

EC 537 Biomedical Engineering

COURSE INFORMATION

Prerequisites	Academic Year & Level		Teaching Methods			Credit Hrs.
	Year	Semester	Lecture	Tutorial	Laboratory	
EC 434	5	9	2	2	0	3

COURSE AIM

Introducing basic concepts in biomedical engineering and applications of electronics in patient care medical – equipment.

COURSE WEEKLY CONTENTS

1	Introduction” Overview of course contents, Overview of text book and references, Grading Policy, Definition of medical instruments, Historical consideration”.	
2	Biological Currents “Law of diffusion, Drift equation, Einstein relation ship, Examples of two ion currents”.	
3	Biological Currents “Goldmann’s equation, Nernst equation, Tissue equivalent circuit, Depolarization of living cells, Biopotentials in the heart, Electrocardiograms”.	
4	Biological Currents” Electrode charge distributions, Electrode equivalent circuit, Electrode impedance measurement, Numerical example”.	
5	Thermal transducer “Semiconductor Thermistor, Whetstone bridge circuits, Conductor Thermistor, Numerical examples.	
6	Strain Gauges “Blood volume measurement, Strain gauge silicon wire, Numerical examples”.	
7	Differential Capacitive Transducer “Tissue displacement measurement, Capacitor in bridge circuits, Numerical examples”.	7 th week assessment + Midterm Exam
8	Biopotential Amplifiers “Potential difference in ECG and EEG equipment, Transistor differential amplifiers, Operational amplifier analysis, Biopotential measurement interference, Equivalent circuits for power line interference, Common mode Rejection Ratio, Numerical examples”.	
9	Common mode Voltage Reduction” Electrocardiographs, Analysis of common mode Reduction circuits, Numerical examples, ECG block diagrams.	
10	ECG Lead connection “Standard ECG lead connections, Block diagram for standard ECG, Numerical examples, Augmented ECG lead connection, Chest ECG lead connections”.	
11	Electroencephalographs “Placement of electrodes on skull, EEG electrodes, EEG block diagrams, EEG voltage measurements, Operational amplifier requirements”.	
12	EEG Active filters “EEG frequency bands, Active low pass filters for delta bands, Active high pass filters for beta bands, Active band pass filters for theta and alpha bands, Active notch filters for common mode reduction, Second written examination” . and 12th week exam.	
13	Pacemakers “Pacemaker block diagram, Pacemaker pulse output, Computation of battery life time, Implantable pacemakers”.	
14	Electronic Pacemaker circuits “Astable Multivibrators, Monostable Multivibrators,	

- Illustrative pacemaker circuits, Numerical examples”.
- 15** Preview of course contents.

STUDENT GRADING & ASSESSMENT

Weeks	Exams	Assign.	Quizzes	Reports	Present.	Lab.	Total
1 to 7	20 Midterm	←	10	MARKS		→	30
		To be freely distributed among possible assessments					
8 to 12	←		20	MARKS		→	20
13 to 15	←		10	MARKS		→	10
16 or 17	40 Final						40
Total	Exams	Assign.	Quizzes	Reports	Present.	Lab.	100

REFERENCES

- Textbook** • R.S. Khandpur, Handbook of Biomedical Instrumentation, McGraw Hill, 2000.
- Other** • J.D. Brozino “,The Biomedical Engineering Handbook”, CRC and IEEE Press 2000.