With effect from the academic year 2008-2009

BM 251 UE

BIOMEDICAL INSTRUMENTATION

Instruction 4 Periods per week
Duration of University Examination 3 Hours
University Examination 75 Marks
Sessionals 25 Marks
Credits 4

UNIT I
Concepts of Biomedical Instrumentation
Evolution of medical instrumentation. Components of a medical instrumentation system.
Static & Dynamic characteristics of medical instruments.
Medical instrument development stages & process.

UNIT II
Medical display Devices and recorders
Display Devices: Basic requirements for the display and recording of Bio-signals, Types of medical display devices.
Medical recorders: Classification of recorders, PMMC writing systems. General features of ink-jet, thermo-sensitive and optical recorders.
Oscilloscopes: Basic description, Cathode Ray Oscilloscope (CRO), Dual beam oscilloscope, Analog storage oscilloscope, Digital storage oscilloscope, Medical, Multibeam & Non-fade display systems.
Liqud crystal displays: Introduction, Passive-matrix and active –matrix addressed LCDs.

UNIT III
Medical Analytical Instrumentation
Electrophoresis. Automation in chemical Analysis.

UNIT IV
Cardiac Instrumentation
Electrocardiography: Block diagram. Circuits, electrodes and their placement. Lead configuration and general ECG waveforms
ECG monitors: Single channel & multi-channel ECG systems. Holter monitors, Stress test systems.
Blood Pressure measurement: Introduction to blood pressure. Direct and indirect methods of Blood Pressure measurements.
Heart sounds: Origin of Heart Sounds, types of microphones for heart sound measurement. Contact and non-contact type of measurement. Phonocardiography.

UNIT V
Neuro-muscular Instrumentation
Electroencephalography: EEG-Block diagram and circuits, electrodes and their placement. Lead configuration and general EEG graphs. Evoked potentials and their measurement. Filters for EEG rhythm analysis.
Suggested Readings:
BM 252 UE

TRANSDUCER AND BIOSENSORS ENGINEERING

Instruction 4 Periods per week
Duration of University Examination 3 Hours
University Examination 75 Marks
Sessionals 25 Marks
Credits 4

UNIT I
Bio-potential Electrodes
Origin and characteristics of biopotentials-ECG, EEG, EGG, EMG, ENG, EOG, ERG
Electrode-Electrolyte Interface, Half cell potential, Offset Voltage.
Electrodes- Types of external, Internal and Microelectrodes.
Mathematical Treatment of Electrodes: Equivalent circuits and applications.

UNIT II
Chemical transducers
Electrochemical transducers-Electrode potential and reference electrodes.
Optically – based Chemical Transducers – Spectrophotometric chemical analysers, Fiber optic chemical transducer.

UNIT III
Transducers

UNIT IV
Principle of operation, associated circuits and applications of Pressure(Blood, Air), flow(blood flow and respiratory gas flow) and humidity transducers.

UNIT V
Bio-MEMS
Biophysical and chemical principles. Micro and nano scale devices. Solid state transducers, optical transducers, electrochemical transducers, biomedical microelectronics. Clinical applications.

Suggested Reading:
CE 151 UE

ENVIRONMENTAL STUDIES

Instruction 4 Periods per week
Duration of University Examination 3 Hours
University Examination 75 Marks
Sessionals 25 Marks
Credits 4

UNIT I

Environmental Studies: Definition, scope and importance, need for public awareness. Natural resources: Water resources; use and over utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Effects of modern Agriculture, fertilizer-pesticide problems, water logginh and salinity.

UNIT II

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in ecosystem, food chains, ecological pyramids, aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries).

Energy resources: Growing energy needs renewable and non-renewable energy sources. Land Resources, land as a resource, land degradation, soil erosion and desertification.

UNIT III

Biodiversity: Genetic species and ecosystem diversity, bio-geographical classification of India. Value of biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.

UNIT IV

Environmental Pollution: Causes, effects and control measures of air pollution, water Pollution, soil pollution, noise pollution, noise pollution, thermal pollution and solid waste management.

Environment protection act: Air, water, forest and wild life Acts, enforcement of Environmental legislation.

UNIT V


Disaster management: Types of disasters, impact of disasters on environment, infrastructure and development. Basic principles of disaster mitigation, disaster management, and methodology, disaster management cycle, and disaster management in India.

Suggested readings:
5. Sharma V.K., Disaster Management, National Center for Disaster management, IIE, Delhi,1999.
EC 254 UE

**SIGNAL ANALYSIS AND TRANSFORM TECHNIQUES**
(Common to BME and CSE)

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**UNIT I**
Definitions and classification of Signals and systems:- The environmental signal, analogy between vector and signal, Signal representation by discrete set of orthogonal functions, Orthonormality and completeness, Exponential and trigonometric Fourier series, convergence, Dirichelet’s conditions, the discrete Spectrum, Application of Fourier series to electrical networks.

**UNIT II**
Signal representation by continuous exponentials:- The direct and inverse Fourier transform, continuous spectrum, Existence and properties of Fourier transform, singularity functions, Parsevals theorem.

**UNIT III**
Convolution integral:- Convolution integral, convolution as summation, graphical method of convolution, network functions, poles and zeros, time domain behavior from pole zero plot and stability.

**UNIT IV**
Discret Signals:- Sampling of continuous time sampling, sampling theorem and problems, discrete time signals and systems-Linear shift invariant, linear, stable, causal and memory less. Linear Constant Coefficient Difference equations, frequency domain representation of systems, Realization of discrete time system-direct, cascade and parallel Forms.

**UNIT V**
Z Transform and Properties:- Z transform, Properties of the region of convergence for the Z-Transform, Inverse Z Transform, Z transform properties, Inverse Z-Transform using Contour Integration, partial fraction expansion, Long division methods, Parseval’s relation and analysis of discrete time systems using Z-Transform

**Suggested Reading:**
1. Lathi B.P. *Signals, Systems and communication*, BSP-2001
EC 271 UE

ELECTRONIC ENGINEERING-II
(Common to BME and EEE)

Instruction: 4 Periods per week
Duration of University Examination: 3 Hours
University Examination: 75 Marks
Sessionals: 25 Marks
Credits: 4

UNIT-I
Feedback Amplifiers: Concept of Feedback, feedback amplifier configurations, circuits, Advantages of negative feedback, analysis of simple feedback amplifiers using BJT and FET.

UNIT -II
Oscillators: Barkhausen Criterion, RC Oscillators: Weinbridge, Phase shift, LC oscillator, Hartly and Colpitts oscillator, Crystal controlled oscillators (analysis of oscillators using BJTs only) stability of oscillator, Non-sinusoidal oscillators (using OP amps).

UNIT -III

UNIT -IV
Carrier Amplifier: Chopper amplifier, Principles and Applications, Phase sensitive detector, Classification of power amplifiers, analysis of class A and Class B power amplifier: distortion in amplifier, push-pull amplifier, complementary symmetry, IC power amplifiers.

UNIT -V
Wave Shaping Circuits: RC Low Pass and High Pass circuits, response to step, pulse Ramp and Square wave input, Differentiator and Integrator, Clipping circuits for single level and two level, Clamping circuit and applications, Multivibrator circuit: Astable, Monostable and Bistable circuit using Op-Amp and 555 timer, Schmitt Trigger circuit.

Suggested Reading:
With effect from the academic year 2008-2009

MT 201 UE

MATHEMATICS-III
(Common to all Branches)

Instruction
Duration of University Examination
University Examination
Sessionals
Credits

4 Periods per week
3 Hours
75 Marks
25 Marks
4

UNIT-I

UNIT-II
Fourier series: Expansion of a function in Fourier series for a given range- half range sine and cosine expansions, Fourier series of odd and even functions, change of interval.

UNIT-III
Applications of Fourier series: Classification of linear second order partial differential equations, separation of variables method, solution of Heat equation, Wave equation, and Laplace equation.

UNIT-IV
Laplace Transforms and Fourier Transforms: Laplace transform, inverse Laplace transform, properties of Laplace transforms, Laplace transforms of Unit step function, Dirac-Delta function with constant coefficients using Laplace transform Fourier transforms-inverse Fourier Transforms-sine and cosine transforms-inverse and cosine transforms.

UNIT-V

Suggested Reading:

References:
BM 281 UE

MEDICAL INSTRUMENTATION LAB

Instruction 3 Periods per week
Duration of University Examination 3 Hours
University Examination 50 Marks
Sessionals 25 Marks
Credits 2

I. Study of the following Transducers:
   1. Thermistor, Thermocouple, RTD
   2. Potentiometric transducer
   3. Strain Gauge
   4. LVDT
   5. Capacitive transducer
   6. Piezoelectric transducer
   7. Photoelectric transducer
   8. Hall Effect transducer

II. Usage, study and analysis of the following equipment:
   1. Colorimeter
   2. Spectrophotometer
   3. Electrophoresis Apparatus
   4. Chromatograph
   5. ECG
   6. EEG
   7. EMG
EC 291 UE

**ELECTRONICS ENGINEERING LAB**

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I. Characteristics of:
   1. Semi-conductor Diodes (Si, Ge and Ze)
   2. Bi-junction Transistors (only CB and CE) (only Static Characteristics)

II. Rectifiers:
   1. Half-wave Rectifier
   2. Full-wave Rectifier without Filters
   3. Half-wave Rectifier with Filters

III. Regulators:
   1. Series and Shunt Regulators
   2. Regulators ICs
   3. SMPS Circuits for power supply regulation

IV. RC Amplifiers:
   1. RC Coupled Amplifier
   2. Frequency response of BJT version
   3. Frequency response of FET version

V. Feedback Amplifiers:
   1. Voltage series configuration
   2. Current Shunt configuration

VI. Oscillators:
   1. Wein Bridge
   2. RC Phase Shift Oscillation
   3. LC Oscillator
   4. Hartley Oscillator
   5. Colpitts Oscillator

VII. Butterworth Filter:
   1. Active Low Pass Filters
   2. Active High Pass Filters
   3. Band Pass Filters
   4. Notch Filters

VIII. Power Amplifier:
   1. Class A Amplifier
   2. Class B Amplifier

IX. Wave Shaping Circuits:
   1. Differentiator Circuits
   2. Integrator Circuits
   3. Clipping Circuits
   4. Clapping Circuits

X. Multivibrator Circuits:
   1. Astable Multivibrator using 555 timer
   2. Monostable Multivibrator using 555 timer
   3. Bistable Multivibrator using 555 timer