UNIVERSITY DEPARTMENTS

ANNA UNIVERSITY CHENNAI :: CHENNAI 600 025

REGULATIONS – 2008

CURRICULUM FROM III & IV SEMESTERS FOR

B.E. BIOMEDICAL ENGINEERING

SEMESTER III

CODE NO	COURSE TITLE	L	T	P	C
THEORY					
MA 9211	Mathematics – III	3	1	0	4
EC 9251	Digital Electronics and System Design	3	0	0	3
EC 9203	Signals and Systems	3	1	0	4
BM 9201	Sensors and Measurements	3	0	0	3
BM 9202	Electronic Circuits	3	1	0	4
BM 9203	Biochemistry	3	0	0	3
PRACTICAL					
BM 9204	Sensors and Measurements lab	0	0	3	2
BM 9205	Biochemistry and Human Physiology Lab	0	0	4	2
BM 9206	Electronic Circuits Lab	0	0	3	2
	TOTAL				**27**

SEMESTER IV

CODE NO	COURSE TITLE	L	T	P	C
THEORY					
MA 9263	Probability and Random Processes	3	1	0	4
BM 9251	Biomedical Instrumentation	3	0	0	3
EE 9113	Basics of Electrical Engineering	3	0	0	3
EC 9302	Linear Integrated Circuits	3	1	0	4
BM 9252	Pathology and Microbiology	3	0	0	3
EC 9261	Analog and Digital Communication	3	0	0	3
GE 9021	Environmental Science and Engineering	3	0	0	3
PRACTICAL					
EC 9262	Integrated Circuits Lab	0	0	3	2
BM 9253	Pathology and Microbiology Lab	0	0	4	2
	TOTAL				**27**

MA 9211 MATHEMATICS III
(Common to all branches of BE / B.Tech Programmes)

L	T	P	C
3	1	0	4

Aim:

To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics.

Objectives:

- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic
- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes
- To develop Z- transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in analysis of continuous time systems

1. FOURIER SERIES **9+3**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half-range Sine and Cosine series – Complex form of Fourier series – Parseval's identity – Harmonic Analysis.

2. FOURIER TRANSFORM **9+3**

Fourier integral theorem – Fourier transform pair-Sine and Cosine transforms – Properties – Transform of elementary functions – Convolution theorem – Parseval's identity.

3. PARTIAL DIFFERENTIAL EQUATIONS **9+3**

Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Singular solutions – Lagrange's Linear equation – Integral surface passing through a given curve – Solution of linear equations of higher order with constant coefficients.

4. APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS **9+3**

Method of separation of Variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates.

5. Z – TRANSFORM AND DIFFERENCE EQUATIONS **9+3**

Z-transform – Elementary properties – Inverse Z-transform – Convolution theorem – Initial and Final value theorems – Formation of difference equation – Solution of difference equation using Z-transform.

L: 45, T: 15, Total : 60

TEXT BOOKS

1. Grewal, B.S. "Higher Engineering Mathematics", Khanna Publications (2007)

REFERENCES

1) Glyn James, "Advanced Modern Engineering Mathematics, Pearson Education (2007)
2) Ramana, B.V. "Higher Engineering Mathematics" Tata McGraw Hill (2007).
3) Bali, N.P. and Manish Goyal, "A Text Book of Engineering 7th Edition (2007) Lakshmi Publications (P) Limited, New Delhi.

EC 9251 DIGITAL ELECTRONICS AND SYSTEM DESIGN 3 0 0 3

1. BASIC CONCEPTS AND COMBINATIONAL CIRCUITS 9

Number Systems – n's complement –Codes - Sum of products and product of sums, Minterms and Maxterms, Karnaugh map and Tabulation method – problem formulation and design of combinational circuits, Adder, Subtractor, Encoder/decoder, – three state devices, Priority Encoder, Mux/Demux, Code-converters, Comparators, Implementation of combinational logic using standard ICs, ROM, EPROM and EEPROM – Coding of Combination Circuits in verilog.

2. SEQUENTIAL CIRCUITS 9

Flip flops – SR, JK, T, D, Master/Slave FF, Triggering of FF, Analysis of clocked sequential circuits – their design, state minimization, moore/mealy model, state assignment, circuit implementation, Registers- shift registers, Ripple counters, Synchronous counters, Timing signal, RAM, Memory decoding, Semiconductor memories - Feedback sequential- Circuit analysis and design- sequential circuit design with verilog.

3. FUNDAMENTAL MODE SEQUENTIAL CIRCUITS 9

Stable, Unstable states, output specifications, cycles and races, state reduction, race free assignments, Hazards, Essential Hazards, Pulse mode sequential circuits, Design of Hazard free circuit

4. MEMORY, CPLDs AND FPGAs 9

ROM, Read/Write memory – Static RAM, Dynamic RAM, PAL, PLA, CPLD – FPGA XL 4000 – CLBs – I/O Block – Programmable Inter connects– Realization of simple combinational and sequential circuits

5 LOGIC GATES 9

Logic families- TTL, NMOS, CMOS, BiCMOS logic-Electrical behavior-static, dynamic-CMOS input and output structures-CMOS logic families -low voltage CMOS logic & interfacing-Bipolar logic Realization of NAND and NOR logic.

L : 45 Total : 45

TEXT BOOK

1. Morris Mano, " Digital logic ", Prentice Hall of India, 1998
2. John. F. Wakerly, "Digital design principles and practices", Pearson Education, Fourth Edition, 2007 .
3. Charles H. Roth, Jr, "Fundamentals of Logic Design", Fourth edition, Jaico Books, 2002

REFERENCE BOOKS

1. William I. Fletcher, "An Engineering Approach to Digital Design", Prentice- Hall of India, 1980
2. Floyd T.L., "Digital Fundamentals", Charles E. Merril publishing company, 1982
3. Jain R.P., "Modern Digital Electronics", Tata McGraw Hill, 1999.

EC 9203 SIGNALS AND SYSTEMS 3 1 0 4

UNIT - I CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Continuous time signals (CT signals)- Discrete time signals (DT signals) – Step, Ramp, Pulse, Impulse, Exponential, classification of CT and DT signals –periodic and aperiodic signals, random signals, Energy & Power signals - CT systems and DT systems, Classification of systems.

UNIT - II ANALYSIS OF CONTINUOUS TIME SIGNALS 9

Fourier series analysis- spectrum of Continuous Time (CT) signals- Fourier and Laplace Transforms in Signal Analysis.

UNIT - III LINEAR TIME INVARIANT –CONTINUOUS TIME SYSTEMS 9

Differential Equation-Block diagram representation-impulse response, convolution integrals-Fourier and Laplace transforms in Analysis- State variable equations and matrix representation of systems.

UNIT - IV ANALYSIS OF DISCRETE TIME SIGNALS 9

Baseband Sampling of CT signals- Aliasing, DTFT and properties, Z-transform & properties.

UNIT - V LINEAR TIME INVARIANT –DISCRETE TIME SYSTEMS 9

Difference Equations-Block diagram representation-Impulse response-Convolution sum- DTFT and Z Transform analysis of Recursive & Non-Recursive systems- State variable equations and matrix representation of systems.

L:45+T:15=60

TEXTBOOK:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, Signals and Systems, Pearson, Indian Reprint, 2007.
2. Simon Haykins and Barry Van Veen, Signals and Systems John Wiley & sons , Inc, 2004.

REFERENCES:

1. H P Hsu, Rakesh Ranjan“ Signals and Systems”, Schaum’s Outlines, Tata McGraw Hill, Indian Reprint ,2007
2. Edward W. Kamen, Bonnie S. Heck, Fundamentals of Signals and Systems Using the Web and MATLAB, Pearson, Indian Reprint, 2007
3. John Alan Stuller, An Introduction to Signals and Systems, Thomson, 2007
4. M.J.Roberts, Signals & Systems, Analysis using Transform methods & MATLAB, Tata McGraw Hill (India), 2007.
5. Robert A. Gabel and Richard A.Roberts, Signals & Linear Systems, John Wiley, III edition, 1987.

BM 9201 SENSORS AND MEASUREMENTS 3 0 0 3

1. SCIENCE OF MEASUREMENT 7

Measurement System – Instrumentation – Classification and Characteristics of Transducers – Static and Dynamic – Errors in Measurements – Calibration – Primary and secondary standards.

2. DISPLACEMENT , PRESSURE,TEMPERATURE SENSORS 11

Strain Gauge: Gauge factor, sensing elements, configuration, unbounded strain gage, biomedical applications; strain gauge as displacement & pressure transducers: force summing devices, capacitive transducer, inductive transducer, LVDT, Passive types: RTD materials & range, relative resistance vs. temperature characteristics, thermistor characteristics, biomedical applications of Temperature sensors. Active type: Thermocouple – characteristics,

3. PHOTOELECTRIC AND PIEZO ELECTRIC SENSORS 9

Phototube, scintillation counter, Photo Multiplier Tube (PMT), photovoltaic, photoconductive cells, photo diodes, phototransistor, comparison of photoelectric transducers, spectro-photometric applications of photo electric transducers. Piezoelectric active transducer and biomedical applications as pressure & Ultrasound transducer.

4. SIGNAL CONDITIONING & SIGNAL ANALYSER 9

AC and DC Bridges –wheat stone bridge, Kelvin, Maxwell, Hay, Schering -Pre-amplifier – impedance matching circuits – isolation amplifier. Spectrum analyzer.

5. DISPLAY AND RECORDING DEVICES 9

Digital voltmeter – Multi meter – CRO – block diagram, CRT – vertical & horizontal deflection system, DSO, LCD monitor, PMMC writing systems, servo recorders, photographic recorder, magnetic tape recorder, X–Y recorder, thermal recorder.

TEXT BOOKS:

1. Principles of Applied Biomedical Instrumentation L.A Geddas and L.E.Baker – John Wiley and sons, .
2. Albert D.Helfrick and William D. Cooper. Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 2007.

REFERRENCE BOOKS:

1. Ernest o Doebelin and dhanesh N manik, Measuremet systems, Application and design ,5th edition ,McGraw-Hill, 2007.
2. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2003.
3. Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 2007.
4. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 2004

BM 9202 ELECTRONIC CIRCUITS 3 1 0 4

AIM:

The aim of this course is to familiarize the student with analysis and design of basic transistor amplifier circuits, signal generator circuits and power supplies

OBJECTIVES:

On completion of this course, the student will understand

- The methods of biasing transistors,
- Design the simple amplifier circuits, and design of signal generation circuits,
- Advantages and analysis of feed back,
- Design of Power supplies.

1. DIODE APPLICATIONS AND TRANSISTOR BIASING 9

Rectifiers – HWR, FWR, Bridge rectifier with and without capacitor and pie filter. Clipper- clampers – voltage multiplier circuits - Operating point of the bi-polar junction transistor – Fixed bias circuit – Transistor on saturation – Emitter stabilized Bias Circuit – Voltage divider bias – Transistors switching network – Trouble shooting the Transistor (In circuit testing)- practical applications. Biasing the FET transistors - CMOS devices – MOSFET handling.

2. SMALL SIGNAL AMPLIFIERS 9

Two port network, h-parameter model – small signal analysis of BJT (CE and CC configurations only) — high frequency model of BJT – (CE configuration only) - small signal analysis of JFET (CS configuration only) - Frequency response of BJT and FET.

3. FEEDBACK AMPLIFIER AND OSCILLATORS 9

Basic of feedback system (block diagram approach) – Types of feedback amplifier – Basic principles of oscillator. Audio oscillators – RC phase shift and wein bridge oscillator. RF oscillators – Heartly and Collpit oscillator – Crystal oscillator

4. POWER AMPLIFIERS 9

Definition – Types of power amplifiers – Class A (series fed – transformer coupled)- Class B amplifier – Class-B push-pull amplifier – Complimentary symmetry type - Class-C amplifier – Heat sinking .

5. VOLTAGE REGULATIONS 9

Shunt voltage regulator – Series voltage regulation – current limiting – foldback technique – SMPS (Block diagram approach) – DC to DC converter - Three terminal IC regulators (78XX and 79XX)

TEXT BOOK

1. Robert L. Boylestad, Louis Nashelsky , Electronic Devices and circuit Theory , Prentice – Hall of India , 2004.

REFERENCE

1. David A. Bell , Electronic Devices And Circuits 4 th Edition Prentice Hall of India. 2003.

BM 9203 BIOCHEMISTRY 3 0 0 3

AIM:

- To study the biochemical reactions and the various methods to analyze them.

OBJECTIVE:

- To give a clear understanding of important biomolecules and their functions.
- To analyze the metabolic pathways in normal and diseased state.
- To help in devising analytical & diagnostic tools.

UNIT I: 6 Hrs

Introduction to biochemistry – Biomolecules, structure of water & its importance – Important noncovalent forces – Hydrogen bonds, electrostatic, hydrophobic & vanderwaals forces – Acid, base & buffers – pH, Henderson Hasselbalch equation. Biological buffers and their significance – Principle of viscosity – surface tension , adsorption, diffusion, osmosis & their applications in biological systems.

UNIT II: 9 Hrs

Classification, structure & properties of carbohydrates – mono, di , oligo & polysaccharides.
Classification, structure & properties of amino acids & proteins.
Classification, structure & properties of Lipids – Simple lipids , Phospholipids , glycolipids & steroids .
Transport of lipids: Lipoproteins
Structure & functions of nucleic acids – Nucleosides , nucleotides – Cyclic AMP , cyclic GMP , ATP , GTP – DNA & RNA

UNIT III: 12 Hrs

Classification of Enzymes, Chemical nature, Active Site, Specificity of Enzyme catalyzed reactions, Regulation : Feedback , Allosteric , Covalent modification , Hormonal regulation, co-enzymes. Assay of enzymes, enzymes in clinical diagnosis of diseases.
Introduction to Metabolism: Carbohydrate metabolism, Glycolysis
Lipid metabolism : fatty acid, beta oxidation , ketogenesis and cholesterol metabolism. TCA cycle : Structure of biological membranes, electron transport & Oxidative phosphorylation.

UNIT IV: 9 Hrs

Liver function and liver function tests, Kidney function and kidney function tests , normal & abnormal constituents of urine and their clinical significance. General characteristics of hormones. Structure , functions & disorders of thyroid , parathyroid , pituitary ,adrenal and pancreatic hormones.
Hormones as chemical messengers: General assay of hormones – Bio assay , chemical assay & immuno assays.

UNIT V: **9 Hrs**

Analytical techniques: Principle and applications of electrophoresis – PAGE , SDS PAGE , Isoelectric focusing , Two Dimensional Electrophoresis.
Chromatography: Principle of adsorption & partition chromatography, Size exclusion , Ion exchange & affinity chromatography.
Spectro photometry, fluorimetry, flame photometry, manometry , microcalorimetry , electrochemical methods, biosensors , automation in clinical laboratory , use of radio isotopes in biochemistry.

TEXT BOOKS :

1. Harper's review of biochemistry By David.W.Martin , Peter.A.Mayes , Victor.W.Rodwell . LANGE medical publications.
2. Practical Biochemistry – Principles & Techniques By Keith Wilson & John Walker. Oxford university press.

REFERENCE BOOKS :

1. Understanding Enzymes By Trevor palmer. Published by Ellis Horwood LTD.

2. Biochemistry Lippincott's Illustrated Reviews By Pamela.C.Champe & Richard.A.Harvey. Lippincott-Raven publishers.

BM 9204 SENSORS AND MEASUREMENT LAB 0 0 3 2

1. Characteristics of strain guages.
2. Displacement measurement using LVDT.
3. Characteristics of temperature sensors – thermistor and RTD.
4. Characteristics of thermocouple
5. Characteristics of Piezoelectric Transducer.
6. Measurement of capacitance and inductors using bridge circuits.
7. Isolation amplifier.
8. Study of Medical Oscilloscope.
9. Study of Input / Output characteristics using X – Y oscilloscope and X – Y recorders.
10. Calculation of spectral response of bio signal, using spectrum analyzer.

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BM 9205 BIOCHEMISTRY & HUMAN PHYSIOLOGY LAB 0 0 4 2

1. General tests for carbohydrates , proteins and lipids.
2. Preparation of serum and plasma from blood.
3. Estimation of blood glucose.
4. Estimation of serum cholesterol.
5. Assay of SGOT/SGPT.
6. Estimation of creatinine in urine.
7. Electrophoresis of serum proteins.
8. Separation of amino acids using thin layer chromatography.
9. ESR , PCV , MCH, MCV, MCHC, total count of RBCs and Hemoglobin estimation
10. Differential count of different WBCs and Blood group identification
11. Ishihara chart for color blindness and Snellen's chart for myopia and hyperopia – by letters reading and opthalmoscope to view retina.
12. Weber's and Rinnee's test for auditory conduction.

BM 9206 ELECTRONIC CIRCUITS LAB 0 0 3 2

1. Rectifiers – HWR and FWR (with & without capacitor filter)
2. Frequency Response of CE amplifier.
3. Frequency Response of CC amplifier
4. Frequency response of CS Amplifiers
5. Class A and Class B power amplifiers.
6. Design and Analysis of feedback Amplifiers.
7. Design of RC phase shift oscillator
8. Design of RC Oscillator
9. Design of LC Oscillator
10. Differential Amplifiers- Transfer characterisitic and CMRR Measurement.

MA9263 PROBABILITY AND RANDOM PROCESSES

L	T	P	C
3	1	0	4

AIM:

To provide the necessary basic concepts in probability and random processes for applications such as random signals, linear systems etc. in communications engineering

OBJECTIVES:

- The students will have an exposure of various distribution functions and help in acquiring skills in handling situations involving more than one variable.
- Able to analyze the response of random inputs to linear time invariant systems.

1. RANDOM VARIABLES 9 + 3

Discrete and Continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions – Functions of a random variable.

2. TWO-DIMENSIONAL RANDOM VARIABLES 9 + 3

Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables - Central limit theorem (for independent and identically distributed random variables).

3. RANDOM PROCESSES 9 + 3

Classification – Stationary process – Markov process - Poisson process – Random telegraph process.

4. CORRELATION AND SPECTRAL DENSITIES 9 + 3

Auto-correlation functions – Cross-correlation functions – Properties – Power spectral density – Cross-spectral density – Properties.

5. LINEAR SYSTEMS WITH RANDOM INPUTS 9 + 3

Linear time invariant system – System transfer function – Linear systems with random inputs – Auto-correlation and Cross-correlation functions of input and output – White noise.

L: 45, T: 15, Total : 60 Periods

TEXT BOOKS

1. Ibe, O.C.,"Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, (2007).
2. Peebles, P.Z., "Probability, Random Variables and Random Signal Principles", Tata McGraw Hill, 4th edition, New Delhi, (2002).

REFERENCES

1. Yates, R.D. and Goodman, D.J., "Probability and Stochastic Processes", John Wiley and Sons, 2nd edition, (2005).
2. Stark, H. and Woods, J.W., "Probability and Random Processes with Applications to Signal Processing", Pearson Education, Asia, 3rd edition, (2002).
3. Miller, S.L. and Childers, D.G.,"Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press, (2004).
4. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill edition, New Delhi, (2004).

BM 9251 BIOMEDICAL INSTRUMENTATION 3 0 0 3

1. BIO POTENTIAL ELECTRODES 9

Origin of bio potential and its propagation. Electrode-electrolyte interface, electrode–skin interface, half cell potential, impedance, polarization effects of electrode – nonpolarizable electrodes. Types of electrodes - surface, needle and micro electrodes and their equivalent circuits. Recording problems - measurement with two electrodes.

2. ELECTRODE CONFIGURATIONS 9

Biosignals characteristics – frequency and amplitude ranges. ECG – Einthoven's triangle, standard 12 lead system. EEG – 10-20 electrode system, unipolar, bipolar and average mode. EMG, ERG and EOG – unipolar and bipolar mode.

3. BIO AMPLIFIER 8

Need for bio-amplifier - single ended bio-amplifier, differential bio-amplifier – right leg driven ECG amplifier. Band pass filtering, isolation amplifiers – transformer and optical isolation - isolated DC amplifier and AC carrier amplifier. Chopper amplifier. Power line interference.

4. MEASUREMENT OF NON-ELECTRICAL PARAMETER 10

Temperature, respiration rate and pulse rate measurements. Blood Pressure: indirect methods - auscultatory method, oscillometric method, direct methods: electronic manometer, Pressure amplifiers - systolic, diastolic, mean detector circuit.
Blood flow and cardiac output measurement: Indicator dilution, thermal dilution and dye dilution method, Electromagnetic and ultrasound blood flow measurement.

5. BIO-CHEMICAL MEASUREMENT 9

Biochemical sensors - pH, pO2 and pCo2, Ion selective Field effect Transistor (ISFET), Immunologically sensitive FET (IMFET), Blood glucose sensors - Blood gas analyzers, colorimeter, flame photometer, spectrophotometer, blood cell counter, auto analyzer (simplified schematic description).

TEXT BOOKS:

1. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education, 2004.
2. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 2004

REFERENCES

1. Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 2007.
2. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2003.
3. Standard Handbook of Biomedical Engineering & Design – Myer Kutz, McGraw-Hill Publisher, 2003.

EE 9113 BASICS OF ELECTRICAL ENGINEERING 3 0 0 3

AIM

To make the students understand the basics of electricity generation and utilization.

OBJECTIVES

- To study the magnetic circuits
- To study the principle and application of transformers
- To study the principle of operation of DC motors
- To study the principle and operation of AC machines
- To study the principle of fractional-kW motors and their applications.

1. MAGNETIC CIRCUIT 9

Magnetic effects of electric current, Magnetic circuits, Magnetic materials and B-H relationship, Electromagnetic induction and force, Hysteresis and eddy current losses.

2. DC MOTORS 9

Parts of DC motors, types of motors, principle of operation of DC motors, Back EMF, circuit model, power balance, calculation of torque and speed, armature and field control, DC motor starting, calculation of efficiency.

3. TRANSFORMERS 9

Methods of generation of AC voltages, role of transformers in the distribution of electricity, Construction and principle of operation of single phase transformers, Ideal transformer, voltage and current relationships, impedance transformation, definition of voltage regulation, Losses in the transformer, calculation of efficiency of transformer, construction and voltage ratio aspects of single phase autotransformer, construction and voltage ratio aspects three phase transformer.

4. AC MACHINES 9

Synchronous machines, construction, principle of operation, phasor diagram voltage equation, Open circuit and short circuit characteristics, voltage regulation, induction motor, construction, circuit model, torque slip characteristics, starting , speed control-slip control , frequency control

5. FRACTIONAL -KW MOTORS 9

Single phase induction motor, principle of operation, torque-speed characteristics, two-phase motors, split phase motor, universal motor, two value capacitance motor, stepper motors - variable reluctance stepper motor-single stack and multistack-permanent magnet stepper motor- drive concepts-unipolar drive circuit, bipolar drive circuit-calculation

TEXT BOOKS:

1. D P Kothari and I J Nagrath, “Basic Electrical Engineering”, TMH, 2ed, 2002
2. P. C Sen, “Principles of Electric machines and power electronics”, John-Wiley & Sons, 2ed, 2001

REFERENCE

1. Muhammad Rashid, “Power electronics circuit, devices and applications”, Prentice–Hall of India, 3rd ed, 2004

EC 9302 LINEAR INTEGRATED CIRCUITS 3 1 0 4

1. CIRCUIT CONFIGURATION FOR LINEAR ICS: 9

Current sources, Analysis of difference amplifiers with active loads, supply and temperature independent biasing, Band gap references, Monolithic IC operational amplifiers, specifications, frequency compensation, slew rate and methods of improving slew rate.

2. APPLICATIONS OF OPERATIONAL AMPLIFIERS: 9

Linear and Nonlinear Circuits using operational amplifiers and their analysis, Inverting
and Non inverting Amplifiers, Differentiator, Integrator Voltage to Current converter, Instrumentation amplifier, Sine wave Oscillators, Low pass and band pass filters, comparator, Multivibrator and Schmitt trigger, Triangle wave generator, Precision rectifier, Log and Antilog amplifiers, Non-linear function generator.

3. ANALOG MULTIPLIER AND PLL: 9

Analysis of four quadrant and variable Tran conductance multipliers, Voltage controlled Oscillator, Closed loop analysis of PLL, AM, PM and FSK modulators and demodulators. Frequency synthesizers, Compander ICs

4. ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTORS 9

Analog switches, High speed sample and hold circuits and sample and hold IC's, Types of D/A converter Current driven DAC, Switches for DAC, A/D converter, Flash, Single slope, Dual slope, Successive approximation, DM and ADM, Voltage to Time and Voltage to frequency converters.

5. SPECIAL FUNCTION ICS 9

Timers, Voltage regulators - linear and switched mode types, Switched capacitor filter, Frequency to Voltage converters, Tuned amplifiers, Power amplifiers and Isolation Amplifiers, Video amplifiers, Fiber optics ICs and Opto couplers, Sources for Noises, Op Amp noise analysis and Low noise OP-Amps.

L = 45

TEXTBOOK:

1. Sergio Franco, " Design with operational amplifiers and analog integrated circuits", McGraw Hill, 1997.

REFERENCE:

1. Gray and Meyer, " Analysis and Design of Analog Integrated Circuits ", Wiley International, 1995.
2. Michael Jacob J., " Applications and Design with Analog Integrated Circuits ", Prentice Hall of India,1996.
3. Ramakant A. Gayakwad, " OP - AMP and Linear IC's ", Prentice Hall of India, 1994.
4. Botkar K.R., " Integrated Circuits ", Khanna Publishers, 1996.
5. Taub and Schilling, " Digital Integrated Electronics ", McGraw Hill, 1977.
6. Caughlier and Driscoll, " Operational amplifiers and Linear Integrated circuits ", Prentice Hall, 1989.
7. Millman J. and Halkias C.C., "Integrated Electronics ", McGraw Hill, 2001.

BM 9252 PATHOLOGY AND MICROBIOLOGY 3 0 0 3

UNIT I: 9

Cell Degeneration, repair and neoplasia-Cell injury and Necrosis, Apoptosis, Intracellular accumulations, Pathological calcification, cellular adaptations of growth and differentiation, Inflammation and Repair including fracture healing, Neoplasia, Classification, Benign and Malignant tumours, carcinogenesis, spread of tumours.

UNIT II: 9

Fluid and hemodynamic derangements, - edema, normal hemostasis, thrombosis, disseminated intravascular coagulation, embolism, infarction, shock.
Hematological disorders-Bleeding disorders, Leukaemias, Lymphomas.

Unit III : 9

General Structural Organisation of bacterial and viral cell- growth and identification of bacteria, observation of culture.
Microscopy: Light microscopy, dark field microscopy, phase contrast microscopy, fluorescence and electron microscopy.

UNIT IV: 9

Genetic disorders, Infection and Immunity-Mutations, Autosomal and X linked disorders, Mendelian disorders, types of immune response, hypersensitivity disorders, Immune deficiency syndrome, Viral disease, Chlamydial ,Bacterial, Mycoplasma, Rickettsial, Fungal, protozoal and helminthic disease.

UNIT V: 9

Identification of disease producing organisms, simple stain, Gram stain, AFB stain, Fluorescent techniques, antigen-antibody techniques.

TEXT BOOKS-PATHOLOGY

1.Ramzi S Cotran, Vinay Kumar & Stanley L Robbins: Pathologic Basis of diseases. WB Saunders Co. 7th edn-2005.
2.Harsh Mohan: Text book of Pathology. Jaypee publishers. 4th edn. 2000.

REFERENCE: Underwood JCE: General and Systematic Pathology Churchill Livingstone 3edn.2000.
Microbiology : Text book - 1. Ananthanarayanan R& Panicker CKJ:Textbook of Microbiology. Orient Longmans.7th ed.2006.
2..Dubey RC and Maheswari DK.A textbook of Microbiology. S Chand 2007.

REFERENCES:
1. Prescott,Harley,Klein.Microbiology.Mc Graw Hill 5th ed. 2002.
2. Manual of Microbiology tools and techniques. Kanika Sharma. Ane's student edition.2007.

EC 9261 ANALOG AND DIGITAL COMMUNICATION 3 0 0 3

1. ANALOG MODULATION 9

Amplitude Modulation – AM, DSBSC, SSBSC, VSB – PSD, modulators and demodulators – Angle modulation – PM and FM – PSD, modulators and demodulators – Superheterodyne receivers

2. PULSE MODULATION 9

Low pass sampling theorem – Quantisation - PAM – Line coding - PCM, DPCM, DM, ADPCM and ADM, Channel Vocoder,– Time Division Multiplexing, frequency Division Multiplexing

3. DIGITAL MODULATION AND TRANSMISSION 9

Phase shift keying – BPSK, DPSK, QPSK - Principles of M-ary signaling M-ary PSK & QAM – Comparison, ISI – Pulse shaping – Duo binary encoding - Cosine filters – Eye pattern, equalizers

4. INFORMATION THEORY AND CODING 9

Measure of information – Entropy – Source coding theorem - Shannon-Fano coding, Huffman Coding, LZ Coding– Channel capacity – Shannon-Hartley law – Shannon's limit- Error control Codes – Cyclic codes, Syndrome calculation – Convolutional Coding, Sequential and Viterbi decoding

5. SPREAD SPECTRUM AND MULTIPLE ACCESS 9

PN sequences – properties – m-sequence –DSSS –Processing gain, Jamming – FHSS –Synchronisation and tracking - Multiple Access – FDMA, TDMA, CDMA

Total 45+15 = 60

TEXT BOOK:

1. H Taub, D L Schilling, G Saha, "Principles of Communication Systems" 3/e, TMH 2007
2. S. Haykin "Digital Communications" John Wiley 2005

REFERENCES:

1. B.P.Lathi, "Modern Digital and Analog Communication Systems", 3/e, Oxford University Press,2007
2. H P Hsu, Schaum Outline Series - "Analog and Digital Communications" TMH 2006
3. B.Sklar, "Digital Communications Fundamentals and Applications" 2/e Pearson Education 2007

GE 9021 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
(Common to all branches) 3 0 0 3

AIM

To create awareness in every engineering graduate about the importance of environment, the effect of technology on the environment and ecological balance and make them sensitive to the environment problems in every professional endeavour that they participates.

OBJECTIVE

At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity. The role of government and non-government organization in environment managements.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies –

Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.
Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation-central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

Total = 45

TEXT BOOKS

1. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd edition, Pearson Education (2004).
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, (2006).

REFERENCE BOOKS

1. R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, "Environmental law", Prentice hall of India PVT LTD, New Delhi, 2007.
4. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press (2005)

EC 9262 INTEGRATED CIRCUIT LAB 0 0 3 2

1. Inverting, non-inverting amplifier and comparator
2. Integrator and Differentiator
3. Active filter – first order LPF and HPF
4. Schmitt trigger using IC741
5. Instrumentation amplifier using IC741
6. Wein bridge oscillator
7. Multivibrator using IC555 Timer
8. Study of logic gates, Half adder and Full adder
9. Encoder and BCD to 7 segment decoder
10. Multiplexer and demultiplexer using digital ICs
11. Universal shift register using flipflops
12. Design of mod-N counter

BM 9253 PATHOLOGY AND MICROBIOLOGY LAB. 0 0 4 2

1. Urine physical and chemical examination (protein, reducing substances, ketones, bilirubin and blood)
2. Hematoxylin and eosin staining.
3. Study of parts of compound microscope
4. Histopathological slides of benign and malignant tumours.
5. Manual tissue processing and section cutting (demonstration)
6. Simple stain.
7. Gram stain.
8. AFB stain.
9. Slides of malyarial parasites, micro filaria and leishmania donovani.
10. Haematology slides of anemia and leukemia
11. Bleeding time and clotting time.
12. Study of bone marrow charts