ANNA UNIVERSITY :: CHENNAI 600 025

UNIVERSITY DEPARTMENTS

REGULATIONS – 2008

CURRICULUM FROM III TO VIII SEMESTERS FOR

B.E. BIOMEDICAL ENGINEERING

SEMESTER III

CODE NO	COURSE TITLE	L	T	P	C
THEORY					
MA9211	Mathematics – III	3	1	0	4
EC9251	Digital Electronics and System Design	3	1	0	4
EC9203	Signals and Systems	3	1	0	4
BM9201	Sensors and Measurements	3	0	0	3
BM9202	Electronic Circuits	3	1	0	4
BM9203	Biochemistry	3	0	0	3
PRACTICAL					
BM9204	Sensors and Measurements lab	0	0	3	2
BM9205	Biochemistry and Human Physiology Lab	0	0	4	2
BM9206	Electronic Circuits Lab	0	0	3	2
	TOTAL	**18**	**4**	**10**	**28**

SEMESTER IV

CODE NO	COURSE TITLE	L	T	P	C
THEORY					
MA9263	Probability and Random Processes	3	1	0	4
BM9251	Biomedical Instrumentation	3	0	0	3
EE9113	Basics of Electrical Engineering	3	0	0	3
EC9302	Linear Integrated Circuits	3	0	0	3
BM9252	Pathology and Microbiology	3	0	0	3
BM9254	Analog and Digital Communication	3	0	0	3
GE9261	Environmental Science and Engineering	3	0	0	3
PRACTICAL					
EC9264	Integrated Circuits Lab	0	0	3	2
BM9253	Pathology and Microbiology Lab	0	0	4	2
	TOTAL	**21**	**1**	**7**	**26**

SEMESTER V

CODE NO	COURSE TITLE	L	T	P	C
THEORY					
EC9311	Digital Signal Processing	3	1	0	4
BM9302	Bio control systems	3	1	0	4
BM9303	Diagnostic and Therapeutic Equipment I	3	0	0	3
BM9304	Bio materials and Artificial organs	3	0	0	3
BM9305	Microprocessor, Micro controller and System Design	3	0	0	3
BM9306	Hospital Management	3	0	0	3
PRACTICAL					
EC9307	Microprocessor and Micro controller Lab	0	0	3	2
BM9308	Biomedical Instrumentation Lab	0	0	3	2
GE9371	Communication Skills and Soft Skills lab	0	0	2	1
	TOTAL	**18**	**2**	**8**	**25**

SEMESTER VI

CODE NO	COURSE TITLE	L	T	P	C
THEORY					
BM9351	Radiological Equipment	3	0	0	3
BM9352	Biomechanics	3	0	0	3
BM9353	Diagnostic and Therapeutic Equipment II	3	0	0	3
BM9354	Internet & Java	3	0	0	3
	Elective I	3	0	0	3
	Elective II	3	0	0	3
PRACTICAL					
EC9308	Digital Signal Processing Lab	0	0	3	2
BM9355	Internet and Java programming Lab	0	0	3	2
BM9356	Diagnostic and Therapeutic Equipment Lab	0	0	3	2
	TOTAL	**18**	**0**	**12**	**24**

SEMESTER VII

CODE NO	COURSE TITLE	L	T	P	C
THEORY					
BM9401	Pattern Recognition and Neural Networks	3	0	0	3
BM9402	Medical Informatics	3	0	0	3
BM9403	Medical Optics	3	0	0	3
EC9036	Digital Image Processing	3	0	0	3
	Elective III	3	0	0	3
	Elective IV	3	0	0	3
PRACTICAL					
BM9404	Hospital Training	0	0	4	2
BM9405	Digital Image Processing Lab	0	0	3	2
	TOTAL	**18**	**0**	**7**	**22**

SEMESTER VIII

CODE NO	COURSE TITLE	L	T	P	C
THEORY					
	Elective V	3	0	0	3
	Elective VI	3	0	0	3
PRACTICAL					
BM9451	**Project Work**	0	0	12	6
	TOTAL	**6**	**0**	**12**	**12**

TOTAL CREDITS: 193

LIST OF ELECTIVES FOR B.E. BIOMEDICAL ENGINEERING

SEMESTER VI

CODE NO.	COURSE TITLE	L	T	P	C
BM9021	Bio Fluids and Dynamics	3	0	0	3
EC9255	Computer Architecture and Organization	3	0	0	3
GE9075	Intellectual Property Rights	3	0	0	3
GE9072	Indian Constitution and Society	3	0	0	3
CS9211	Data Structures and Object Oriented Programming in C^{++}	3	0	0	3
BM9022	Biometric Systems	3	0	0	3
EC9034	Multimedia Compression and Communication	3	0	0	3
EC9081	Microcontroller Engineering	3	0	0	3

SEMESTER VII

CODE NO.	COURSE TITLE	L	T	P	C
CS9036	Soft Computing	3	0	0	3
BM9023	Physiological Modeling	3	0	0	3
EC9073	Bio Informatics	3	0	0	3
BM9024	Refrigeration and Air-Conditioning	3	0	0	3
GE9022	Total Quality Management	3	0	0	3
BM9025	Computer Hardware, Interfacing and Instrumentation	3	0	0	3
EC9040	Robotics	3	0	0	3
EC9043	Foundations of Nanoelectronics	3	0	0	3

SEMESTER VIII

CODE NO.	COURSE TITLE	L	T	P	C
BM9026	Bio MEMS	3	0	0	3
BM9027	Medical Imaging Techniques	3	0	0	3
EC9355	Digital VLSI	3	0	0	3
EC9083	Reliability Engineering	3	0	0	3
EC9028	Cryptography and Network Security	3	0	0	3
EC9029	EMI / EMC	3	0	0	3
ME9023	Rapid Prototyping	3	0	0	3
GE9021	Professional Ethics in Engineering	3	0	0	3
EC9078	Embedded and Real time Systems	3	0	0	3

MA9211 MATHEMATICS III L T P C
(Common to all branches of BE / B.Tech Programmes) 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

UNIT I 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.

UNIT II FOURIER TRANSFORM 9+3

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

UNIT III 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.

UNIT IV 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.

UNIT V 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 PERIODS

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.

EC9251 DIGITAL ELECTRONICS AND SYSTEM DESIGN L T P C
3 1 0 4

UNIT I BASIC CONCEPTS AND COMBINATIONAL CIRCUITS 9+3

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.

UNIT II SEQUENTIAL CIRCUITS 9+3

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.

UNIT III FUNDAMENTAL MODE SEQUENTIAL CIRCUITS 9+3

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

UNIT IV MEMORY, CPLDs AND FPGAs 9+3

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

UNIT V LOGIC GATES 9+3

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, T : 15 TOTAL : 60 PERIODS

TEXT BOOKS:

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.

EC9203 SIGNALS AND SYSTEMS L T P C
3 1 0 4

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 9+3

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+3

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+3

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+3

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

UNIT V LINEAR TIME INVARIANT –DISCRETE TIME SYSTEMS 9+3

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 TOTAL : 60 PERIODS

TEXT BOOKS:

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.

BM9201 SENSORS AND MEASUREMENTS L T P C
3 0 0 3

UNIT I SCIENCE OF MEASUREMENT 7

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

UNIT II DISPLACEMENT, PRESSURE,TEMPERATURE SENSORS 11

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

UNIT III 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 and Ultrasound transducer.

UNIT IV SIGNAL CONDITIONING AND SIGNAL ANALYSER 9

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

UNIT V DISPLAY AND RECORDING DEVICES 9

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

TOTAL : 45 PERIODS

TEXT BOOKS:

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

REFERENCE 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** **L T P C**
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.

UNIT I DIODE APPLICATIONS AND TRANSISTOR BIASING 9+3
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.

UNIT II SMALL SIGNAL AMPLIFIERS 9+3
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.

UNIT III FEEDBACK AMPLIFIER AND OSCILLATORS 9+3
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

UNIT IV POWER AMPLIFIERS 9+3
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 .

UNIT V VOLTAGE REGULATIONS 9+3
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)

L : 45, T : 15 TOTAL : 60 PERIODS

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** **L T P C**
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**

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

UNIT II **9**

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

UNIT III **12**

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 and Oxidative phosphorylation.

UNIT IV **9**

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

UNIT V **9**

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

TOTAL : 45 PERIODS

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Trevor Palmer, “ Understanding Enzymes”. Ellis Horwood LTD.
2. Pamela.C.Champe and Richard.A.Harvey Biochemistry Lippincott’s Illustrated Reviews Lippincott-Raven publishers

BM 9204 SENSORS AND MEASUREMENT LAB L T P C
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 recorders.
10. Calculation of spectral response of bio signal, using spectrum analyz

TOTAL : 45 PERIODS

BM 9205 BIOCHEMISTRY & HUMAN PHYSIOLOGY LAB L T P C
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.

TOTAL : 45 PERIODS

BM 9206 ELECTRONIC CIRCUITS LAB L T P C
0 0 3 2

1. Rectifiers – HWR and FWR (with and 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.

TOTAL : 45 PERIODS

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

UNIT I RANDOM VARIABLES 12

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

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES 12

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).

UNIT III RANDOM PROCESSES 12

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

UNIT IV CORRELATION AND SPECTRAL DENSITIES 12

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

UNIT V LINEAR SYSTEMS WITH RANDOM INPUTS 12

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 L T P C
3 0 0 3

UNIT I 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.

UNIT II 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.

UNIT III 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.

UNIT IV 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.

UNIT V 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).

TOTAL : 45 PERIODS

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. Myer Kutz, " Standard Handbook of Biomedical Engineering and Design", McGraw-Hill Publisher, 2003.

EE 9113 BASICS OF ELECTRICAL ENGINEERING L T P C
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.

UNIT I 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.

UNIT II 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.

UNIT III 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.

UNIT IV 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

UNIT V 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

TOTAL : 45 PERIODS

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 L T P C
3 0 0 3

UNIT I 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.

UNIT II 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.

UNIT III 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

UNIT IV 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.

UNIT V 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.

TOTAL :45 PERIODS

TEXTBOOK:

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

REFERENCES:

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. Coughlin 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 L T P C
3 0 0 3

UNIT I CELL DEGENERATION, REPAIR AND NEOPLASIA 9

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 FLUID AND HEMODYNAMIC DERANGEMENTS 9

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 GENETIC DISORDERS, INFECTION AND IMMUNITY 9

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.

TOTAL : 45 PERIODS

TEXT BOOKS:

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.
3. Ananthanarayanan R& Panicker CKJ:Textbook of Microbiology. Orient Longmans.7th ed.2006.
4. Dubey RC and Maheswari DK.A textbook of Microbiology. S Chand 2007.

REFERENCES:

1. Underwood JCE, “General and Systematic Pathology” Churchill Livingstone, 3edn 2000.
2. Prescott,Harley,Klein.Microbiology.Mc Graw Hill 5th ed. 2002.
3. Kanika Sharma Manual of Microbiology tools and techniques. Kanika Sharma. Ane’s student edition.2007.

BM 9254 ANALOG AND DIGITAL COMMUNICATION L T P C
3 0 0 3

UNIT I ANALOG MODULATION 9

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

UNIT II 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

UNIT III 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

UNIT IV 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

UNIT V 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 PERIODS

TEXT BOOKS:

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 9261 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 studied

TOTAL : 45 PERIODS

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)

EC9264 **INTEGRATED CIRCUITS LAB** **L T P C**
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

TOTAL : 45 PERIODS

BM9253 **PATHOLOGY AND MICROBIOLOGY LAB** **L T P C**
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

TOTAL : 45 PERIODS

EC9311 DIGITAL SIGNAL PROCESSING L T P C
3 1 0 4

UNIT I DISCRETE FOURIER TRANSFORM (DFT) AND FAST FOURIER TRANSFORM (FFT) 12

Discrete Fourier transform – properties of DFT – linearity, circular-shifting in time and frequency domains, time-reversal, time-scaling, circular correlation, multiplication, convolution, parseval's relation – circular convolution –sectional convolution – overlap-add method and overlap-save method – radix-2 fast Fourier algorithm – decimation-in-time FFT – decimation-in-frequency FFT – inverse FFT.

UNIT II FINITE IMPULSE RESPONSE (FIR) FILTER 12

Introduction to FIR filter - phase delay and group delay – linear phase transfer function. Design of FIR filter using Fourier method, Rectangular window, Hanning window, Hamming window, Kaiser window. Design using frequency sampling technique. Structure realization of FIR system – direct form, cascade form, linear phase FIR system.

UNIT III INFINITE IMPULSE RESPONSE (IIR) FILTER 12

Introduction to IIR filter - Impulse-invariant transformation technique – Bilinear transformation technique – frequency transformation in digital domain - design of Butterworth filter and Chebyshev filter (type-1) (restricted to 3^{rd} order). Structure realization of IIR system – lattice structure and lattice-ladder structure.

UNIT IV FINITE WORD LENGTH EFFECT IN FIR AND IIR FILTER 13

Quantization of fixed-point and floating-point numbers – product quantization – variance estimation of quantization error – finite word length effect on IIR filter – Product quantization error in IIR filter – mathematical analysis of steady state output noise – dynamic scaling to prevent overflow – limit-cycle oscillation in recursive system – rounding-off error in DFT and FFT computation- Introduction to digital signal Processors.

UNIT V BASICS OF RANDOM SIGNAL PROCESSING (ONLY QUALITATIVE ANALYSIS 11

Introduction to probability function, joint probability, conditional probability – estimation parameters – joint distribution function, probability density function, ensemble average – mean squared value, variance, standard deviation, moments, correlation, covariance, orthogonality, auto-covariance, auto-correlation, cross-covariance and cross-correlation – stationarity – ergodic – white noise – energy density spectrum – power density spectrum estimation – periodogram – direct method, indirect method, Barlett method – Welch method. Decimator (down sampling) – frequency-domain analysis of decimator – interpolation (up sampling) – frequency-domain analysis of interpolator

TOTAL: 45 + 15: 60 PERIODS

TEXT BOOKS:

1. E. C. Ifeachor and B.W. Jervis, "Digital Signal processing – A Practical Approach", Pearson education, New Delhi, 4^{th} Edition, 2004.
2. John G. Proakis and Dimitris G. Manolakis, "Digital Signal Processing, Algorithms and Applications", Pearson education, New Delhi, 4^{th} Edition, 2007.

REFERENCES:

1. Sanjit K. Mitra, "Digital Signal Processing – A computer Based Approach", TMH New Delhi, 1998
2. Andreas Antoniou, "Digital filter Analysis and Design", Prentice Hall India,
3. R. Rabiner and B. Gold, "Theory and Application of Digital Signal processing", PHI, 2009

BM 9302 **BIO CONTROL SYSTEMS** **L T P C**
3 1 0 4

AIM:

By studying various control systems modeling technique, time response analysis and frequency response analysis , biological control systems can be analysed and understood.

OBJECTIVES:

- To study concept and different mathematical techniques applied in analyzing any given system
- To learn to do the analysis of given system in time domain and frequency domain
- To study the techniques of plotting the responses in both domain analysis
- To study techniques of modeling the physiological systems

UNIT I CONTROL SYSTEM MODELLING 12

Terminology and basic structure of control system, example of a closed loop system, transfer functions, modeling of electrical systems, translational and rotational mechanical systems, electromechanical systems, block diagram and signal flow graph representation of systems, conversion of block diagram to signal flow graph, reduction of block diagram and signal flow graph.

UNIT II TIME RESPONSE ANALYSIS 12

Step and Impulse responses of first order and second order systems, determination of time domain specifications of first and second order systems from its output responses. definition of steady state error constants and its computation, definition of stability, Routh-Hurwitz criteria of stability, root locus technique, construction of root locus and study of stability, definition of dominant poles and relative stability .

UNIT IIII FREQUENCY RESPONSE ANALYSIS 12

Frequency response, Nyquist stability criterion, Nyquist plot and determination of closed loop stability, definition of gain margin and phase margin, Bode plot, determination of gain margin and phase margin using Bode plot, use of Nichol's chart to compute resonance frequency and band width.

UNIT IV PHYSIOLOGICAL CONTROL SYSTEMS 12

Block diagram representation of the muscle stretch reflex, difference between engineering and physiological control systems, generalized system properties , models with combination of system elements, introduction to simulation.

UNIT V PHYSIOLOGICAL SYSTEM MODELING 12

Linear model of respiratory mechanics, model of chemical regulation of ventilation, linear model of muscle mechanics, model of regulation of cardiac output, model of Neuromuscular reflex motion.

L : 45, T : 15, TOTAL : 60 PERIODS

TEXT BOOKS:

1. M. Gopal "Control Systems Principles and design", Tata McGraw Hill ,2002
2. Benjamin C. Kuo, "Automatic control systems", Prentice Hall of India, 1995
3. Michael C K Khoo, "Physiological control systems", IEEE press, Prentice –Hall of India, 2001.

REFERENCES:

1. John Enderle, Susan Blanchard, Joseph Bronzino “Introduction to Biomedical Engineering” second edition, Academic Press, 2005.
2. Richard C. Dorf, Robert H. Bishop,” Modern control systems”,Pearson, 2004

BM 9303 DIAGNOSTIC AND THERAPEUTIC EQUIPMENT – I L T P C
3 0 0 3

UNIT I CARDIAC EQUIPMENTS 9

Electrocardiograph, Normal and Abnormal Waves, Heart rate monitor, Arrhythmia Simulator, Holter Monitor, Phonocardiography, Plethysmography. Cardiac Pacemaker- Internal and External Pacemaker–Batteries, AC and DC Defibrillator- Internal and External.

UNIT II NEUROLOGICAL EQUIPMENTS 9

Clinical significance of EEG, Multi channel EEG recording system, Epilepsy, Evoked Potential –Visual, Auditory and Somatosensory, MEG (Magneto Encephalon Graph). EEG Bio Feedback Instrumentation.

UNIT III SKELETAL MUSCULAR SYSTEM 9

Sliding theory of contraction, recording and analysis of EMG waveforms, fatigue characteristics , Muscle stimulators, nerve stimulators, Nerve conduction velocity measurement, EMG Bio Feedback Instrumentation.

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UNIT IV RESPIRATORY MEASUREMENT STSTEM 9

Instrumentation for measuring the mechanics of breathing – Spirometer-Lung Volume and vital capacity, measurements of residual volume, pneumotachometer - Airway resistance measurement, Whole body plethysmography, Intra-Alveolar and Thoracic pressure measurements, Apnea Monitor. Types of Ventilators – Pressure, Volume, Time controlled. Flow, Patient Cycle Ventilators, Humidifiers, Nebulizers, Inhalators.

UNIT V SENSORY MEASUREMENT 9

Psycho Physiological Measurements - for testing sensory Responses, Electro occulograph, Electro retinograph, Audiometer-Pure tone, Speech. EGG (Electrogastrograph), galvanic skin resistance(GSR).

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Joseph J. Carr and John M. Brown, “Introduction to Biomedical equipment technology”, Pearson education, 2003.
2. John G.Webster, “Medical Instrumentation Application and Design”, third edition, Wiley India Edition, 2007.

REFERENCE BOOKS:

1. Myer Kutz, “Standard Handbook of Biomedical Engineering & Design” McGraw-Hill.
2. Khandpur R.S, “Handbook of Biomedical Instrumentation”, Tata McGraw - Hill, New Delhi, 2003.
3. L.A Geddes and L.E.Baker, “Principles of Applied Biomedical Instrumentation”,
4. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Pearson Education, New Delhi, 2007.

BM 9304 BIO MATERIALS AND ARTIFICIAL ORGANS L T P C
3 0 0 3

UNIT I STRUCTURE OF BIO-MATERIALS AND BIO-COMPATIBILITY 9

Definition and classification of bio-materials, mechanical properties, visco elasticity, wound-healing process, body response to implants, blood compatibility.

UNIT II IMPLANT MATERIALS 9

Metallic implant materials, stainless steels, co-based alloys, Ti-based alloys, ceramic implant materials, aluminum oxides, hydroxyapatite glass ceramics carbons, medical applications.

UNIT III POLYMERIC IMPLANT MATERIALS 9

Polymerization, polyamides, Acryrilic polymers, rubbers, high strength thermoplastics, medical applications. Bio polymers: Collagen and Elastin.

UNIT IV TISSUE REPLACEMENT IMPLANTS 9

Soft-tissue replacements, sutures, surgical tapes, adhesive, Percutaneous and skin implants, maxillofacial augmentation, blood interfacing implants, hard tissue replacement implants, internal fracture fixation devices, joint replacements.

UNIT V ARTIFICIAL ORGANS 9

Artificial Heart, Prosthetic Cardiac Valves, Artificial lung (oxygenateor), Artificial Kidney (Dialyser membrane) , Dental Implants.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. SUJATA V. BHATT, “Biomaterials” Second Edition ,Publisher - Narosa Publishing House, 2005.
2. Jon B. Park Joseph D. Bronzino, “BIOMATERIALS - Principles and Applications”, CRC Press,2003

REFERENCES:

1. PARK J.B., "Biomaterials Science and Engineering", Plenum Press, 1984.
2. Myer Kutz, "Standard Handbook of Biomedical Engineering and Design" McGraw-Hill, 2003.
3. John Enderle, Joseph D. Bronzino, Susan M. Blanchard, "Introduction to Biomedical Engineering," Elsevier, 2005.

BM 9305	MICROPROCESSOR, MICRO CONTROLLER AND SYSTEM DESIGN	L T P C 3 0 0 3

UNIT I ARCHITECTURE OF 8085 /8086 9

8085- Functional Block Diagram- Description - Addressing Modes, Timing diagrams. 8086- Architecture, Instruction set, Addressing Modes. Introduction to 8087 - Architecture.

UNIT II 8086 ASSEMBLY LANGUAGE PROGRAMMING 9

Simple Assembly Language Programming, Strings, Procedures, Macros, Assembler Directives- Interrupts and Interrupt Applications.

UNIT III PERIPHERAL INTERFACING & APPLICATION 9

Programmable Peripheral Interface (8255), keyboard display controller (8279), ADC, DAC Interface, Programmable Timer Controller (8254), Programmable interrupt controller (8259), Serial Communication Interface (8251).

UNIT IV MICROCONTROLLER 9

Architecture of 8051 Microcontroller- Instruction Set – Assembly Language Programming – Branching, I/O and ALU Instructions. Programming 8051 - Timers, Serial Port, Interrupts Interfacing with External Memory and C programming for 8051.

UNIT V 8086 AND 8051 BASED SYSTEM DESIGN 9

Design and interfacing - LED, LCD & Keyboard Interfacing, ADC, DAC, Sensor Interfacing, External Memory Interface Traffic light controller, Washing machine, RTC Interfacing using I^2C Standard, Motor Control, Relay, PWM, DC, Stepper Motor Multichannel biomedical data acquisition system.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Ramesh S. Gaonkar, "Microprocessor Architecture Programming and Applications with 8085." Fourth edition, Penram International Publishing 2006.
2. Douglas V.Hall, "Microprocessor and Interfacing, Programming and Hardware".Revised second Edition, Indian edition 2007. Tata McGraw Hill.
3. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.MCKinlay "The 8051 Microcontroller and Embedded Systems", Second Edition, Pearson Education 2008.

REFERENCES:

1. Kenneth J.Ayala., "The 8051 Microcontroller, 3rd Edition, Thompson Delmar Learning, 2007, New Delhi.
2. K. Ray , K.M .Bhurchandi "Advanced Microprocessor and Peripherals", Second edition, Tata McGraw-Hill, 2007.
3. Barry B.Brey, "The Intel Microprocessors Architecture, Programming and Interfacing"Pearson Education, 2007. New Delhi.
4. Krishna Kanth, Microprocessors and Microcontrollers Architecture, Programming and System Design using 8085, 8086, 8051 and 8096, PHI, 2007.
5. Zdravko Karakehayov, "Embedded System Design with 8051 Microcontroller hardware and software", Mercel Dekkar, 1999

BM 9306 HOSPITAL MANAGEMENT L T P C
3 0 0 3

UNIT I OVERVIEW OF HOSPITAL ADMINISTRATION 9

Distinction between Hospital and Industry, Challenges in Hospital Administration – Hospital Planning – Equipment Planning – Functional Planning.

UNIT II HUMAN RESOURCE MANAGEMENT ON HOSPITAL 9

Principles of HRM – Functions of HRM – Profile of HRD Manager – Tools of HRD – Human Resource Inventory – Manpower Planning.

UNIT III RECRUITMENT AND TRAINING 9

Different Departments of Hospital, Recruitment, Selection, Training Guidelines – Methods of Training – Evaluation of Training – Leadership grooming and Training, Promotion – Transfer.

UNIT IV PLANNING SUPPORTIVE SERVICES 9

Medical Records Department – Central Sterilization and Supply Department – Pharmacy – Food Services - Laundry Services.

UNIT V COMMUNICATION AND SAFETY ASPECTS IN HOSPITAL 9

Purposes – Planning of Communication, Modes of Communication – Telephone, ISDN, Public Address and Piped Music – CCTV.
Security – Loss Prevention – Fire Safety – Alarm System – Safety Rules.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. R.C.Goyal, "Hospital Administration and Human Resource Management", PHI – Fourth Edition, 2006.
2. G.D.Kunders, "Hospitals – Facilities Planning and Management – TMH, New Delhi – Fifth Reprint 2007.

REFERENCE:

1. Cesar A.Caceres and Albert Zara, "The Practice of Clinical Engineering, Academic Press, New York, 1977.

EC 9307 MICROPROCESSOR AND MICRO CONTROLLER LAB L T P C
0 0 3 2

8085 based experiments

1. Assembly Language Programming of 8085

8086 based experiments

1. Programs for 16 bit Arithmetic, Sorting, Searching and String operations,
2. Programs for Digital clock, Interfacing ADC and DAC
3. Interfacing and Programming 8279, 8259, and 8253.
4. Serial Communication between two Microprocessor Kits using 8251.
5. Interfacing and Programming of Stepper Motor and DC Motor Speed control and Parallel Communication between two Microprocessor Kits using Mode 1 and Mode 2 of 8255.
6. Macro assembler Programming for 8086

8051 based experiments

1. Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051 microcontroller.
2. Programming and verifying Timer, Interrupts and UART operations in 8051 microcontroller.
3. Interfacing – DAC and ADC and 8051 based temperature measurement
4. Interfacing – LED and LCD
5. Interfacing – stepper motor traffic light control
6. Communication between 8051 Microcontroller kit and PC.
7. R8C based applications

TOTAL : 45 PERIODS

BM 9308 BIO MEDICAL INSTRUMENTATION LAB L T P C
0 0 3 2

1. Design of low noise pre-amplifier for ECG
2. Measurement of pulse rate using photo transducer
3. Measurement of respiration rate
4. Measurement of blood flow velocity using ultrasound transducer
5. Photoelectric colorimeter
6. Spectrophotometer measurements
7. Study of ESU – cutting and coagulation modes
8. pH Measurement and conductivity test
9. Measurement of heart rate using F-V converter
10. Galvanic skin resistance (GSR) measurement
11. Recording of Audiogram

TOTAL : 45 PERIODS

GE9371 COMMUNICATION SKILLS AND SOFT SKILLS L T P C
FIFTH / SIXTH SEMESTER 0 0 2 1

AIM:

To enhance the overall capability of students and to equip them with the necessary Communication Skills and Soft Skills that would help them excel in their profession.

OBJECTIVES:

- To equip students of engineering and technology with effective speaking and
- listening skills in English.
- To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their
- jobs.
- To enhance the performance of students at Placement Interviews, Group
- Discussions and other recruitment exercises

A. Viewing and discussing audio-visual materials (6 periods)

1. Resume / Report Preparation / Letter Writing: (2)

2. Presentation skills: (1)

Elements of effective presentation – Structure of presentation - Presentation tools – Body language.

3. Soft Skills: **(1)**
Time management – Stress management – Assertiveness – Negotiation strategies.

4. Group Discussion: **(1)**
Group discussion as part of selection process, Structure of group discussion – Strategies in group discussion – Mock group discussions.

5. Interview Skills: **(1)**
Kinds of interviews – Interview techniques – Corporate culture – Mock interviews.
(Career Lab Software may be used for this section).

Note: Career Lab software may be used to learn the skills, to be applied in the practice session.

B. Practice session **(24 periods)**

1. **Resume / Report Preparation / Letter writing**: Students prepare their own resume and report. (4)
2. **Presentation Skills:** Students make presentations on given topics. (8)
3. **Group Discussion**: Students participate in group discussions. (6)
4. **Interview Skills**: Students participate in Mock Interviews (6)

TOTAL : 30 PERIODS

REFERENCE BOOKS:

1. Anderson, P.V, **Technical Communication**, Thomson Wadsworth, Sixth Edition, New Delhi, 2007.
2. Prakash P, **Verbal and Non-Verbal Reasoning**, Macmillan India Ltd., Second Edition, New Delhi, 2004.
3. John Seely, **The Oxford Guide to Writing and Speaking**, Oxford University Press, New Delhi 2004.
4. David Evans, **Decisionmaker**, Cambridge University Press, 1997.
5. Thorpe, E and Thorpe, S **Objective English**, Pearson Education, Second Edition, New Delhi 2007.
6. Turton, N.D and Heaton, J.B, **Dictionary of Common Errors**, Addision Wesley Longman Ltd., Indian reprint 1998.

BM 9351 RADIOLOGICAL EQUIPMENTS L T P C
3 0 0 3

AIM:

To get the clear understanding of X-ray generation and radio isotopes and various techniques used for visualizing organs in detail.

OBJECTIVES:

- To study the functioning of X-ray tubes and scattered radiation and method by which fogginess can be reduced.
- To study the different types radio diagnostic unit.
- To know the techniques to visualize opaque, transparent organs.
- To study the special techniques adopted to visualize different sections of any organ.

UNIT I MEDICAL X-RAY EQUIPMENT 9

Nature of X-Rays - X-ray Absorption - Tissue Contrast. X-Ray Equipment (Block Diagram) – X-ray Tube, the collimator, Bucky Grid, power supply. Digital Radiography - discrete digital detectors, storage phosphor and film Scanning. X-Ray Image intensifier tubes - Fluoroscopy – Digital Fluoroscopy. Angiography, Cine angiography. Digital Subtraction Angiography. Mammography.

UNIT II COMPUTER TOMOGRAPHY 9

Principles of Tomography - First to Fourth generation scanners – Image reconstruction technique- Back projection and Iterative method. Spiral CT Scanning - Ultra fast CT Scanners- X-Ray Sources – Collimation – X-Ray Detectors – Viewing System.

UNIT III MAGNETIC RESONANCE IMAGING 9

Fundamentals of Magnetic Resonance- Interaction of nuclei with static Magnetic Field and Radio frequency wave – Rotation and Precession –induction of a magnetic resonance signal – bulk Magnetization – Relaxation Processes T1 and T2. Block diagram approach of MRI system- System Magnet (Permanent, Electromagnet and super conductors) , generation of Gradient magnetic Fields , Radio Frequency coils (sending and receiving), Shim coils, Electronic components.

UNIT IV NUCLEAR MEDICINE SYSTEM 9

Radio isotopes- alpha, beta and gamma radiations. Radio pharmaceuticals.Radiation detectors - Gas Filled, ionization Chambers, proportional counter, GM counter and Scintillation Detectors. Gamma Camera- Principle of operation, Collimator, Photo multiplier tube, X-Y Positioning Circuit, Pulse height Analyzer. Principles of SPECT and PET.

UNIT V RADIATION THERAPY AND RADIATION SAFETY 9

Radiation therapy-Linear accelerator, betatron, Cesium and Cobalt Therapy. Radiation Protection in Medicine – Radiation Protection principles, Radiation measuring instruments-Dosimeter, film Badges, Thermo luminescent dosimeters – Electronic dosimeter- ICRP regulation, Practical reduction of dose to staff and visitors.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Steve Webb, “Physics of medical Imaging”, Taylor and Francis, 1988
2. R. Hendee and Russell Ritenour “Medical Imaging Physics”, Fourth Edition William, Wiley –Liss, 2002.

REFERENCE BOOKS:

1. Gopal B.Saha “Physics and Radiobiology of Nuclear Medicine” –Third edition – Springer, 2006.
2. B.H Brown , PV Lawford, R H Small wood, D R Hose, D C Barber, Medical Physics and Biomedical Engineering – CRC Press, 1999.
3. Myer Kutz, “Standard handbook of Biomedical Engineering and Design”, McGraw – Hill, 2003.
4. P.Raghunathan, “Magnetic Resonance Imaging and Spectroscopy in Medicine Concepts and Techniques”, Orient Longman, 2007.

BM9352 BIOMECHANICS L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Scope of mechanics in medicine, mechanics of bone structure, determination of in-vivo elastic modulus. Biofluid mechanics, flow properties of blood.

UNIT II MECHANICS OF PHYSIOLOGICAL SYSTEMS 9

Heart valves, power developed by the heart, prosthetic valves. Constitutive equations for soft tissues, dynamics of fluid flow in cardiovascular system and effect of vibration - shear stresses in extra-corporeal circuits.

UNIT III ORTHOPAEDIC MECHANICS 9

Mechanical properties of cartilage, diffusion properties of articular cartilage, mechanical properties of bone, kinetics and kinematics of joints, Lubrication of joints.

UNIT IV MATHEMATICAL MODELS 9

Introduction to Finite Element Analysis, Mathematical models - pulse wave velocities in arteries, determination of in-vivo elasticity of blood vessel, dynamics of fluid filled catheters.

UNIT V ORTHOPAEDIC APPLICATIONS 9

Dynamics and analysis of human locomotion - Gait analysis (determination of instantaneous joint reaction analysis), occupant response to vehicular vibration. Mechanics of knee joint during standing and walking.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Dhanjoo N. Ghista, “Bio-mechanics of Medical Devices”, Marcel Dekker, 1980.
2. Manfred Clynes, “Bio-medical Engineering Systems”, McGraw Hill, 1998.

REFERENCES:

1. Y.C. Fung, “Bio-Mechanics- Mechanical Properties of Tissues”, Springer-Verlag, 1998.
2. Dhanjoo N. Ghista, “Orthopaedic Mechanics”, Academic Press, 1990.

BM 9353 DIAGNOSTIC AND THERAPEUTIC EQUIPMENT-II L T P C
3 0 0 3

UNIT I ULTRASONIC TECHNIQUE 9

Diagnosis: Basic principles of Echo technique, display techniques A, B and M mode, Application of ultrasound as diagnostic tool – Echocardiogram, abdomen, obstetrics and gynaecology, ophthalmology.

UNIT II PATIENT MONITORING AND BIOTELEMETRY 9

ICU/CCU Equipments, Infusion pumps, bed side monitors, Central consoling controls. Radio Telemetry (single, multi), Portable and Landline Telemetry unit, Applications in ECG and EEG Transmission.

UNIT III DIATHERMY 9

IR and UV lamp and its application. Thermography – Recording and clinical application. Short wave diathermy, ultrasonic diathermy, Microwave diathermy, Electro surgery machine - Current waveforms, Tissue Responses, Electro surgical current level.

UNIT IV EXTRA CORPOREAL DEVICES AND SPECIAL DIAGNOSTIC TECHNIQUES 9

Need for heart lung machine, functioning of bubble, disc type and membrane type oxygenators, finger pump, roller pump, electronic monitoring of functional parameter. Hemo Dialyser unit , Lithotripsy, Principles of Cryogenic technique and application, Endoscopy, Laproscopy.

UNIT V PATIENT SAFETY 9

Physiological effects of electricity – important susceptibility parameters – Macro shock – Micro shock hazards – Patient’s electrical environment – Isolated Power system – Conductive surfaces – Electrical safety codes and standards – Basic Approaches to protection against shock, Protection equipment design, Electrical safety analyzer – Testing the Electric system

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Leslie Cromwell, “Biomedical Instrumentation and Measurement”, Prentice Hall of India, New Delhi, 2007
2. John G. Webster, “Medical Instrumentation Application and Design”, John Wiley and sons, 2002
3. Joseph J. Carr and John M. Brown, “Introduction to Biomedical equipment technology”, John Wiley and sons, New York, 1997

REFERENCE BOOKS:

1. Richard Aston, “Principles of Biomedical Instrumentation and Measurement”, Merril Publishing Company, 1990.
2. L.A Geddas and L.E.Baker, ”Principles of Applied Biomedical Instrumentation”
3. John G. Webster, Bioinstrumentation”, John Willey and sons, New York, 2004
4. Khandpur R.S, “Handbook of Biomedical Instrumentation”, Tata McGraw - Hill, New Delhi, 2003.
5. Myer Kutz Standard Handbook of Biomedical Engineering & Design McGraw-Hill Publisher, 2003

BM 9354 INTERNET AND JAVA L T P C
3 0 0 3

UNIT I WORLD WIDE WEB 9

HTTP protocol, Web browsers Netscape, Internet explorer, Web site and web page design, HTML, Dynamic HTML, CSS.

UNIT II JAVASCRIPT PROGRAMMING 9

Introduction, Control statements, Functions, Arrays and Objects.

UNIT III WEB DESIGN TOOLS 9

Micromedia Dream Weaver, XML, Web Servers, Databases – SQL, MYSQL, DBI and ADO.NET

UNIT IV JAVA PROGRAMMING 9

Language features, Classes, Object and methods. Sub-classing and dynamic binding, Multithreading, Overview of class library, Object method serialization, Remote method invocation, Java Servelets and Javaserver pages.

UNIT V WEB DESIGN AND MEDICAL STANDARDS 9

Web Design case studies – Design and development of Dynamic Hospital Information System Web sites using Macromedia Dreamweaver, Java, XML, Javascript, Programming Techniques. HL7 Standards, DICOM standards.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Deitel, “Internet and World Wide Web”, Pearson Education / PHI, 2007
2. Deitel, “Java How to Program”, Pearson Education / PHI, 2006.
3. Herbert Schildt, “The complete Reference JAVA 2”, Fifth Edition, Tata McGRaw Hill Publishing Com.Ltd, New Delhi.
4. Achyut S Godbole and Atul Kahate, “Web Technologies, TCP / IP to Internet Application Architecture”, TMH, 2007.

REFERENCES:

1. Margaret Levine Young, “Internet The Complete Reference”, Tata McGraw Hill, 1999
2. Cay S. Horstmann & Gary Cornell, “Core Java^{tm}” Volume – I & II, Pearson Education, 2006.
3. Balagurusamy E. “Programming with Java, A premier” Second Edition, Tata McGraw Hill,2006

EC9308	DIGITAL SIGNAL PROCESSING LAB	L T P C 0 0 3 2

MATLAB / Equivalent Software Package(30% of the course)

1. Generation of sequences (functional and random), correlation and convolution
2. Spectrum Analysis using FFT
3. Filter Design and Analysis
4. Filter Implementation in time-domain and frequency domain
5. Study of Quantization errors in DSP algorithms
6. Multirate Filters
7. Adaptive filter
8. Equalization
9. Echo Cancellation

DSP Processor Implementation (70% of the course)

1. Waveform Generation
2. FIR Implementation
3. IIR Implementation
4. FFT
5. Finite word Length effect
6. Multirate filters

TOTAL : 45 PERIODS

BM 9355 INTERNET AND JAVA PROGRAMMING LABORATORY L T P C
0 0 3 2

1. Programs using basic elements and design of Web pages, hyperlinks and web navigation using HTML, XHTML and CSS.
2. Java script programs using control statements, functions, arrays and objects and applications in web environment
3. Macromedia Dreamweaver platform to design and develop web pages, insert images and links into web pages, create XHTML elements to be able insert script into Dreamweaver pages and site management
4. Programs relating to relational database model, database queries using SQL, MYSQL database server and interfaces
5. Java programming using GUI components, java applet applications, servelets and java server pages.
6. Design and development of a web based dynamic Hospital Information System

TOTAL : 45 PERIODS

BM 9356 DIAGNOSTIC AND THERAPEUTIC EQUIPMENT LAB L T P C
0 0 3 2

1. Recording and analysis of ECG signals.
2. Recording and analysis of EEG signals.
3. Recording - Fatigue test of EMG signals.
4. Simulation of ECG – detection of QRS complex and heart rate
5. Study of Pacemaker simulator
6. Study of Defibrillator simulator
7. Study of shortwave and ultrasonic diathermy.
8. Study of biotelemetry
9. Electrical safety measurements.
10. Mini project.

TOTAL : 45 PERIODS

BM 9401 PATTERN RECOGNITION AND NEURAL NETWORKS L T P C
3 0 0 3

UNIT I INTRODUCTION AND SIMPLE NEURAL NET 9

Elementary neurophysiology and biological neural network-Artificial neural network – Architecture, biases and thresholds, Hebb net, Perceptron, Adaline and Madaline.

UNIT II BACK PROPOGATION AND ASSOCIATIVE MEMORY 9

Back propogation network, generalized delta rule, Bidirectional Associative memory, Hopfield network

UNIT III NEURAL NETWORKS BASED ON COMPETITION 9

Kohonen Self organising map, Learning Vector Quantisation, counter propogation network.

UNIT IV UNSUPERVISED LEARNING AND CLUSTERING ANALYSIS 9

Patterns and features, training and learning in pattern recognition, discriminant functions, different types of pattern recognition. Unsupervised learning- hierarchical clustering, partitional clustering. Neural pattern recognition approach – perceptron model

UNIT V SUPERVISED LEARNING USING PARAMETRIC AND NON PARAMETRIC APPROACH 9

Bayesian classifier, non parametric density estimation, histograms, kernels, window estimators, k-nearest neighbour classifier , estimation of error rates.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Hagan, Demuth and Beale, “Neural network design”, Vikas Publishing House Pvt. Ltd., New Delhi , 2002
2. Freeman J.A., and Skapura B.M, " Neural networks, algorithms, applications and programming techniques”, Addison – Wesley,2003
3. Duda R.O, Hart P.G, “Pattern classification and scene analysis”, Wiley Edition,2000
4. Earl Gose, Richard Johnsonbaugh, Steve Jost, “Pattern Recognition and Image Analysis”, Prentice Hall of India Pvt. Ltd., New Delhi, 1999.

REFERENCE BOOKS:

1. Robert Schalkoff, “ Pattern recognition, Statistical, Structural and neural approaches” John Wiley and Sons(Asia) Pte. Ltd., Singapore, 2005
2. Laurene Fausett ,” Fundamentals of neural networks – Architectures, algorithms and applications”, Prentice Hall, 1994

BM 9402 **MEDICAL INFORMATICS** **L T P C**
3 0 0 3

UNIT I MEDICAL INFORMATICS 9

Introduction - Structure of Medical Informatics –Internet and Medicine -Security issues Computer based medical information retrieval, Hospital management and information system, Functional capabilities of a computerized HIS, e-health services, Health Informatics – Medical Informatics, Bioinformatics

UNIT II COMPUTERISED PATIENT RECORD 9

Introduction - History taking by computer, Dialogue with the computer, Components and functionality of CPR, Development tools, Intranet, CPR in Radiology- Application server provider, Clinical information system, Computerized prescriptions for patients.

UNIT III COMPUTERS IN CLINICAL LABORATORY AND MEDICAL IMAGING 9

Automated clinical laboratories-Automated methods in hematology, cytology and histology, Intelligent Laboratory Information System - Computerized ECG, EEG and EMG, Computer assisted medical imaging- nuclear medicine, ultrasound imaging ultrasonography-computed X-ray tomography, Radiation therapy and planning, Nuclear Magnetic Resonance

UNIT IV COMPUTER ASSISTED MEDICAL DECISION-MAKING 9

Neuro computers and Artificial Neural Networks application, Expert system - General model of CMD, Computer –assisted decision support system-production rule system-cognitive model, semester networks , decisions analysis in clinical medicine-computers in the care of critical patients-computer assisted surgery-designing

UNIT V RECENT TRENDS IN MEDICAL INFORMATICS 9

Virtual reality applications in medicine, Computer assisted surgery , Surgical simulation , Telemedicine - Tele surgery, computer aids for the handicapped, computer assisted instrumentation in Medical Informatics - Computer assisted patient education and health - Medical education and health care information.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. R.D.Lele “Computers in medicine progress in medical informatics”, Tata Mcgraw Hill Publishing computers Ltd,2005, New Delhi
2. Mohan Bansal, “Medical informatics”, Tata Mcgraw Hill Publishing Ltd, 2003, New Delhi

BM9403 **MEDICAL OPTICS** **L T P C**
3 0 0 3

UNIT I OPTICAL PROPERTIES OF THE TISSUES 9
Refraction, Scattering, absorption, light transport inside the tissue, tissue properties, Light interaction with tissues, optothermal interaction, fluorescence, speckles.

UNIT II INSTRUMENTATION IN PHOTONICS 9
Instrumentation for absorption, scattering and emission measurements, excitation light sources – high pressure arc lamp, solid state LEDs, Lasers, optical filters, polarizer, solid state detectors, time resolved and phase resolved detectors.

UNIT III APPLICATIONS OF LASERS 9
Laser in tissue welding, lasers in dermatology, lasers in ophthalmology, otolaryngology, urology.

UNIT IV OPTICAL TOMOGRAPHY 9
Optical coherence tomography, Elastography, Doppler optical coherence tomography, Application towards clinical imaging.

UNIT V SPECIAL OPTICAL TECHNIQUES 9
Near field imaging of biological structures, in vitro clinical diagnosis, fluorescent spectroscopy, photodynamic therapy.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Tuan Vo Dirh, “Biomedical photonics – Handbook”, CRC Press, Bocaraton, 2003
2. Mark E. Brezinski., “Optical Coherence Tomography: Principles and Applications”, Academic Press, 2006.

REFERENCE BOOKS:

1. Leon Goldman, M.D., & R. James Rockwell, Jr., “Lasers in Medicine”, Gordon and Breach, Science Publishers Inc., New York, 1971
2. R. Splinter and B.A Hooper, “An Introduction to BioMedical Optics”, Taylor and Francis,2007

EC9036 DIGITAL IMAGE PROCESSING L T P C
3 0 0 3

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Elements of digital image processing systems, Vidicon and Digital Camera working principles, - Elements of visual perception, brightness, contrast, hue, saturation, mach band effect, Color image fundamentals - RGB, HSI models, Image sampling, Quantization, dither, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT, KLT, SVD.

UNIT II IMAGE ENHANCEMENT 9

Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Directional Smoothing, Median, Geometric mean, Harmonic mean, Contraharmonic mean filters, Homomorphic filtering, Color image enhancement.

UNIT III IMAGE RESTORATION 9

Image Restoration - degradation model, Unconstrained and Constrained restoration, Inverse filtering-removal of blur caused by uniform linear motion, Wiener filtering, Geometric transformations-spatial transformations.

UNIT IV IMAGE SEGMENTATION 9

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and Merging – Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

UNIT V IMAGE COMPRESSION 9

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, Vector Quantization, Transform coding, JPEG standard, MPEG.

TOTAL : 45 PERIODS

TEXTBOOKS:

1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Pearson, Education, Inc., Second Edition, 2004.
2. Anil K. Jain, “Fundamentals of Digital Image Processing”, Pearson Education, Inc., 2002.

REFERENCES:

1. Kenneth R. Castleman, “Digital Image Processing”, Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' “Digital Image Processing using MATLAB,” Pearson Education, Inc., 2004.
3. D,E. Dudgeon and RM. Mersereau, “Multidimensional Digital Signal Processing,” Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt, “Digital Image Processing” , John Wiley, New York, 2002
5. Milan Sonka et al, “IMAGE PROCESSING, ANALYSIS AND MACHINE VISION”, Brookes/Cole, Vikas Publishing House, 2nd edition, 1999,

BM 9405 DIGITAL IMAGE PROCESSING LAB L T P C
0 0 3 2

1. Display of Grayscale Images.
2. Histogram Equalization.
3. Non-linear Filtering.
4. Edge detection using Operators.
5. 2-D DFT and DCT.
6. Filtering in frequency domain.
7. Display of color images.
8. Conversion between color spaces.
9. DWT of images.
10. Segmentation using watershed transform.

TOTAL : 45 PERIODS

REFERENCE:

Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, “Digital Image Processing using MATLAB”, Pearson Education, Inc., 2004.

BM 9021 BIOFLUIDS AND MECHANICS L T P C
3 0 0 3

UNIT I BIO-FLUID MECHANICS 10

Newton’s laws, Stress, Strain, Elasticity, Hooks-law, viscosity, Newtonian fluid, Non-Newtonian fluid, Viscoelastic fluids, vascular tree, Relationship between diameter, velocity and pressure of blood flow, Resistance against flow. BIOVISCOELASTIC FLUID: Viscoelasticity - Viscoelastic models, Maxwell, Voigt and Kelvin Models, Response to Harmonic variation, Use of viscoelastic models, Bio-Viscoelastic fluids: Protoplasm, Mucus, Saliva, Synovial fluids.

UNIT II FLOW PROPERTIES OF BLOOD 10

Physical, Chemical and Rheological properties of blood. Apparent and relative viscosity, Blood viscosity variation: Effect of shear rate, hematocrit, temperature, protein contents of blood. Casson’s equation, Problems associated with extracorporeal blood flow. RHEOLOGY OF BLOOD IN MICROVESSELS: Fahraeus -Lindquist effect and inverse effect, distribution of suspended particles in a narrow rigid tube. Nature of red blood cells in tightly fitting tubes, hematocrit in very narrow tube.

UNIT III CARDIAC MECHANICS 9

Cardiovascular system. Mechanical properties of blood vessels: arteries, arterioles, capillaries and veins. Blood flow: Laminar and Turbulent, Physics of cardiovascular diseases, Prosthetic heart valves and replacements. RESPIRATORY MECHANICS: Alveoli mechanics, Interaction of Blood and Lung P-V curve of Lung, Breathing mechanism, Airway resistance, Physics of Lung diseases.

UNIT IV SOFT TISSUE MECHANICS 9

Pseudo elasticity, non-linear stress-strain relationship, Viscoelasticity, Structure, function and mechanical properties of skin, ligaments and tendons.

UNIT V ORTHOPEDIC MECHANICS 8

Mechanical properties of cartilage, diffusion properties of Articular cartilage, mechanical properties of bone, kinetics and kinematics of joints, lubrication of joints.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Y.C Fung, Biomechanics- “Mechanical properties of living tissues”, 2nd ed, Springer - Verlag, 1993.
2. D.O Cooney, “Biomedical engineering Principles”. Marcel Dekker, INC New York,1976.

REFERENCES:

1. Silver Frederick H. “Biomaterials, Medical Devices & Tissue Engineering”, Chapman & Hall, London, 1994
2. Biomechanics by Nihanth ozkai
3. D.A Mc Donald, Blood flow in arteries, Edward Arnold ltd, 1998.

EC 9255 COMPUTER ARCHITECTURE AND ORGANIZATION L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Computing and Computers, Evolution of Computers, VLSI Era, System Design-Register Level, Processor Level, CPU Organization, Data Representation, Fixed – Point Numbers, Floating Point Numbers, Instruction Formats, Instruction Types. Addressing modes.

UNIT II DATA PATH DESIGN 9

Fixed Point Arithmetic, Addition, Subtraction, Multiplication and Division, Combinational and Sequential ALUs, Carry look ahead adder, Robertson algorithm, booth's algorithm, non-restoring division algorithm, Floating Point Arithmetic, Coprocessor, Pipeline Processing, Pipeline Design, Modified booth's Algorithm

UNIT III CONTROL DESIGN 9

Hardwired Control, Microprogrammed Control, Multiplier Control Unit, CPU Control Unit, Pipeline Control, Instruction Pipelines, Pipeline Performance, Superscalar Processing, Nano Programming.

UNIT IV MEMORY ORGANIZATION 9

Random Access Memories, Serial - Access Memories, RAM Interfaces, Magnetic Surface Recording, Optical Memories, multilevel memories, Cache & Virtual Memory, Memory Allocation, Associative Memory.

UNIT V SYSTEM ORGANIZATION 9

Communication methods, Buses, Bus Control, Bus Interfacing, Bus arbitration, I/O and system control, I/O interface circuits, Handshaking, DMA and interrupts, vectored interrupts, PCI interrupts, pipeline interrupts, IOP organization, operation systems, multiprocessors, fault tolerance, RISC and CISC processors, Superscalar and vector processor.

TOTAL : 45 PERIODS

TEXTBOOKS:

1. John P.Hayes, "Computer architecture and Organisation", Tata McGraw-Hill, Third edition, 1998.
2. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, " Computer Organisation", V edition, McGraw-Hill Inc, 1996.

REFERENCES:

1. Morris Mano, "Computer System Architecture", Prentice-Hall of India, 2000.
2. Behrooz Parhami, "Computer Architecture from Microprocessors to Supercomputer", Oxford University Press.
3. Miles J. Murdocca and Vincent P. Heuring, "Principles of Computer Architecture", PHI, 2000.
4. P.Pal Chaudhuri, , "Computer organization and design", 2nd Ed., Prentice Hall of India, 2007.
5. G.Kane & J.Heinrich, "MIPS RISC Architecture", Englewood cliffs, New Jersey, Prentice Hall, 1992.

GE9075 INTELLECTUAL PROPERTY RIGHTS (IPR) L T P C
3 0 0 3

UNIT I **5**

Introduction – Invention and Creativity – Intellectual Property (IP) – Importance – Protection of IPR – Basic types of property (i) Movable Property (ii) Immovable Property and (iii) Intellectual Property.

UNIT II **10**

IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and International levels – Application Procedures.

UNIT III **10**

International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT).

UNIT IV **10**

Indian Position Vs WTO and Strategies – Indian IPR legislations – commitments to WTO-Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy – Present against unfair competition.

UNIT V **10**

Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition.

TOTAL: 45 PERIDOS

TEXT BOOK:

1. Subbaram N.R. “Handbook of Indian Patent Law and Practice “,
2. S. Viswanathan Printers and Publishers Pvt. Ltd., 1998.

REFERENCES:

1. Eli Whitney, United States Patent Number: 72X, Cotton Gin, March 14, 1794.
2. Intellectual Property Today: Volume 8, No. 5, May 2001, [www.iptoday.com].
3. Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000. www.ipmatters.net/features/000707_gibbs.html.

GE 9072 INDIAN CONSTITUTION AND SOCIETY L T P C
3 0 0 3

UNIT I **9**

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.

UNIT II **9**

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

UNIT III **9**

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.

UNIT IV **9**

Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries - Assessment of working of the Parliamentary System in India.

UNIT V **9**

Society : Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Rights of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Durga Das Basu, " Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.
2. R.C.Agarwal, "Indian Political System", S.Chand and Company, New Delhi, 1997
3. Maciver and Page, " Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.
4. K.L.Sharma, "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, New Delhi, 1997

REFERENCES:

1. Sharma, Brij Kishore, " Introduction to the Constitution of India", Prentice Hall of India, New Delhi.
2. U.R.Gahai, "Indian Political System ", New Academic Publishing House, Jalaendhar.
3. R.N. Sharma, "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.

CS9211 DATA STRUCTURES AND OBJECT ORIENTED PROGRAMMING IN C++ **L T P C 3 0 0 3**

UNIT I PINCIPLES OF OBJECT ORIENTED PROGRAMMING **9**

Introduction- Tokens-Expressions-contour Structures –Functions in C++, classes and objects, constructors and destructors ,operators overloading and type conversions .

UNIT II ADVANCED OBJECT ORIENTED PROGRAMMING 9

Inheritance, Extending classes, Pointers, Virtual functions and polymorphism, File Handling Templates ,Exception handling, Manipulating strings.

UNIT III DATA STRUCTURES AND ALGORITHMS 9

Algorithm, Analysis, Lists, Stacks and queues, Priority queues-Binary Heap-Application, Heaps, skew heaps, Binomial –hashing-hash tables without linked lists

UNIT IV NONLINEAR DATA STRUCTURES 9

Trees-Binary trees, search tree ADT, AVL trees splay Trees, B-trees, Sets and maps in standard Library, Graph Algorithms-Topological sort, shortest path algorithm network flow problems-minimum spanning tree, applications of depth-first-search-Introduction to NP - completeness.

UNIT V SORTING AND SEARCHING 9

Sorting – Insertion sort, Shell sort, Heap sort, Merge sort, Quick sort, Indirect sorting, Bucket sort, External sorting, Disjoint set class, Algorithm Design Techniques –Greedy algorithm, Divide and Conquer, Dynamic Programming, Randomized Algorithm, Back tracking algorithm.

TOTAL: 45 PERIODS

TEXT BOOKS:

1) Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 3rd ed, Pearson Education Asia, 2007.
2) E. Balagurusamy, “ Object Oriented Programming with C++”, McGraw Hill Company Ltd., 2007.

REFERENCES:

1. Michael T. Goodrich, “Data Structures and Algorithm Analysis in C++”, Wiley student edition, 2007.
2. Sahni, “Data Structures Using C++”, The McGraw-Hill, 2006
3. Sourav Sahay, “object oriented programming with C++”, Oxford University Press, 2006, New Delhi.zz
4. Seymour, “Data Structures”, The McGraw-Hill, 2007.

BM 9022 BIO METRIC SYSTEMS L T P C
3 0 0 3

UNIT I BIOMETRIC FUNDAMENTALS 9

Key Biometric terms and Processes – Definitions-verification and identification – matching, Accuracy in Biometric Systems – False match rate - False nonmatch rate - Failure to enroll rate – Derived metrics - An Introduction to Biometric Authentication Systems- a taxonomy of application environment, a system model, biometrics and privacy.

UNIT II FINGERPRINT IDENTIFICATION TECHNOLOGY 9

History, Components, Application of Fingerprints, The Technology- Finger Scan Strengths and Weaknesses, Criminal Applications, Civil Applications, Commercial Applications, Technology Evaluation of Fingerprint Verification Algorithms.

UNIT III IRIS RECOGNITION 9

Introduction, Anatomical and Physiological underpinnings, Components, Sensing, Iris Scan Representation and Matching, Iris Scan Strengths and Weaknesses, System Performance, Future Directions.

UNIT IV FACE RECOGNITION 9

Introduction, Components, Facial Scan Technologies, Face Detection, Face Recognition-Representation and Classification, Kernel- based Methods and 3D Models, Learning the Face Spare, Facial Scan Strengths and Weaknesses, Methods for assessing progress in Face Recognition.

UNIT V VOICE SCAN 9

Introduction, Components, Features and Models, Addition Method for managing Variability, Measuring Performance, Alternative Approaches, Voice Scan Strengths and Weaknesses, NIST Speaker Recognition Evaluation Program, Biometric System Integration.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. James Wayman & Anil Jain, “Biometric Systems – Technology, Design and Performance Evaluation”, Springer-verlag London Ltd,2005, USA.
2. Sanir Nanavati, Michael Thieme, “Biometrics Identity Verification in a Networked world”, Wiley Computer Publishing Ltd, 2003, New Delhi.

REFERENCE:

1. John D. Woodword Jr., “Biometrics”, Dreamtech Press, 2003, New Delhi.

EC9034 MULTIMEDIA COMPRESSION AND COMMUNICATION L T P C
3 0 0 3

UNIT I MULTIMEDIA COMPONENTS 9

Introduction - Multimedia skills - Multimedia components and their chacracteristics - Text, sound, images, graphics, animation, video, hardware.

UNIT II AUDIO AND VIDEO COMPRESSION 9

Audio compression–DPCM-Adaptive PCM –adaptive predictive coding-linear Predictive coding-code excited LPC-perpetual coding Video compression –principles-H.261-H.263-MPEG 1, 2, 4.

UNIT III TEXT AND IMAGE COMPRESSION 9

Compression principles-source encoders and destination encoders-lossless and lossy compression-entropy encoding –source encoding -text compression –static Huffman coding dynamic coding –arithmetic coding –Lempel Ziv-Welsh Compression-image compression

UNIT IV VoIP TECHNOLOGY 9

Basics of IP transport, VoIP challenges, H.323/ SIP –Network Architecture, Protocols, Call establishment and release, VoIP and SS7, Quality of Service- CODEC Methods-VoIP applicability

UNIT V MULTIMEDIA NETWORKING 9

Multimedia networking -Applications-streamed, stored and audio-making the best Effort service-protocols for real time interactive applications-distributing multimedia-beyond best effort service-secluding and policing Mechanisms-integrated services-differentiated Services-RSVP.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Fred Halshall “Multimedia communication - applications, networks, protocols and standards”, Pearson education, 2007.
2. Tay Vaughan, “Multimedia: making it work”, 7/e, TMH 2007
3. Kurose and W.Ross “Computer Networking a Top down approach”, Pearson education

REFERENCES:

1. Marcus goncalves “Voice over IP Networks”, McGraw Hill
2. KR. Rao,Z S Bojkovic, D A Milovanovic, “Multimedia Communication Systems: Techniques, Standards, and Networks”, Pearson Education 2007
3. R. Steimnetz, K. Nahrstedt, “Multimedia Computing, Communications and Applications”, Pearson Education
4. Ranjan Parekh, “Principles of Multimedia”, TMH 2006

EC 9081 MICROCONTROLLER ENGINEERING L T P C
3 0 0 3

UNIT I RISC PROCESSORS 9

RISC Vs CISC, RISC properties and evolution, Advanced RISC microcontrollers, PIC 8-bit microcontrollers.

UNIT II R8C 16-BIT MICROCONTROLLER 9

The R8C Architecture, CPU Registers, Instruction Set, On-Chip Peripherals, R8C Tiny Development Tools, ADC, PWM, UART, Timer Interrupts, System design using R8C Microcontroller.

UNIT III SYSTEM DESIGN TECHNIQUES 9

Design Methodologies, Specification, System Analysis and Architecture Design, Hardware-Software Design Examples.

UNIT IV EMBEDDED SOFTWARE DEVELOPMENT 9

Cross development tools, Debugging techniques, Real-time Operating System, Memory Management, Scheduling techniques.

UNIT V SYSTEM DEVELOPMENT 9

Microcontroller based System Design, Peripheral Interfacing, Inter-Integrated Circuit Protocol for RTC, EEPROM, ADC/DAC, Application in Automobiles, Robotics and consumer Electronics.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Julio Sanchez Maria P.Canton, "Microcontroller Programming: The microchip PIC", CRC Press, Taylor & Francis Group,2007.
2. D. E. Simon, "An Embedded Software Primer", Addison-Wesley, 1999.
3. Wayne Wolf, "Computers as Components: Principles of Embedded Computing System Design", Morgan Kaufman Publishers, 2006.

CS 9036 SOFT COMPUTING L T P C
3 0 0 3

UNIT I FUZZY SET THEORY 10

Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set-theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

UNIT II OPTIMIZATION 8

Derivative-based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative-free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

UNIT III ARTIFICIAL INTELLIGENCE 10

Introduction, Knowledge Representation – Reasoning, Issues and Acquisition: Prepositional and Predicate Calculus, Rule Based knowledge Representation, Symbolic Reasoning Under Uncertainity, Basic knowledge Representation Issues, Knowledge acquisition – Heuristic Search: Techniques for Heuristic search, Heuristic Classification - State Space Search: Strategies, Implementation of Graph Search, Search based on Recursion, Patent-directed Search, Production System and Learnin

UNIT IV NEURO FUZZY MODELING 9

Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

UNIT V APPLICATIONS OF COMPUTATIONAL INTELLIGENCE 8

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.
2. N.P.Padhy, "Artificial Intelligence and Intelligent Systems", Oxford University Press, 2006.
3. Elaine Rich & Kevin Knight, "Artificial Intelligence", Second Edition, Tata McGraw Hill Publishing Comp., 2006, New Delhi.

REFERENCES:

1. Timothy J.Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
2. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
3. S. Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
4. R.Eberhart, P.Simpson and R.Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996.
5. Amit Konar, "Artificial Intelligence and Soft Computing Behaviour and Cognitive model of the human brain", CRC Press, 2008.

BM9023 PHYSIOLOGICAL MODELLING L T P C
3 0 0 3

UNIT I PROPERTIES OF SYSTEMS AND ELECTRICAL ANALOG 9

System concept, system properties – Resistance, storage, compliance, piece-wise linear approximation, electrical analog for compliance, thermal storage, step response of first order systems – resistance- compliance systems, and pulse response of first order systems

UNIT II TRANSFER FUNCTIONS 9

Transfer functions and its use, Study of transfer function of first order and second order systems, engineering concept in coupled system, example of Transformed signals.

UNIT III IMPEDANCE CONCEPT 9

Transfer function with impedance concept, prediction of performance, identification of the system from impedance function, periodic signals, relationship between transfer function and sinusoidal response, evaluation of transfer function from frequency response.

UNIT IV FEEDBACK SYSTEMS 9

Characteristics of physiological feedback systems, stability analysis of systems.

UNIT V SIMULATION OF BIOLOGICAL SYSTEMS 9

Simulation of thermal regulation, pressure and flow control in circulation, occulo motor system, endocrinal system, functioning of receptors.

TOTAL : 45 PERIODS

REFERENCES:

1. William B.Blesser, " System approach to Bio-medicine", McGraw-Hill book co., New York, 1969.
2. Manfred Clynes and John H.Milsum, "Bio-medical engineering system", McGraw-Hill book co., NewYork, 1970.
3. Michael C.K. Khoo," Physiological Control Systems -Analysis, Simulation and Estimation" Prentice Hall of India Pvt. Ltd., New Delhi, 2001
4. Douglas S. Rigg, "Control theory and physiological feedback mechanism", The William & Williams co., Baltimore, 1970.

EC9073 BIO INFORMATICS L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Overview of structural Bioinformatics; Characteristics, Categories, Navigation and information, retrieval of Bioinformatics databases,

UNIT II DATABASES 9

Description and Organisation of Sequence, Structure and Other databases; Database Warehousing and data mining in Bioinformatics.

UNIT III TOOLS 9

Need for tools, Knowledge discovery, Industry trends and data mining tools; Data submission tools, Data analysis tools, Prediction tools and modeling tools.

UNIT IV MACHINE LEARNING IN BIOINFORMATICS 9

Neural network, Genetic and fuzzy logic applications in Bioinformaitcs; Modeling for Bioinformatics – Hidden Markov, Comparative, probabilistic and molecular modeling

UNIT V ALGORITHMS 9

Classification algorithms, implementing algorithms , biological algorithms, bioinformatics tasks and corresponding algorithms and bioinformatics software; Data analysis algorithms – Sequence comparison, Substitution matrices and sequence alignment optimal algorithm; Prediction algorithms – Gene prediction, Phylogenetic prediction and protein structure prediction algorithms.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Orpita Bosu and Simminder Kaur Thukral, "Bioinformatics Databases, Tools and Algorithms", Oxford University press, 2007, New Delhi.
2. Yi – Ping Phoebe Chen, "Bioinformatics Technolgies", Springer International Edition, 2007, New Delhi

REFERENCES:

1. Harshawardhan P.Bal, "Bioinformatics principles and applications", TataMcGraw Hill Publishing Company Ltd, 2007, New Delhi
2. Kenneth Baclawski, Tianhua Niu, "Bioinformatics", Jaico Publishing House, 2007, Delhi.
3. Lukas K. Beehler and Hooman H. Rashidi, "Bioinformatics basics Applications in biological science and medicine", Taylor and Francis Group, 2005,

BM 9024 REFRIGERATION AND AIR CONDITIONING L T P C
3 0 0 3

UNIT I REFRIGERATION CYCLES AND REFRIGERANTS 9

Vapour Compression Refrigeration Cycle-Simple saturated vapour compression Refrigeration cycle.Thermodynamic analysis of the above. Refrigerant Classification, Designation, Alternate Refrigerants, Global Warming Potential and Ozone Depleting Potential aspects.

UNIT II SYSTEM COMPONENTS 9

Refrigerant Compressors - Reciprocating Open and Hermetic type, Screw Compressors and Scroll Compressors -Construction and Operation characteristics. Evaporators - DX coil, Flooded type Chillers Expansion devices -Automatic Expansion Valves, Capillary Tuber and Thermostatic Expansion Valves. Condensing Units and Cooling Towers.

UNIT III CYCLING CONTROLS AND SYSTEM BALANCING 9

Pressure and Temperature controls. Range and Differential settings. Selection and balancing of system components - Graphical method.

UNIT IV PSYCHROMETRY 9

Moist air behaviour, Psychrometric chart, Different Psychrometric process analysis.

UNIT V AIR CONDITIONING 9

Summer and Winter Airconditioning, Cooling Load Calculations, Air Distribution Patterns, Dynamic and Frictional Losses in Air Ducts, Equal Friction Method, Fan Characteristics in Duct Systems.

TOTAL : 45 Periods

TEXT BOOKS:

1. W.F.Stocker and J.W.Jones, "Refrigeration and Air Conditioning " McGraw Hill Book Company, 1985.

REFERENCES:

1. R.J.Dossat, "Principles of Refrigeration ", John Wiley and Sons Inc., 2 ed, 2003.
2. Dr.S.S.Thipse, “Refrigeration and Air Conditioning”, Jaico Publishing House, 2007.
3. Manohar Prasad, "Refrigeration and Air Conditioning ", Wiley Eastern Ltd., 1995.

GE9022 TOTAL QUALITY MANAGEMENT L T P C
3 0 0 3

AIM :

To Provide comprehensive knowledges about the principles, practices, tools and techniques of Total Quality Management

OBJECTIVES :

- To Understand the various principles, practices of TQM to achieve quality
- To learn the various statistical approaches for quality control
- To understand the TQM tools for continuous process improvement
- To learn the important of ISO amd Quality systems

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

UNIT II TQM PRINCIPLES 9

Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDSA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES I 9

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II 9

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors including IT.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Dale H.Besterfiled, et at., "Total Quality Management", Pearson Education Asia, Third Edition, Indian Reprint (2006).

REFERENCE BOOKS:

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 6th Edition, South-Western (Thomson Learning), 2005.
2. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, 3rd Edition, 2003.
3. Suganthi,L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd.,2006.
4. Janakiraman,B and Gopal, R.K, "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.

BM9025 COMPUTER HARDWARE, INTERFACING AND INSTRUMENTATION L T P C 3 0 0 3

UNIT I INTEL ADVANCED PROCESSORS 7

80186, 80286- Architecture, Programming enhancements, 80c188EB interfacing.

UNIT II INTEL 80386, 80486 PROCESSOR 10

80386- Introduction, Special 80386 registers, Memory management, Protected mode, virtual 8086 mode, memory paging mechanism, 80486 Microprocessor – Introduction and architecture.

UNIT III PENTIUM PROCESSORS 10

Pentium Architecture- Memory Management- New Pentium instructions - Pentium Pro microprocessors - Pentium II, Pentium III, Pentium 4- Special Features and Software changes.

UNIT IV PC HARDWARE OVERVIEW 10

Functional Units & Interconnection, New Generation Mother Boards 286 to Pentium 4 Bus Interface- ISA- EISA- VESA- PCI- PCIX., Memory and I/O Port Addresses, Peripheral Interfaces and Controller.

UNIT V PC BASED DATA ACQUISITION 8

Plug-in data acquisition and control boards and programming – ADC, DAC, Digital I/O board and Timing board, Serial port and parallel port programming. Data acquisition and programming using serial interfaces – PC and microcontroller serial ports, USB and IEEE 1394.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. B.B.Brey, "The Intel Microprocessor 8086/8088/80186/80188,80286,80386, 80486 Pentium, Pentium Pro, PII, PIII & IV Archietecture, Programming &Interfacing", Pearson India, 2007.
2. B.Govindarajulu, "IBM PC and clones Hardware, Trouble Shooting and Maintenance", Second Edition, Tata McGraw Hill, New Delhi, 2005.
3. N.Mathivanan, "PC-Based Instrumentation concepts and practice", Prentice Hall of India, New Delhi, 2007

REFERENCES:

1. Douglas V.Hall, "Microprocessor and Interfacing, Programming and Hardware". Revised second Edition, Indian edition. Tata McGraw Hill, New Delhi, 2007.
2. A.K.Ray, K.M. Bhurchandi, "Advanced microprocessors and peripherals", II Edition, Tata McGraw Hill 2006.

EC9040 ROBOTICS L T P C
3 0 0 3

UNIT I SCOPE OF ROBOTS 4

The scope of industrial Robots - Definition of an industrial robot - Need for industrial robots - applications.

UNIT II ROBOT COMPONENTS 9

Fundamentals of Robot Technology - Automation and Robotics - Robot anatomy - Work volume - Precision of movement - End effectors - Sensors.

UNIT III ROBOT PROGRAMMING 9

Robot Programming - Methods - interlocks textual languages. Characteristics of Robot level languages, characteristic of task level languages.

UNIT IV ROBOT WORK CELL 9

Robot Cell Design and Control - Remote Center compilance - Safety in Robotics.

UNIT V FUTURE TRENDS 14

Advanced robotics, Advanced robotics in Space - Specific features of space robotics systems - long-term technical developments, Advanced robotics in under - water operations. Robotics Technology of the Future - Future Applications.

TOTAL :45 PERIODS

TEXTBOOK:

1. Barry Leatham - Jones, "Elements of industrial Robotics" PITMAN Publishing , 1987.

REFERENCES:

1. Mikell P.Groover, Mitchell Weiss, Roger N.Nagel Nicholas G.Odrey, "Industrial Robotics Technology, Programming and Applications ", McGraw Hill Book Company 1986.
2. Fu K.S. Gonzaleaz R.C. and Lee C.S.G., "Robotics Control Sensing, Vision and Intelligence " McGraw Hill International Editions, 1987.
3. Bernard Hodges and Paul Hallam, " Industrial Robotics", British Library Cataloging in Publication 1990.
4. Deb, S.R. Robotics Technology and flexible automation, Tata Mc GrawHill, 1994.

EC9043 FOUNDATIONS FOR NANOELECTRONICS L T P C
3 0 0 3

UNIT I INTRODUCTION TO QUANTUM MECHANICS 9

Particles, waves, probability amplitudes, Schrodinger equation, wavepackets solutions, operators, expectation values, eigenfuntions, piecewise constant potentials.

UNIT II SIMPLE HARMONIC OSCILLATORS AND APPROXIMATIONS 9

SHM Operators, SHM wavepacket solutions, Quantum LC circuit, WKB approximations, variational methods.

UNIT III SYSTEMS WITH TWO AND MANY DEGREES OF FREEDOM 9

Two level systems with static and dynamic coupling, problems in more than one dimensions, electromagnetic field quantization, density of states.

UNIT IV STATISTICAL MECHANICS 9

Basic concepts, microscopic, quantum systems in equilibrium, statistical models applied to metals and semiconductors

UNIT V APPLICATIONS 9

Hydrogen and Helium atoms, electronic states, Atomic force microscope, Nuclear Magnetic Resonance, carbon nanotube properties and applications

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Hagelstein, Peter L., Stephen D. Senturia, and Terry P. Orlando, "Introduction to Applied Quantum and Statistical Physics.", New York, NY: Wiley, 2004.
2. Rainer Waser, "Nanoelectronics and Information Technology", Wiley 2005
3. Michael A. Nielsen and Isaac L. Chuang, "Quantum Computation and Quantum Information", Cambridge University Press, 2000.

REFERENCES:

1. Neil Gershenfeld "The Physics of Information Technology", Cambridge University Press, 2000.
2. Adrian Ionesu and Kaustav Banerjee eds. " Emerging Nanoelectronics: Life with and after CMOS" , Vol I, II, and III, Kluwer Academic, 2005.

BM9026 BIO MEMS L T P C
3 0 0 3

UNIT I MEMS AND MICROSYSTEMS 9

Typical MEMs and Microsystems, , materials for MEMS - active substrate materials- Silicon and its compounds, Silicon piezoresistors, Gallium Arsenide, quartz, polymers. Micromachining- photolithography, thin film deposition, doping, etching, bulk machining, wafer bonding, LIGA

UNIT II MICROSENSORS AND ACTUATORS 9

Mechanics for MEMs design- static bending of thin plates,mechanical vibration, thermomechanics, fracture and thin film mechanics. Mechanical sensors and actuators – beam and cantilever – microplates, strain, pressure and flow measurements, gyroscope, piezoactuator.Thermal sensors and actuators- micromachined thermocouple probe, Peltier effect heat pumps, thermal flow sensors

UNIT III MICRO OPTO ELECTRO MECHANICAL SYSTEMS 9

Fundamental principle of MOEMS technology, light modulators, beam splitter, microlens, digital micromirror devices, light detectors, grating light valve, optical switch

UNIT IV MICROFLUIDIC SYSTEMS 9

Fluid dynamics, continuity equation, momentum equation, equation of motion, laminar flow in circular conduits, fluid flow in microconduits, in submicrometer and nanoscale.

Microscale fluid, expression for liquid flow in a channel, fluid actuation methods, dielectrophoresis, microfluid dispenser, microneedle, micropumps-continuous flow system

UNIT V APPLICATION OF BIOMEMS 9

CAD for MEMs, Drug delivery, micro total analysis systems (MicroTAS) detection and measurement methods, microsystem approaches to polymerase chain reaction (PCR), DNA hybridization

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Nitaigour Premchand Mahalik, " MEMS", Tata McGraw Hill Publishing Company, New Delhi, 2007
2. Tai Ran Hsu , " MEMS and Microsystems design and manufacture", Tata McGraw Hill Publishing Company, New Delhi, 2002
3. Wanjun Wang, Stephen A.Soper,"BioMEMs: Technologies and applications", CRC Press, New York, 2007

BM 9027 MEDICAL IMAGING TECHNIQUE L T P C
3 0 0 3

AIM

- To study the image reconstruction techniques

OBJECTIVE

- To study the quality assurance test for radiography, method of recording sectional images
- To study the functioning of radioisotopic imaging equipments
- To study the MRI, image acquisition and reconstruction
- To study the 3-D image display techniques

UNIT I ULTRASOUND IN MEDICINE 9

Production of ultrasound – properties and principles of image formation, capture and display – principles of A-mode, B-mode and M-mode display – Doppler ultra sound and colour flow mapping – applications of diagnostic ultra sound.

UNIT II X-RAY COMPUTED TOMOGRAPHY 9

Priniciples of sectional imaging – scanner configuration – data acquisition system – image formation principles – conversion of x-ray data to scan image – 2-D image reconstruction techniques –Iteration and Fourier method – types of CT scanners.

UNIT III MAGNETIC RESONANCE IMAGING 9

Priniciples of MRI pulse sequence – image acquisition and reconstruction techniques – MRI instrumentation, magnetic gradient system, RF coils – receiver system functional MRI – Application of MRI .

UNIT IV RADIO ISOTOPIC IMAGING 9

Rectilinear scanners – linear scanners – SPECT – PET, Gamma camera, radio nuclides for imaging – emission computed CT.

UNIT V INFRA RED IMAGING 9

Physics of thermography – imaging systems – pyroelectric vidicon camera, clinical thermography – liquid crystal thermography.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Steve Webb, "The physics of medical imaging", Adam Hilger, Bristol, England, Philadelphia, USA, 1988.

REFERENCES:

1. A. C. Kak, "Principles of computed tomography", IEEE press, Newyork
2. G. A. Hay, "Medical Image formation perception and measurement",

EC 9355 DIGITAL VLSI L T P C
3 0 0 3

UNIT I MOS TRANSISTOR PRINCIPLE 9

NMOS and PMOS transistors, Process parameters for MOS and CMOS, Electrical properties of CMOS circuits and device modeling, Scaling principles and fundamental limits, CMOS inverter scaling, propagation delays, Stick diagram, Layout diagrams

UNIT II COMBINATIONAL LOGIC CIRCUITS 9

Examples of Combinational Logic Design, Elmore's constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design, Power dissipation – Low power design principles

UNIT III SEQUENTIAL LOGIC CIRCUITS 9

Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Memory architecture and memory control circuits, Low power memory circuits, Synchronous and Asynchronous design

UNIT IV DESIGNING ARITHEMETIC BUILDING BLOCKS 9

Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, accumulators, Multipliers, dividers, Barrel shifters, speed and area tradeoff

UNIT V IMPLEMENTATION STRATEGIES 9

Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures.

TOTAL : 45 PERIODS

TEXTBOOKS:

1 Jan Rabaey, Anantha Chandrakasan, B.Nikolic, "Digital Integrated circuits: A design perspective". Second Edition, Prentice Hall of India, 2003.

2 M.J. Smith, "Application specific integrated circuits", Addisson Wesely, 1997

REFERENCE BOOKS:

1. N.Weste, K.Eshraghian, “Principles of CMOS VLSI DESIGN”, second edition, Addision Wesley 1993
2. R.Jacob Baker, Harry W.LI., David E.Boyee, “CMOS Circuit Design, Layout and Simulation”, 2005 Prentice Hall of India
3. A.Pucknell, Kamran Eshraghian, “BASIC VLSI DESIGN”, Third edition, Prentice Hall of India, 2007

EC9083 RELIABILITY ENGINEERING L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Hardware Reliability and Software Reliability Concepts, Reliability Management, Benefits of Reliability Program, Basic Reliability measurement units**:-** bath tube curve, Failures, Faults, MTBF, MTTF, Failure rate, Hazard Rate, Reliability factors, Reliability and Unreliability costs, Reliability Life cycle Modeling - Hardware-Series Model-parallel models- Redundant Models-Shared load systems-Baye’s theorem applications-Boolean Truth table-FTA - Software:-Historic developments of models, classification schemes, Environments and runs-random process- with and without Repair-particularization. Calendar time modeling

UNIT II DESIGN TOOLS 9

Design Evaluation-Stress strength Analysis-FMEA-FMECA-Worst Case Analysis-Roboust Design approach-Human Factors-Parts Control and Derating Software considerations

UNIT III EVALUATION 9

Hardware: Development/growth testing-test analyse and Fix (TAAF)-Production Reliability Acceptance testing (PRAT)- Qualification Testing-Environmental Stress Screening-Burn-in-Accelerated Life Testing Software: Testing components-State-based classes-Parallel Architecture-system testing-Testing OOPs models

UNIT IV PREDICTION 9

Hardware: Benefits of Reliability Predictions, Field and Industry Data-Parts count- Part stress method- Reliability allocation and apportionment-Reliability prediction goals.
Software: Execution time component-Calendar Time component-Prediction Models:-Jelinski-Morando Model-Shooman Model-Musa Model-Littlewood-Verrall Model-Crow Model.Least-Squares estimation- Bayesian ineference

UNIT V IMPLEMENTATION AND PLANNING 9

Organization Responsibility-System engineering – Reliability program elements-Management of Operational Phases-Life cycle Cost analysis-Resource management-Evaluation of software Engineering Technologies-planning for Application.

TOTAL : 45 PERIODS

TEXT BOOK:

1. Birolini.A "Reliability Engineering – Theory and Practice", 4th edition, Springer International Edition, New Delhi, 2006.

REFERENCES:

1. Willian E. Perry, "Effective methods for Software Testing": John Wiley and Sons., 2002, Singapore
2. Ireson, W.G Coombs, C.F & Moss R. "Handbook of Reliability Engineering and Management", McGraw Hill,1996 New York
3. O'Connor, P.D.T. "Practical Reliability Engineering", John Wiley and Sons, 1996. New York:
4. John.D.Musa, Antony Iannino, Kazuhira Okumoto, Software Reliability Measurement, Prediction and application, International edition Mc-graw hill Book co.-1987,Singapore
5. Angus J E, J B Bowen, & S J Vandenberg. "Reliability Model Demostration Study" Rome Air Development Centre, Technical Report RADC-TR-83-207, Rome, 1983,Newyork
6. K.C.Kapur & Lamberson L.R . Reliability in Engineering Design, John Wiley and sons Inc, 1974,New York
7. Mann, N.R, Schafer, R.E & Singpurwalla, N. D " Methods for Statistical Analysis of Reliability life", John Wiley and sons, 1974, New York.

EC9028 CRYPTOGRAPHY AND NETWORK SECURITY L T P C
3 0 0 3

UNIT I NUMBER THEORETIC AND ALGEBRAIC ALGORITHMS 9

Introduction – Integer Arithmetic Modular Arithmetic – matrices – Linear congruence - Substitution ciphers – Transposition ciphers – Stream cipher - Block ciphers – Algebraic structure – GF(2) field.

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UNIT II MODERN SYMMETRIC KEY CIPHERS 9

Modern block ciphers – Modern stream ciphers – DES – AES – Multiple uses of modern block ciphers and stream cipher.

UNIT III ASYMMETRIC KEY ENCIPHERMENT 9

Mathematics of cryptography – Primality Testing – Factorization – Chinese Remainder Theorem – Quadratic congrivence – Exponentiation & Logarithm – RSA Rabin – Elgamal – Elliptic curve

UNIT IV INTEGRITY AUTHENTICATION AND KEY MANAGEMENT 9

Message integrity – random oracle model – message authentication – SHA-512 – WHIRL POOL - Digital signature schemes – password – challenge response – zero knowledge – Biometrics – Keberos – symmetric key management – public key distribution – stegnography

UNIT V NETWORK SECURITY **9**

Security at the Application Layer: E-mail – PGP – S/MIME – Security at the transport layer: SSL and TLS – Security at the network layer: IPsec, Two Security Protocol – Security Association – Internet Key Exchange – ISAKMP.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Behrouz A. Ferouzan, "Cryptography & Network Security", Tata McGraw Hill, 2007.
2. W.Stallings, "Cryptography & Network Security: Principles and Practice", Prentice Hall, Third Edition, 2003.

REFERENCES:

1) Douglas R.Stlinson, "Cryptography Theory and Practice", CRC Press series on Discrete Mathematics and its application 1995.
2) Charlie Kaufman, Radia Perlman, Mike Speciner, "Network Security Private Communication in a Public World", Pearson Education, Second Edition, 2003.

EC9029 ELECTRO MAGNETIC INTERFERENCE AND COMPATIBILITY **L T P C 3 0 0 3**

UNIT I BASIC CONCEPTS **7**

Definition of EMI and EMC; Intra and Inter system EMI; Sources and victims of EMI, Conducted and Radiated EMI emission and susceptibility; Transient & ESD; Case Histories; Radiation Hazards to humans. .

UNIT II COUPLING MECHANISM **9**

Common made coupling; Differential mode coupling; Common impedance coupling; Ground loop coupling; Field to cable coupling; Cable to cable coupling; Power mains and Power supply coupling.

UNIT III EMI MITIGATION TECHNIQUES **10**

Shielding – principle, choice of materials for H, E and free space fields, and thickness; EMI gaskets; Bonding; Grounding – circuits, system and cable grounding; Filtering; Transient EMI control devices and applications; PCB Zoning, Component selection, mounting, trace routing.

UNIT IV STANDARDS AND REGULATION **7**

Units of EMI; National and International EMI Standardizing Organizations – IEC, ANSI, FCC, CISPR, BIS, CENELEC; FCC standards; EN Emission and Susceptibility standards and specifications; MIL461E Standards.

UNIT V EMI TEST METHODS AND INSTRUMENTATION 12

EMI test sites - Open area site; TEM cell; Shielded chamber; Shielded Anechoic chamber; EMI test receivers; Spectrum Analyzer; Transient EMI Test wave Simulators; EMI coupling Networks - Line impedance Stabilization Networks; Feed through capacitors; Antennas and factors; Current probes and calibration factor; MIL-STD test methods; Civilian STD Test methods.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. V.P. Kodali, "Engineering EMC Principles, Measurements and Technologies", IEEE Press, Newyork,2001
2. Henry W.Ott., "Noise Reduction Techniques in Electronic Systems", A Wiley Inter Science Publications, John Wiley and Sons, Newyork, 1988.

REFERENCES:

1. Don R.J.White Consultant Incorporate, "Handbook of EMI/EMC", Vol I-V, 1988.
2. Bemhard Keiser, "Principles of Electromagnetic Compatibility", 3rd Ed, Artech house, Norwood, 1987

ME9023 RAPID PROTOTYPING L T P C
3 0 0 3

UNIT I INTRODUCTION 10

Basic operation-impact of rapid prototyping and tooling on product development-benefits-applications

UNIT II RAPID PROTOTYPING PROCESSES 10

Introduction-classification-laminated object manufacturing-fused deposition modeling-stereolithography-solid ground curing-selective laser sintering-3 D printing.

UNIT III CAD PROCESSES 10

Introduction-data requirements-solid modeling-surface modeling . Geometric processing- interface formats-model prepration-slicing,support structures and machine instructions.

UNIT IV MATERIALS FOR RAPID PROTOTYPING 5

Plastics-resins-metals-ceramics-selection of materials for suitable processes-advantages-limitations.

UNIT V RAPID TOOLING PROCESSES 10

Introduction-classification-indirect rapid tooling-silicone rubber moulding-epoxy moulding-electro forming- vacuum casting- vacuum forming- rapid tools for injection moulding- direct rapid tooling processes-SLS rapid tool-shape deposition manufacturing – laser deposition lamination- rapid tooling roots.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Ibrahim zeid, "CAD/CAM theory and practice", Tata McGraw Hill,1998

REFERENCES:

1. Paul F. Jacobs Stereolithography, Rapid Prototyping and Manufacture. Fundamentals of 1995
2. Rapid proto typing reports, CAD/CAM publishing, 1991
3. Rapid News, University of Warwick, UK, 1995.
4. Rapid Tools for Injection Moulding
   (www.vmreg.com/raptia/reports/CRIF.pdf)
   Applications of RP techniques for Sheet Metal Forming
   (www.raptia.org)

   Medical RP applications
   (http:// home.att.net/~rppat/museum/mus-5.htm)

GE9021 PROFESSIONAL ETHICS IN ENGINEERING L T P C
3 0 0 3

AIM:

To sensitize the engineering students on blending both technical and ethical

OBJECTIVES:

- Identify the core values that shape the ethical behavior of an engineer
- Utilize opportunities to explore one's own values in ethical issues
- Become aware of ethical concerns and conflicts
- Enhance familiarity with codes of conduct
- Increase the ability to recognize and resolve ethical dilemmas

UNIT I ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

UNIT III ENGINEER'S RESPONSIBILITY FOR SAFETY 9

Safety and Risk – Assessment of Safety and Risk – Riysis – Reducing Risk – The Government Regulator's Approach to Risk - Chernobyl Case Studies and Bhopal

UNIT IV RESPONSIBILITIES AND RIGHTS 9

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) - Discrimination

UNIT V GLOBAL ISSUES 9

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct

TOTAL :45 PERIODS

TEXT BOOKS:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York, 2005.
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Thompson Learning 2000.

REFERENCES:

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, 2003.
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, 2001.
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, 2004.
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, 2003

EC9078 EMBEDDED AND REAL TIME SYSTEMS L T P C
3 0 0 3

UNIT I INTRODUCTION TO EMBEDDED COMPUTING 9

Complex systems and micro processors – Design example: Model train controller – Embedded system design process – Formalism for system design – Instruction sets Preliminaries – ARM Processor – CPU: Programming input and output – Supervisor mode, exception and traps – Coprocessor – Memory system mechanism – CPU performance – CPU power consumption.

UNIT II COMPUTING PLATFORM AND DESIGN ANALYSIS 9

CPU buses – Memory devices – I/O devices – Component interfacing – Design with microprocessors – Development and Debugging – Program design – Model of programs – Assembly and Linking – Basic compilation techniques – Analysis and optimization of execution time, power, energy, program size – Program validation and testing.

UNIT III PROCESS AND OPERATING SYSTEMS 9

Multiple tasks and multi processes – Processes – Context Switching – Operating Systems –Scheduling policies - Multiprocessor – Inter Process Communication mechanisms – Evaluating operating system performance – Power optimization strategies for processes.

UNIT IV HARDWARE ACCELERATES & NETWORKS 9

Accelerators – Accelerated system design – Distributed Embedded Architecture – Networks for Embedded Systems – Network based design – Internet enabled systems.

UNIT V CASE STUDY 9

Data Compressor - Software Modem – Personal Digital Assistants – Set–Top–Box. – System-on-Silicon.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Wayne Wolf, “Computers as Components - Principles of Embedded Computer System Design”, Morgan Kaufmann Publisher, 2006.

REFERENCE BOOKS:

1) David E-Simon, “An Embedded Software Primer”, Pearson Education, 2007.
1) K.V.K.K.Prasad, “Embedded Real-Time Systems: Concepts, Design & Programming”, dreamtech press, 2005.
2) Tim Wilmshurst, “An Introduction to the Design of Small Scale Embedded Systems”, Pal grave Publisher, 2004.
3) Sriram V Iyer, Pankaj Gupta, “Embedded Real Time Systems Programming”, Tata Mc-Graw Hill, 2004.
5) Tammy Noergaard, “Embedded Systems Architecture”, Elsevier, 2006.