumara doss
- Introduction to Medical Electronics. B.R. Klin
- Introduction to Biomedical Instrumentation Mandeep Singh Printice Hall India 2010.