Second Semester 2015-2016 Date : 09/01/2016

Course Handout (Part II)

In addition to Part I (General Handout for all courses appended to the Time Table), this portion gives further specific details regarding the course:

Course No: EEE/INSTR F432

Course Title: Medical Instrumentation

Instructor-in-charge: SUREKHA BHANOT

Course Description: Basic components of bio-medical instruments, bioelectric signals and recording electrodes, transducers, recording and display devices; patient care and monitoring systems, cardio vascular measurements-blood pressure, blood flow, cardiac output, heart sounds, etc; instrumentation for respiratory and nervous system, analysis of EEE, ECG, EMG, EOG and action potentials; non-invasive diagnostic measurements-temperature, ultrasonic diagnosis, CAT scan techniques; sensory measurements, motor response, analysis and behavior, etc; bio-telemetry, bio- feedback; Recent advances in biomedical instrumentation-microprocessor based systems, lasers and optical fiber based systems.

Scope and objective:

The objective of this course is to relate specific engineering and instrumentation principles to the task of obtaining physiological data. Thus starting with the origin of bioelectric signals, the course deals with

i. The transducers, electrodes and other devices for recording the bioelectric events;
ii. The design of specific medical instruments and
iii. The recent developments in this field.

Text Book (T): Cromwell : Biomedical Instrumentation and Measurements; PHI, New Delhi, 2nd Ed. 1990.

Reference Book :

R1: J. J. Carr and J. M. Brown: Introduction to Biomedical Equipments & Technology; Pearson Education, 4th Ed., 2001.

R2: Mandeep Singh, Introduction to Biomedical Instrumentation, EEE edition, PHI.

R3: John G Webster, Medical Instrumentation: Application and Design, John Wiley & Sons.

R4: R. S. Khandpur, Handbook of biomedical instrumentation, Tata McGraw-Hill.

R5: R. M. Rangayyan, Biomedical Signal Analysis: A Case-Study Approach, John Wiley & Sons.

R6: M. R. Neuman, Biomedical Image Analysis, CRC Press.

Course Plan:

Lecture No.	Content	Reference
01-06	Introduction to biomedical Instrumentation, Definition, concepts, significance & scope, fields of biomedical engineering, classification of biomedical instruments, roots, prefixes, suffixes in media terminology, Biometrics, Man-instrument system, Physiological systems of body, Challenges in measuring a living system	T-ch1, R2- ch1, class notes
07-08	Transducers for bio-medical applications	T-ch2, R1-ch6, R4-ch2, class notes
08-11	Signal conditioning techniques, Introduction to Biomedical signal processing	R1-ch5, R2-ch5, R3-ch3, R5-ch1, class notes
12-13	Bioelectode potential, biopotential amplifiers, bio-electrodes	T-ch3, 4, R1-ch6, R2-ch2, R4-ch1, class notes
14-19	Cardiovascular system : functioning of heart, measurement of blood pressure, blood flow, pulse rate, heart sound, ECG, ECG signal processing	T-ch5, R-ch8, 9, R2-ch3, R4-ch12, 13, R5-ch4, 5, 6, class notes
20-21	Respiratory Systems : physiology, tests and instruments	T-ch8, R1-ch10, R2-ch4, R4-ch14, class notes
22-25	Nervous Systems : Anatomy, instrumentation, EEG, EMG,EOG,EEG, ERG, Signal processing of EEG signal	T-ch10, R1-ch5, R2-ch12, 13, R5-ch4, 5, 6, class notes
26	Sensory and behavioural measurements :psycho physiological measurements, GSR	T-ch11, R2-ch6, class notes
27-29	X-RAY and Radioisotope instrumentation, Signal processing of X-RAY	T-ch14, R1-ch23, R2-ch8, R3-ch13, ch19, R6-ch1, class notes
30-34	Imaging systems [Ultrasonic, MRI,CT,PET etc.], Introduction to Biomedical Image processing	T-ch9, R1-ch17, R2-ch8, R4-ch19-22, R6-ch1, class notes
35-36	Therapeutic and prosthetic devices	R2-ch9, 23, R3-ch13, R4-ch23-25, class notes
37	Clinical laboratory instruments	T-ch13, R1-ch16, R2-ch7, R3-ch11, R4-ch15, 17, class notes
38	Lasers and fiberoptic in medical instrumentation	R1-ch21, R2-ch12, R4-ch27, class notes
39-40	Patient monitoring systems	T-ch7, R2-ch10, R4-ch6, R4-ch6, class notes

Evaluation Scheme:

EC. No.	Evaluation Component	Duration	Weightage	Date & Time	Nature of Component
1.	Mid Sem Test	90 min.	90M	17/3 9:00 - 10:30 AM	CB
2.	7 Quizzes [5 announced +2 surprise]		50M	Continuous	CB
3.	Assignments	-	40 M	Continuous	OB
4.	Comprehensive Exam	3 hrs.	120 M	10/5 FN	CB and OB

Chamber Consultation Hours: To be announced in class

Notices: Notices concerning this course will be displayed on Instrumentation NB

Surekha Bhanot

Instructor-in-charge