ANNA UNIVERSITY CHENNAI :: CHENNAI 600 025

CURRICULUM 2004

B.E. BIOMEDICAL ENGINEERING

SEMESTER III

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

Code No.	Course Title	L	T	P	M
THEORY					
BM1201	Transforms and Random Process	3	1	0	100
BM1202	Human Physiology	3	0	0	100
EC1216	Signals and Systems	3	1	0	100
EC1212	Circuits and Networks	3	1	0	100
EC1213	Electronic Circuits	3	1	0	100
BM1203	Biochemistry	3	0	0	100
PRACTICAL					
EC1214	Circuits and Networks Lab	0	0	3	100
BM1204	Biochemistry and Human Physiology Lab	0	0	4	100
EC1215	Electronic Circuits Lab	0	0	3	100

SEMESTER IV

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

Code No.	Course Title	L	T	P	M
THEORY					
BM1251	Electric Fields and machines	3	1	0	100
BM1252	Sensors and Measuring Techniques	3	0	0	100
BM1253	Medical Physics	3	0	0	100
EC1266	Analog and Digital ICs	3	1	0	100
BM1255	Pathology and Microbiology	3	0	0	100
EC1267	Principles of Communication	3	0	0	100
PRACTICAL					
EC1263	Integrated Circuits Lab	0	0	3	100
BM1258	Pathology and Microbiology Lab	0	0	4	100

SEMESTER V

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

Code No.	Course Title	L	T	P	M
THEORY					
CY1201	Environmental Science and Engineering	3	0	0	100
EC1311	Digital Signal Processing	3	1	0	100
BM1301	Bio control systems	3	1	0	100
BM1302	Bio medical Instrumentation	3	0	0	100
BM1303	Bio materials and Artificial organs	3	0	0	100
EC1318	Microprocessor and application	3	0	0	100
GE1302	Communication Skill and Seminar**	0	0	3	-
PRACTICAL					
EC1316	Microprocessor Lab	0	0	3	100
BM1304	Biomedical Instrumentation Lab	0	0	3	100

SEMESTER VI

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

Code No.	Course Title	L	T	P	M
THEORY					
EC1361	Digital Image Processing	3	0	0	100
MG1351	Principles of Management	3	0	0	100
BM1351	Radiological Equipments	3	0	1	100
BM1352	Diagnostic and Therapeutic Equipments I	3	0	1	100
BM1353	Visual Programming	3	0	0	100
	Elective I	3	0	0	100
GE1351	Professional Skill and Seminar**	0	0	3	-
PRACTICAL					
EC1370	Digital Signal Processing Lab	0	0	3	100
BM1354	Visual Programming Lab	0	0	3	100

SEMESTER VII

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

Code No.	Course Title	L	T	P	M
THEORY					
BM1003	Neural Networks and Application	3	0	0	100
BM1401	Computers in Medicine	3	0	1	100
BM1402	Medical Optics	3	0	0	100
BM1403	Diagnostic and Therapeutic Equipments II	3	0	0	100
	Elective II	3	0	0	100
	Elective III	3	0	0	100
PRACTICAL					
BM1404	Hospital Training	0	0	4	100
BM1405	Diagnostic and Therapeutic Equipments	0	0	3	100

SEMESTER VIII

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

Code No.	Course Title	L	T	P	M
THEORY					
BM1451	Hospital Management	3	0	0	100
	Elective IV	3	0	0	100

	Elective V	3	0	0	100
PRACTICAL					
BM1452	Project Work	0	0	12	200
BM1453	Comprehension**	0	0	2	-

** No Examinations

LIST OF ELECTIVES FOR B.E. BIOMEDICAL ENGINEERING

LIST OF ELECTIVES - VI SEMESTER

Code No.	Course Title	L	T	P	M
BM1001	Bio Mechanics	3	0	0	100
BM1002	Computer Architecture	3	0	0	100
BM1004	Analog and Digital Communication	3	0	0	100
GE1001	Intellectual Property Rights	3	0	0	100
GE1002	Indian Constitution and Society	3	0	0	100

LIST OF ELECTIVES - VII SEMESTER

Code No.	Course Title	L	T	P	M
BM1005	AI and Pattern Recognition	3	0	0	100
BM1006	Physiological Modeling	3	0	0	100
BM1007	Medical Informatics	3	0	0	100
BM1008	Refrigeration and Air-Conditioning	3	0	0	100
MG1401	Total Quality Management	3	0	0	100

LIST OF ELECTIVES - VIII SEMESTER

Code No.	Course Title	L	T	P	M
BM1009	Bio Fluids and Dynamics	3	0	0	100
BM1010	Medical Imaging Techniques	3	0	0	100
BM1011	Telehealth Technology	3	0	0	100
BM1012	Assist Devices	3	0	0	100
BM1013	VLSI Design	3	0	0	100
BM1014	Computer Networks	3	0	0	100
BM1015	Rapid Prototyping	3	0	0	100
GE1301	Professional Ethics and Human values	3	0	0	100

BM1201 TRANSFORMS AND RANDOM PROCESSES 3 1 0 100

1. FOURIER TRANSFORMS: 9

Fourier transform pairs, Properties – Fourier Sine and Cosine transforms, Transforms of simple functions, Transforms of derivatives, Convolution integrals, Evaluation of integrals using Fourier Transform.

2. LAPLACE TRANSFORM: 9

Transforms of simple functions, Properties, Transforms of derivatives and integrals, Periodic functions, Convolution theorem, Inversion formula, Initial and Final value theorems, Applications to solve ordinary differential equations.

3. PROBABILITY AND RANDOM VARIABLES: 8

Probability concepts, Random variables, Moments, Moment generating function, Binomial, Poisson, Geometric, Exponential, Gamma distributions, Functions of a random variable.

4. TWO DIMENSIONAL RANDOM VARIABLES: 8

Joint, Marginal and Conditional distributions, Covariance, Correlation and Regression.

5. RANDOM PROCESSES: 11

Classification, Stationary and Markov processes, Poisson Process – Properties, Pure Birth Process, Birth and Death Process, Markov Chain, Auto-correlation and Cross-correlation functions - Properties.

L = 45, T = 15, TOTAL: 60

TEXT BOOKS:

1. Kandasamy.P, Thilagavathy. K, Gunavathy.K, 'Engineering Mathematics' Vol.III S.Chand & Co.2002
2. Veerarajan.T, 'Probability statistics and Random Processes' Tata McGraw-Hill, Co, New Delhi.2002.

REFERENCES:

1. J. Medhi, 'Stochastic Processes', New Age International Publication, New Delhi (2nd Ed), 1994.
2. Peebles Jr., 'Probability, Random Variables and Random Signal Principles' McGraw-Hill Publishers.1987.
3. H.M. Taylor and S.Karlia 'An Introduction to Stochastic Modeling', Academic Press, Inc., 1984.
4. U.N.Bhat, 'Elements of Applied Stochastic Processes', John Wiley, New York, 1984.

BM1202 HUMAN PHYSIOLOGY 3 0 0 100

AIM

To understand the functioning of the various physiological system.

OBJECTIVES

- To expose students to the structure and functioning of the cell.
- To give the idea of functioning of cardiac, nervous, digestive and respiration system.
- To understand special sensing units responsible for hearing and vision.

1. CELL 9

Structure of Cell – Function of each Components of the cell – Membrane Potential – Action Potential – Generation and Conduction – Electrical Stimulation.
Blood Cell – Composition – Origin of RBC – Blood Groups – Estimation of RBC, WBC and platelet.

2. CARDIAC AND NERVOUS SYSTEM 10

Cardiac Cycle – ECG – Blood Pressure – Feedback Control for Blood Pressure – Nervous control of Heart. Cardiac output – Coronary and Peripheral Circulation – Structure and function of Nervous tissue – Reflex action – Velocity of Conduction of Nerve Impulses. Electro Encephalograph – Autonomic Nervous System.

3. RESPIRATORY SYSTEM 8

Physiological aspects of respiration. Exchange of gases – Regulation of Respiration. Disturbance of respirating function. Pulmonary function test.

4. DIGESTIVE AND EXCRETORY SYSTEM 9

Organization of GI system, Digestion and absorption – Movement of GI tract – Structure of Nephron – Mechanism of Urine formation – Urine Reflex – Skin and Sweat Gland – Temperature regulation.

5. SPECIAL SENSES 9

Optics of Eye – Retina - Photochemistry of Vision – Accommodation Neurophysiology of Vision – EOG. Physiology of Internal Ear - Mechanism of Hearing – Auditory pathway, Hearing Tests.

TOTAL : 45

TEXT BOOK

1. Sarada Subramanyam, K.Madhavan Kutty and H.D.Singh – Text book of 'Human Physiology' – S.Chand & Company, 1996.(Unit I –IV).
2. Sujit K.Chaudhuri – Concise Medical Physilogy – New Central Book agency, 1997. (Unit V).

REFERENCES

1. Arthur.C.Guyton – Textbook of Medical Physiology – Prism Book (p) Ltd. 1996.
2. Cyril A.Keele Eric Neil and Neil Norman Joels Samson Wrigths' Applied Physiology – Oxford University Press – 1983.

EC1216 SIGNALS AND SYSTEMS 3 1 0 100

AIM

To study and analyse characteristics of continuous, discrete signals and systems.

OBJECTIVES

- To study the properties and representation of discrete and continuous signals.
- To study the sampling process and analysis of discrete systems using z-transforms.
- To study the analysis and synthesis of discrete time systems.

1. CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Continuous time signals (CT signals), Discrete time signals (DT signals)- Step, Ramp, Pulse, Impulse, Exponential, Classification of CT and DT signals- Periodic and Aperiodic, random signals, CT systems and DT systems, Classification of systems - Linear Time invariant systems.

2. ANALYSIS OF CT SIGNALS 9

Fourier series analysis, Spectrum of CT signals, Fourier Transform and Laplace Transform in Signal Analysis.

3. LTI - CT SYSTEMS 9

Differential equation, Block diagram representation, Impulse response, Convolution integral, Frequency response, Fourier Methods and Laplace transforms in analysis, State equations and Matrix.

4. ANALYSIS OF DT SIGNALS 9

Spectrum of DT signals, Discrete Time Fourier Transform (DTFT), Discrete Fourier Transform (DFT), Properties of Z-transform in signal analysis.

5. LTI - DT SYSTEMS 9

Difference equations, Block diagram representation, Impulse response, Convolution SUM, Frequency response, FFT and Z-transform analysis, State variable equation and Matrix.

TUTORIAL 15

TOTAL : 60

TEXT BOOK

1. Allan V. Oppenhein et al, "Signals and Systems", Prentice Hall of India Pvt. Ltd, 1997.

REFERENCES

Ashok Ambardar, "Analog and Digital Signal Processing", Thomson Learning Inc., 1999.
Douglas K.Lindner, "Signals and Systems", McGraw-Hill International, 1999.
Simon Haykin and Barry Van Veen, "Signals and Systems", John Willey & Sons, Inc, 1999.
Roger E. Zeimer et al, "Signals and Systems", Continuous and Discrete, McMillan, 2 ED, 1990.

EC1212 CIRCUITS AND NETWORKS 3 1 0 100

AIM

To know about basic analysis and synthesis techniques used in electronics and communications.

OBJECTIVES

- To study about various network theorems and the method of application to analyse a circuit.
- To know the concept of transfer function of a network and the nature of response to external inputs.
- To synthesize a network in different forms from the transfer function.
- To know the concept and design of frequency selective filters.

1. BASICS OF CIRCUIT ANALYSIS 9

Kirchoff's Laws, DC and AC excitation, series and parallel circuits, sinusoidal steady state analysis, Mesh current and Node Voltage method of Analysis, Matrix method of Analysis.

2. NETWORK THEOREMS AND RESONANCE CIRCUITS 9

Thevenin's and Norton's theorems, Superposition theorem, Compensation theorem, Reciprocity theorem, Maximum power transfer theorem, series and parallel resonance, Quality factor and Bandwidth.

3. ANALYSIS OF NETWORKS IN 'S' DOMAIN 9

Network elements, Transient response of RL, RC and RLC Circuits to DC excitation, Natural and forced oscillations, Two-port Networks, Parameters and transfer function, Interconnection of two-ports.

4. ELEMENTS OF NETWORK SYNTHESIS 9

Network realizability, Hurwitz polynomials, Positive real functions, Properties of RL, RC and LC Networks, Foster and Cauer forms of Realization, Transmission Zeroes, synthesis of transfer functions

5. FILTER DESIGN 9

Butterworth and Chebyshev approximation, Normalized specifications, Lowpasss filter design, Frequency transformations, Frequency and Impedance denormalisation, Types of frequency selective filters, Linear phase filters, Active filter design concepts.

TUTORIAL **15**

TOTAL : 60

TEXT BOOKS

1. A. Sudhakar, Shyammohan S. Palli, "Circuits and Networks Analysis and Synthesis", Second Edition, Tata McGraw-Hill, 2002. Unit (I – IV)
2. Vasudev. K. Aartre, "Network Theory and Filter Design", Wiley – Eastern Ltd, Second Edition, 1993. (Unit V)

REFERENCES

1. William H. Hayt and Jack E. Kermmerly, "Engineering Circuit Analysis", McGraw-Hill International Edition, 1993.
2. Joseph Edminister and Mahmood Nahri, "Electric Circuits", Third Edition, Tata McGraw-Hill, New Delhi, 1999.
3. Umesh Sinha, "Network Analysis", Sataya Prakasan, New Delhi, 1986.
4. Franklin. F. Kuo, "Network Analysis and Synthesis", John Wiley, 1996.
5. Vanval Kenburg, "Network Analysis", Prentice Hall of India Pvt. Ltd, New Delhi, 1994.

EC1213 ELECTRONIC CIRCUITS 3 1 0 100

AIM

The aim of this course is to familiarise the student with the analysis and design of basic transistor amplifier circuits, tuned amplifiers, wave shaping and multivibrator circuits and power supplies.

OBJECTIVES

On completion of this course, the student will understand

- The methods of biasing transistors.
- Design of simple amplifier circuits.
- Advantages and method of analysis of feedback
- Analysis and design of LC Oscillators, tuned amplifiers, wave shaping circuits and multi vibrators.
- Analysis and design of power supplies.

1. BJT BIASING & FET BIASING **10**

BJT - Biasing - DC Load line, AC load line - operating point - Fixed bias - Emitter stabilized network - voltage Divider bias. Design of Bias circuit with emitter resistor, design of hfe independent circuit. Bias stabilization. FET Biasing - Fixed Bias, Self Bias - Voltage Divider Bias. MOSFET Biasing.

2. AMPLIFIERS **10**

BJT Transistors Modelling - hybrid Equivalent circuit . BJT - small signal analysis CE, CB, CC amplifiers - FET Small signal analysis - CS, CG and Source follower. Frequency response of amplifiers. Compound Configurations. - Cascade Connection Darlington Connection - Differential Amplifier Analysis- Tuned Amplifiers - Types and Frequency response (principle only).

3. FEEDBACK AMPLIFIER **9**

Feedback connection types - Circuit example for each feedback - conditions for oscillation - phase Shift Oscillator - Wein Bridge Oscillator. Tuned Oscillator, Colpitts Oscillator, Hartley Oscillator, Quartz Crystal Oscillator.

4. PULSE CIRCUITS **9**

RC Wave Shaping Circuits - Diode Clampers and Clippers - Multivibrator - Monostable - Astable and Bistable Multivibrator - Schmitt Triggers

5. POWER SUPPLIES **7**

Rectifiers- FWR - Filter Considerations - Voltage Regulations - Capacitor Filter LCD - RC Filter - Series Voltage Regulation - Shunt Voltage Regulation - SMPS.

TUTORIAL **15**

TOTAL : 60

TEXT BOOK

1. Electronic Devices and Circuit Theory - Robert L.Boylestad Louis Nashesky - Rourson Eduction Asia, 2002.

REFERENCE

1. Electronic Devices and Circuits – David A. Bell - Prentice Hall Publications

BM1203 BIOCHEMISTRY **3 0 0 100**

AIM

- To give a clear picture about various chemical activities taking place at cellular level.
- To understand the various chemical activities taking place in blood, muscles and at neuromuscular junctions.

OBJECTIVES

- To study the biochemical activities taking place at cellular level.
- To study the chemical composition of blood and urine in normal and abnormal conditions.
- Chemical activities taking place at muscles and neuromuscular junction.
- To study the various analysis to be done in the biofluids and different equipments used for this purpose.

1. **9**

Biochemistry of living cell, Sub cellular fractionation using the differential centrifugation method. Function of each organelle Redox Potential, Oxidative Phosphorylation , Transport of substances across biological membrane.
NUCLEIC ACID: Composition and Function, Genes, Outline of DNA Structure,
Re-Combinant DNA and its applications.

2. ENZYMES AND HORMONES **9**

Enzymes: Chemical Nature, General Properties, Spectrophotometric measurement of enzymes, Isolation techniques, Diagnostic enzymes. Enzyme biotechnology.
Hormones: Chemical Nature, Properties of hormones, Hormonal Assay and their Significance.

3. CARBOHYDRATE, LIPID, PROTEIN **9**

(i) **Carbohydrate** – Classification, Metabolism of carbohydrate and its dysfunction. Uses of Carbohydrates.

(ii) **Lipids**: Classification, Metabolism of lipids, Cholesterol, bile acids, Transport of lipids, Lipid metabolism dysfunction.

(iii) **Protein:** Classification, Amino acids, Chromatography, electrophoresis and architecture of protein molecules.

4. **9**

(i) **BIO CHEMISTRY OF BLOOD AND BODY FLUIDS:** Liver Function tests, Renal Function Tests, Blood gas Analysis, Measurement of Electrolytes. Their abnormal and Normal Values and Conditions.

(ii) Biochemistry of Urine and Stools testing.

5. DIAGNOSTIC TOOL **9**

Principles and Application of Photometry , Spectrophotometry, Flurometry, Flame Photometry, Densitometry, Calorimetry, Automation in Clinical Laboratory. Use of Isotopes in Biochemistry.

TOTAL : 45

TEXT BOOK

1. Dr. Ambiga Shanmugam, 'Fundamentals of Bio Chemistry for Medical Students', Karthic Printers, Madras 1997.

EC1214 CIRCUITS AND NETWORKS LAB 0 0 3 100

1. Verification of Kirchoff's Laws
2. Verification of Thevenin's and Norton' Theorem
3. Verification of Superposition and Reciprocity Theorem
4. Verification of Maximum power transfer and compensation theorem
5. Resonance circuits
6. Study of Transients
7. Study of Bridge Circuits
8. Filter design using Butterworth Approximation
9. Filter design using Chebyshev Approximation

List of equipment for a batch of 30

Sl.No	Description	Quantity required
1.	0-30 V RPS	9 Nos
2.	0-30 Voltmeter	7 Nos
3.	0-30 mA Ammeter	5 Nos
4.	0-100 mA AC Ammeter	1 No
5.	0-200 mV AC Voltmeter	1No
6.	Audio Oscillator	6 Nos
7.	CRO (30 MHz)	5 Nos
8.	Required passive components	

BM1204 BIO CHEMISTRY AND HUMAN PHYSIOLOGY LAB 0 0 4 100

1. Recording of Muscle Response to Induced Electrical Stimulation
2. Study of rate of Conduction of Nerve Impulses.

3. Isolated Frog Heart Perfusion and Effect of ionic Changes.
4. Testing of Hearing using Tuning Fork.
5. Testing of various parameters of Vision and Errors of Refraction.
6. Testing for Detection of Glucose, Fructose and Starch.
7. General Test for Proteins
8. Testing of Urine for presence of Sugar, Protein
9. Estimation using Spectrophotometer

List of equipment for a batch of 30

Sl.No	Description	Quantity required
1.	Recording of Muscle Response to induced Electrical Stimulation (i) Low voltage (D.C)unit (ii) DuBois Raymond induction coil with Neef's hammer – to obtain alternate faradic current (iii) Vibrating Reed (iv) Stimulating electrodes (v) Tap key (vi) Tuning fork (100 Hz)	 1 No 2 Nos 2 Nos 5 Nos 5 Nos 2 Nos
2.	Study of rate of Conduction of Nerve Impulses (i) Sherington – Starling drum (ii) Lucas trough / Muscle bath (iii) Writing lever with after load screw (Isotonic Muscle Lever) (iv) Electrical Kymograph (v) Muscle bath stand and S clamps Hook and weight	 2 Nos 2 Nos 4 Nos 2 Nos 2 Nos
3.	Isolated Frog Heart perfusion and Effect of ionic changes (i) Mariotte's bottle (Perfusion bottle) (ii) Rubber tubing (iii) Syme's Cannula (iv) Frontal lever/ Starling's Heart lever (v) Myograph board	 1 set
4.	Testing of Hearing using Tuning Fork Tuning Fork with 256 Hz	2 Nos
5.	Testing of various parameters of Vision and Errors of Refraction Color Blindness – Isihara chart Visual acuity – Snellen's chart Myopia + Hyperopia – by letters reading Ophthalmoscope – to view retina	 1set
6.	Testing for Detection of Glucose, Fructose and Starch (i) Test for detection of Glucose Source – Blood Estimation – Spectrophotometer Reagent : Alkaline Cupric Tartarate Solution Phosphomolybdic acid (ii) Test for detection of Fructose Reagent : 1% alpha napthol Concentrated Hydrochloric acid (iii) Test for detection of starch Reagent : Iodine	 1 set

	(iv) Test tube	
7.	General Test for Proteins General test for Proteins Reagent : Concentrated Nitric acid	1 set
8.	Testing of Urine for Presence of Sugar, Protein Testing of Urine for Presence of Sugar, Protein of Sugar Reagent – Benedict's reagent Protein Reagent – 1% Acetic acid	1 set
9.	Estimation using Spectrophotometer Spectrophotometer	1 No

EC1215 ELECTRONIC CIRCUITS LAB 0 0 3 100

1. Rectifier - FWR
2. Frequency Response of CE amplifier with self-bias.
3. Class B Power Amplifier - Efficiency Determination.
4. LC Oscillators (Hartley and Colpitt).
5. R- C Phase Shift Oscillator
6. Monostable and Astable Multivibrators.
7. Tuned Amplifier Frequency response.
8. Schmitt Trigger
9. Feedback Amplifier

List of equipment for a batch of 30

Sl.No	Description	Quantity required
1.	Rectifier – FWR • Diodes, Resistors, Capacitors • Transformer, Voltmeter, CRO, Regulated Power supply, Multimeter.	10 each 1 each
2.	Frequency Response of CE amplifier with self-bias • Transistors, Resistors, Capacitors • Function Generator, CRO, Regulated Power Supply	10 each 1 each
3.	Class B Power Amplifier – Efficiency Determination • Power Transistor and Power resistors • Function Generator, CRO, Regulated Power Supply, Power meter	10 each 1 each
4.	LC Oscillators (Hartley and Colpitt) • Transistors, Resistors, Capacitors, Inductors • CRO, Regulated Power Supply	10 each 1 each
5.	R-C Phase Shift Oscillator • Transistors, FETs, Resistors and Capacitors • CRO, Regulated Power Supply	10 each 1 each
6.	Monostable and Astable Multivibrators • Transistors, Resistors, Capacitors • CRO, Regulated Power Supply	10 each 1 each
7.	Tuned Amplifier Frequency response • Transistors, Resistors, Capacitors, Inductors • CRO, Regulated Power Supply.	10 each 1 each
8.	Schmitt Trigger • Transistors, Resistors • CRO, Regulated Power Supply, Function Generator	10 each 1 each

9.	Feedback Amplifier • Transistors, Resistors, Capacitors, Inductors • CRO, Regulated Power Supply, Function Generator	 10 each 1 each

BM1251 ELECTRIC FIELDS AND MACHINES 3 1 0 100

AIM

To give the necessary background to understand various laws and equations governing electric and magnetic fields.

OBJECTIVES

- To study in detail the steady electric field and steady magnetic field.
- To understand the variation in the equations while analysing the electric / magnetic field in time varying condition from the steady state condition.
- To study the measurements to be made to access the electrical parameters related to both electric and magnetic field.
- To understand the working of various electrical machines in both AC and DC excitation.

1. STATIC ELECTRIC FIELD 8

Coulomb's Law, Electric field intensity, Gauss's law and its applications, Permittivity, Polarisation, Boundary relation, Capacitance, Dielectric strength, Energy and energy density, Poisson's and Laplace equations and applications, Electric Current, Current Density, Ohms law at a point, Resistance and Conductance, Continuity relations for current, Problems.

2. STEADY MAGNETIC FIELD 8

The Biot- Sawart law, Gauss's law for magnetic fields, Torque on a loop, Ampere's law and magnetic field intensity, Magnetic materials, Magnetic dipoles, Loops and Solenoids, Magnetization, Inductance, Energy in an Inductor and Energy Density, Boundary relations, Ferro magnetism, Hysteresis, Reluctance and Permeance, Problems.

3. TIME VARYING ELECTRIC AND MAGNETIC FIELDS 7

Faraday's law, Transformer and Motional Induction, Maxwell's equation from Faraday's law, Self and Mutual Inductance, Displacement current, Maxwell's equation from Ampere's law and its in consistency, Boundary relation, Poynting Vector, Comparison of field and circuit theory, Circuit application of Pointing Vector.

4. ELECTRICAL CIRCUITS 7

Ohms law, Kirchoffs law, Steady State solution of DC circuits, Introduction to AC circuits, waveforms and RMS value, Power and Power factor, Single Phase and 3 Phase balanced circuits, Power measurement.

5. ELECTRICAL MACHINES 10

Principles of Operation and characteristics of Transformers (Single – Phase and Three – Phase), DC Machines, Synchronous Machines, 3 Phase and Single Phase Induction Motors, (op. principles).

6. ELECTRICAL MEASUREMENTS: 5

Moving coil and Moving Iron Instruments (Ammeter and Voltmeter), Dynamometer type watt meters and energy meters (op.principles).

TUTORIAL 15

TOTAL : 60

TEXT BOOK

1. John D.Krauss, “Electromagnetics”, McGraw-Hill, 1999

REFERENCE

1. Hayt.W.H, “Engineering Electromagnetics”, McGraw-Hill, 1995.

BM1252 SENSORS AND MEASURING TECHNIQUES 3 0 0 100

AIM

To gain knowledge about the measuring instruments and the methods of measurement.

OBJECTIVES

- To get the basic idea of measurements and the errors associated with measurement.
- To know about the types of transducers available.
- To understand the function of signal generators and analyzers.
- To gain information about the function of various measuring instruments and display and recording systems and the methods of using them.

1. CONCEPTS OF MEASUREMENT: **6**

Measurements, instrumentation, errors in measurements, calibration and standard.

2. TRANSDUCERS: 10

Classification and characteristics of transducers, transducers for measurement of pressure, flow and temperature, optical sensors, acoustic sensors, DC and AC bridges.

3. SIGNAL GENERATORS AND SIGNAL ANALYSERS 10

AF generator, Pulse generator, AM/FM signal generators, Function generator, Sweep frequency generator, wave analyser, spectrum analyser, logic analyser, distortion analyser.

4. DIGITAL INSTRUMENTS: **10**

Digital Voltmeters and Multimeters, automation in Voltmeters, accuracy in DVM, Guarding techniques, Frequency, period, time interval and pulse width measurement.

5. DATA DISPLAY AND RECORDING SYSTEM: **9**

CRO, Single beam, dual trace, double beam CRO, storage CRO, sampling oscilloscope, analog and digital recorders, multichannel column display oscilloscope, magnetic recorder.

TOTAL : 45

TEXT BOOK

1. Cooper, “ Electronic Instrumentation and Measurement techniques “ Prentice Hall of India, 1998.

REFERENCES

1. Doeblin, “Measurements Systems “, McGraw-Hill, 1990.
2. C. Barney, “ Intelligent Instrumentation “, Prentice hall of India, 1985.
3. C.S. Rangan ,” Instrumentation Devices and Systems”, Tata McGraw-Hill 1998.

BM1253 MEDICAL PHYSICS 3 0 0 100

AIM

To get the complete understanding of radioactivity and effect of high frequency signals on various tissues of the body.

OBJECTIVES

- To understand various parameters in atomic physics.
- To study effects of radiation in various living cells and lethal dose levels.
- Understand the principles and application of photomedicine.

1. ATOMIC PHYSICS 10

Traditional definition of atom, periodic system of elements, mechanical properties of atom, emission of light and its frequencies. Electromagnetic spectra.
Principles of Nuclear Physics – Natural radioactivity, Decay series, type of radiation and their applications, artificially produced isotopes and its application, accelerator principles; Radionuclides used in Medicine and technology.

2. INTERACTION WITH LIVING CELLS 8

Target theory, single hit and multi target theory, cellular effects of radiation, DNA damage, depression of Macro molecular synthesis, Chromosomal damage.

3. SOMATIC EFFECT OF RADIATION 8

Radio sensitivity protocol of different tissues in human, LD 50/30 effect of radiation on skin, blood forming organs, lenses of eye, embryo and Endocrinal glands.

4. GENETIC EFFECT OF RADIATION 10

Threshold of linear dose effect, relationship, factors affecting frequency of radiation induced mutation, Gene controlled hereditary diseases, biological effect of microwave and RF wave. Variation in dielectric constant and specific conductivity of tissues. Penetration and propagation of signals effects in various vital organs, Protection standards.

9

PHOTO MEDICINE –Synthesis of Vitamin D in early and late cutaneous effects, Phototherapy, Photo hemotherapy, exposure level, hazards and maximum permissible exposures.
LASER PHYSICS – Characteristics of Laser radiation, Laser speckle, biological effects, laser safety management.

TOTAL : 45

TEXT BOOKS

1. Moselly, 'Non ionising Radiation' Adam Hilgar Brustol 1988
2. Branski.S and Cherski.P 'Biological effects of Microwave' Hutchinson & ROSS Inc. Strondsburg 1980

REFERENCES

1. Glasser.O.Medical Physics Vol.1,2,3 year Book Publisher Inc Chicago, 1980

EC1266 ANALOG AND DIGITAL IC'S 3 1 0 100

AIM

To understand the functions of various digital and analog IC's and their applications in the design of electronic circuits.

OBJECTIVES

- To get the knowledge about the important electrical characteristics and operation of different analog IC's.
- To study the applications of the above IC's in the design of electronic circuits.
- To get basics of digital systems.
- To study the design of combinational circuits and sequential circuits and thus to gain knowledge about digital IC's.

1. OPERATIONAL AMPLIFIERS AND APPLICATIONS 10

Characteristics of ideal op amp, Virtual Short, differential amplifier, offset currents and voltages, Slew rate, 741 IC Specifications, inverting an non-inverting amplifiers, adder/ subtractor, instrumentation amplifier, voltage to current and current to voltage converters, dc voltage follower, differential dc amplifier, bridge amplifier, integrator, differentiator, active low pass, high pass and band pass active filters, precision diode and clamp, half wave rectifier, average detector, peak detector, log – antilog amplifiers, astable, monostable and triangular wave generators, Schmitt Trigger, analog multiplier.

2. PHASE LOCKED LOOP AND APPLICATIONS, D/A AND A/D 10 CONVERTERS 10

Basic Principles, Phase comparator, Voltage controlled Oscillator, Lock Range, Capture Range, PLL IC 565, Functional block Schematic of PLL, PLL applications – Frequency multiplication, frequency translation, AM, FM detection, D/A converter, A/D converters, Successive approximation, Parallel ADC, V to F ADC, Counter Ramp ADC.

3. NUMBER SYSTEMS 9

Binary, Octal, Hexadecimal, Conversions between Number Systems, BCD, Gray and Excess 3 Representations, r's and (r-1)'s Complements, Subtraction using 1's and 2's. Complements, Binary to Gray, Gray to Binary Conversions, Alpha numeric codes, Boolean theorems, Minterm and maxterm representation, SOP and POS forms, Karnaugh maps, Tabulation methods, Logic gates – Truth tables, Realization of Boolean functions using Gates, Universal Gates.

4. MSI COMBINATIONAL CIRCUITS 7

Half and Full adders, Parallel binary adder, BCD adder, Half and Full subtractors, magnitude comparator, Decoder, Encoder, Multiplier, ROM, PLA, Boolean _Expression Implementation using these IC's.

5. SEQUENTIAL CIRCUITS 9

Flip Flops – SR, JK, T, D, Characteristic equations, Excitation Tables, Design of counters using Excitation tables, Synchronous and Asynchronous Counters, 7490, 74161 Counter IC specifications, Ring and Johnson Counters, Shift Registers, 74194 Shift Register IC Specifications.

TUTORIAL 15

TOTAL : 60

TEXT BOOKS

1. Ramakant A.Gayakwad, 'OP-AMP and Linear IC's', Prentice Hall, 1994.
2. Morris Mano.M 'Digital Logic and Computer Design' Prentice Hall of India, 2001.

REFERENCES

1. Millman.J Halkias.C.C., 'Integrated Electronics', McGraw-Hill, 1972.

BM1255 PATHOLOGY AND MICROBIOLOGY 3 0 0 100

AIM

To get the basic understanding of pathological and microbiological variations in identifying various diseased conditions.

OBJECTIVES

- To study the normal cell structures and variations during diseased conditions.
- To get the thorough understanding of humodynamic variations in various pathological conditions.
- To understand the pathological conditions of infections and immunity.
- To study the bacterial growth pattern and different types of microscopes used for these purpose.
- To study the different types of staining techniques used to identify disease forming organism.

1. NORMAL CELL STRUCTURE 9

Cell Degeneration and regeneration - Inflammations, apoptosis, Neoplasia. Classification, Difference between benign and malignant tumors – Etiology of tumors – Spread of Tumors.

2. FLUID AND HEAMODYNAMIC DERANGEMENT 9

Edema, Shock, Hemorrhage – Thrombus – Embolism – Disseminated intra vascular Coagulation – Hematological disorders. Bleeding Disorders – Leukemia – lymphoma.

3. GENETIC DISORDERS, INFECTION AND IMMUNITY 9

Autosomal and Sex linked disorders – Storage disorders – Types of hypersensitivity reactions – Immune deficiency Syndrome – Primary – HIV – Viral disease. Chlamydial – Bacterial – mycoplasma – Rickettsial disease – Fungal, protozolal. – Helminthic disease.

4. General Structural Organization of Bacterial, Viral Cell – Growth and Identification of Bacteria, Observation of culture.
Microscopy: - Light Microscopy – Dark field Microscopy – Phase contrast microscopy – electron microscopy. **9**

5. Identification of disease producing organism, Simple Stain, Gram Stain, AFB Stain, Fluorescent techniques, Antigen – Antibody Technique. **9**

TOTAL : 45

TEXT BOOKS

1. Robbins S.L & Ramzi S.C, "Pathologic Basis of Diseases', W.B. Saunders Co. 1999
2. Anatha Narayanan.R & Jayaram Panicker C.R, 'Text Book of Microbiology, Orient Laongman' 1998.

EC1267 PRINCIPLES OF COMMUNICATION 3 0 0 100

AIM

To have knowledge about Analog and Digital transmission of both Analog data and Digital Data, Security, modulation and different accessing methods.

OBJECTIVES

- To have understanding about different types of AM Communication systems (Transmitters & Receivers)
- To study in detail the different types of FM transmitters & Receivers and PM Transmitters and Receivers
- To gain knowledge about different digital modulation techniques for digital transmission.
- To have knowledge about base band transmission ISI and distortion free base band transmission
- To know the spread spectrum modulation techniques and different multiple access methods.

1. SPECTRAL ANALYSIS AND RANDOM PROCESS 9

Spectral characteristics of periodic and aperiodic signal – Spectra of common signals related to communication – cross correlation – autocorrelation and power / energy density spectra – random signals and process – modelling noises.

2. ANALOG MODULATION SYSTEMS 9

Basic principles of AM, FM, and PM – Spectra – power consideration – receivers characteristics and deduction of AM, FM, and PM and Systems performance – Threshold effects reduction.

3. BASE BAND DATA COMMUNICATION 9

Sampling and quantisation – PCM, ADPCM, DM, ADM, Base band pulse shaping – binary data formats – base band transmission – ISI – correlative coding – optimum SNR – matched filter detection.

4. DIGITAL MODULATION 9

Digital modulation – coherent binary modulation techniques – coherent quadrature modulation techniques – non-coherent binary modulation – M-array modulation – performance of digital modulation systems based on probability if error – band width – ISI.

5. SPREAD SPECTRUM AND ERROR CORRECTION TECHNIQUES 9

Fundamental concepts – Direct sequence spread spectrums and frequency hopping spread spectrum – Block Codes – cyclic codes.

TOTAL : 45

TEXT BOOKS

1. Bernald Sklan, 'Digital Communocation' Pearson Education, 2nd edition 2001.
2. Taub & Schilling, 'Principles of Communication', Tata McGraw Hill Publication, 1990.
3. Simon Haykins, 'Digital Communication', John Wiley, 2001.

REFERENCES

1. B.P.Lathi, 'Analog and Digital Communication Systems', PHI, 1992.
2. Proakis, 'Digital Communication', McGraw-Hill, 1992.
3. A.B.Carlson, 'Communication Systems' McGraw-Hill, 1992.
4. K.Sam Shanmugam,'Digital and Analog Communication Systems, John Wiley, 1985.

EC1263 INTEGRATED CIRCUITS LAB 0 0 3 100

1. Integrator and Differentiator
2. Multivibrators using IC 555 Timer
3. Schmitt Trigger
4. Instrumentation Amplifier
5. Phase shift Oscillator and Wien Bridge Oscillator

6. Half Adder and Full Adder
7. Encoder and Decoder
8. Multiplexer
9. Shift Register
10. Decade Counter

List of equipment for a batch of 30

Sl.No	Description	Quantity required
1.	**Integrator and Differentiator** • IC 741, Resistors, Capacitors • CRO, Dual Power Supply, Function Generator	 10 each 1 each
2.	**Multivibrators using IC 555 Timer** • IC 555 • CRO, Dual Power Supply	 10 each 1 each
3.	**Schmitt Trigger** • IC 741 • CRO, Dual Power Supply, Function Generator	 10 each 1 each
4.	**Instrumentation Amplifier** • IC 741, Resistors, Capacitors • CRO, Dual Power Supply, Function Generator	 10 each 1 each
5.	**Phase shift Oscillator and Wien Bridge Oscillator** • IC 741, Resistors, Capacitors • CRO, Dual Power Supply, Function Generator	 10 each 1 each
6.	**Half Adder and Full adder** • Half Adder and Full adder ICs • Bread Board, LEDs, Digital Trainer kit, Regulated Power Supply.	 10 each 1 each
7.	**Encoder and Decoder** • Encoder and Decoder ICs • Bread Board, LEDs, Digital Trainer kit, Regulated Power Supply	 10 each I each
8.	**Multiplexer** • Multiplexer Ics • Bread Board, LEDs, Digital Trainer kit, Regulated Power Supply	 10 each I each
9.	**Shift Register** • Shift Register ICs • Bread Board, LEDs, Digital Trainer kit, Regulated Power Supply	 10 each I each
10.	**Decade Counter** • Decade Counter ICs • Bread Board, LEDs, Digital Trainer kit, Regulated Power Supply	 10 each I each

BM1258 PATHOLOGY AND MICROBIOLOGY LAB 0 0 4 100

1. Haemoglobin Estimation.
2. Peripheral Smear Study.
3. Urine Smear Study
4. Cross matching of Blood.
5. Tissue Biopsy – Benign and Malignant.
6. Simple Stain test
7. Gram Stain test.
8. AFB Stain test.

List of equipment for a batch of 30

Sl.No	Description	Quantity required
1.	**Haemoglobin Estimation** Sahil's Haemoglobinometer	1 set
2.	**Peripheral Smear Study** Peripheral smear – Routine Leishman's Stain RBC – Size, Shape Inclusions in RBC WBC – Differential count Glass Slide, Binocular Microscope with light	1 set
3.	**Urine Smear Study** Urine Smear, Glass Slide, Cover slips Binocular Microscope with light	1 set
4.	**Cross matching of Blood** Blood Grouping : cross – matching with respective centisera available in the market Slide, Antisera, Binocular Microscope with light	1 set
5.	**Tissue Biospy – Benign and Malignant** Tissue Biospy – Aspirating biopsy needle (under doctor's supervision) Glass slide	1 set
6.	**Simple Stain test** SIMPLE STAIN, Glass Slide Reagents – Methylene blue, Crystal Violet, Cabal Iuschin	1 set
7.	**Gram Stain test** **SIMPLE GRAM STAIN** Reagents – Crystal Violet, Gram's Iodine, 95% ethyl alcohol Safranin Urine bacterial count/ml exceeding 100,000(10s) denotes urinary tract infection. Normal : 0-100 ml Glass Slide	1 set
8.	**AFB Strain test** ACID FAST STAIN (ZIEHL – NEELSON METHOD) Reagent – Carbal Iushin, Acid Alcohol, Methylene blue, Glass slide	1 set

GE1351 PROFESSIONAL ETHICS AND HUMAN VALUES 3 0 0 100

OBJECTIVE

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty
- To appreciate the rights of Others

1. HUMAN VALUES 10

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality

2. ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

3. ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study

4. SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies.
Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

5. GLOBAL ISSUES 8

Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE),India, etc.

TOTAL : 45

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw-Hill, New York, 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCES

1. Charles D. Fleddermann, “Engineering Ethics”, Pearson Education/ Prentice Hall, New Jersey, 2004 (Indian Reprint)
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, “Engineering Ethics – Concepts and Cases”, Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, “ Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001 .

EC1311 DIGITAL SIGNAL PROCESSING 3 1 0 100

AIM

To study the signal processing methods and processors.

OBJECTIVES

- To study of DFT and its computation
- To study the design techniques for digital filters
- To study the finite word length effects in signal processing
- To study special techniques like power spectrum estimation, time frequency representation.

1. DISCRETE – TIME SIGNALS AND SYSTEMS 10

Sampling of Analogue signals – aliasing – standard discrete time signals – classification – discrete time systems – Linear time invariant stable casual discrete time systems – classification methods – linear and circular convolution – difference equation representation – DFS, DTFT, DFT – FFT computations using DIT and DIF algorithms. Time response and frequency response analysis of discrete time systems to standard input signals.

2. INFINITE IMPULSE RESPONSE DIGITAL FILTERS 9

Review of design of analogue Butterworth and Chebyshev Filters, Frequency transformation in analogue domain – Design of IIR digital filters using impulse invariance technique – Design of digital filters using bilinear transform – pre warping – Frequency transformation in digital domain – Realization using direct, cascade and parallel forms.

3. FINITE IMPULSE RESPONSE DIGITAL FILTERS 9

Symmetric and Antisymmetric FIR filters – Linear phase FIR filters – Design using Frequency sampling technique – Window design using Hamming, Hanning and Blackmann Windows – Concept of optimum equiripple approximation – Realisation of FIR filters – Transversal, Linear phase and Polyphase realization structures.

4. FINITE WORD LENGTH EFFECTS 8

Quantization noise – derivation for quantization noise power – Fixed point and binary floating point number representations – Comparison – Overflow error – truncation error – coefficient quantization error – limit cycle oscillations- signal scaling – analytical model of sample and hold operations.

5. SPECIAL TOPICS IN DSP 9

Discrete Random Signals- Mean, Variance, Co-variance and PSD – Periodiogram Computation – Principle of Multi rate DSP – decimation and Interpolation by integer factors – Time and frequency domain descriptions – Single, Multi stage, polyphase structures – QMF filters – Subband Coding.

TUTORIAL 15

TOTAL : 60

TEXT BOOK

1. John G. Proakis and Dimitris G.Manolakis, 'Digital Signal Processing, Algorithms and Applications', PHI of India Ltd., New Delhi, 3rd Edition, 2000.

REFERENCES

1. Sanjit K.Mitra 'Digital Signal Processing', A Computer Based Approach, Tata McGraw-Hill, New Delhi, 1998.

BM1301 BIOCONTROL SYSTEMS 3 1 0 100

AIM

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

OBJECTIVES

- To study system concept and different mathematical techniques applied in analysing 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 apply these analysis to study the biological systems.

1. CONTROL SYSTEM MODELLING. 9

System concept, Differential Equations, Transfer functions, Modelling of electrical systems, Translational and rotational mechanical systems, Electro-mechanical systems, physiological systems, block diagram modelling, signal flow graphs.

2. TIME RESPONSE ANALYSIS 9

Time domain specifications, step and Impulse response analysis of first order and second order systems, steady state errors, stability, Routh-Hurwitz criteria, Root locus techniques, construction of root locus, stability, dominant poles, applications of Root locus diagram.

3. FREQUENCY RESPONSE ANALYSIS 9

Frequency response, Bode plot-Nyquist plots, Nyquist stability criterion, Relative stability, Gain margin, phase margin, bandwidth magnitude plots, constant circles, Nichol's chart

4. PHYSIOLOGICAL CONTROL SYSTEMS 9

Introduction to physiological control systems, modelling of human movements, parameter estimation, linearizing

5. STUDY OF BIOLOGICAL SYSTEMS 9

Human Thermal system, Neuro muscular system, Respiratory system, occulomotor system.

TUTORIAL 15

TOTAL : 60

REFERENCES

1. M.Gopal, 'Control Systems', Principles and Design, Tata McGraw-Hill, 1997.

2. Benjamin. C.Kuo, ' Automatic Control Systems', Prentice Hall of India, 1995.
3. Manfreclyner and John H.Milsum, Bio Medical engineering system, McGraw-Hill and Co., Neo York, 1970.

BM1302 BIOMEDICAL INSTRUMENTATION 3 0 0 100

AIM

To give a complete exposure of various recording mechanism and physiological parameters measured for diagnostic application.

OBJECTIVES

- To study different types of electrodes used in biopotential recording.
- To understand the characteristics of bioamplifiers and different types of recorders.
- To understand how to measure various biochemical and nonelectrical parameters of human system.
- To study the instrumentation concerned with measuring the blood flow volume, velocity and number of particles in the blood.

1. BIO-POTENTIAL ELECTRODES 9

Electrode electrolyte interface, half-cell potential, polarisation and non- polarisable electrode, calomel electrode, needle and wire electrode, microelectrode-metal micropipete.

2. RECORDING SYSTEM 9

Low-Noise preamplifier, main amplifier and driver amplifier, inkjet recorder, thermal array recorder, photographic recorder, magnetic tape recorder, X-Y recorder, medical oscilloscope.

3. BIO-CHEMICAL MEASUREMENT 9

pH, pO_2, pCO_2, $pHCO_3$, Electrophoresis, colorimeter, spectro photometer, flame photometer, auto analyser.

4. NON-ELECTRICAL PARAMETER MEASUREMENTS 9

Respiration, heart rate, temperature, pulse blood pressure, cardiac output, O_2, CO_2 measurements.

5. BLOOD FLOW AND BLOOD CELL COUNTING 9

Electromagnetic and ultrasonic blood flowmeter, indicator dilution method, thermodilution method, manual and automatic counting of RBC, WBC and platelets.

TOTAL : 45

TEXT BOOK

1. Leslie Cromwell, “Biomedical Instrumentation and measurement”, Prentice hall of India, New Delhi, 1997.

REFERENCES

1. John G. Webster, “Medical Instrumentation Application and Design”, John Wiley and sons, New York, 1998.

2. Khandpur R.S, “Handbook of Biomedical Instrumentation”, Tata McGraw-Hill, New Delhi, 1997.
3. Joseph J.carr and John M. Brown, “introduction to Biomedical equipment technology”, John Wiley and sons, New York, 1997.

BM1303 BIOMATERIALS AND ARTIFICIAL ORGANS 3 0 0 100

AIM

- To understand the properties of the Bio-compatible materials
- To study the different types of Biomaterials
- To study artificial organs made using tissue materials

OBJECTIVE

- To study the characteristics and classification of Biomaterials
- To study about the different metals and ceramics used as biomaterials
- To learn about polymeric materials and combinations that could be used as a tissue replacement implants
- To study the artificial organ developed using these materials

1. 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.

2. 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..

3. POLYMERIC IMPLANT MATERIALS 9

Polymerisation, polyolefin, polyamicles, Acryrilic, polymers, rubbers, high strength thermoplastics, medical applications.

4. TISSUE REPLACEMENT IMPLANTS 9

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

5. ARTIFICIAL ORGANS 9

Artificial Heart, Prosthetic Cardiac Valves, Limb prosthesis, Externally Powered limb Prosthesis, Dental Implants

TOTAL : 45

TEXT BOOK

1. PARK J.B., “Biomaterials Science and Engineering”, Plenum Press, 1984.

EC1318 MICROPROCESSOR AND APPLICATIONS 3 0 0 100

AIM

To understand the architecture and instruction sets of different microprocessors and microcontrollers and to design systems using them.

OBJECTIVES

- To study the architecture of microprocessors like 8085, 8086 and higher versions and microcontrollers.
- To understand the instruction set of the above.
- To know the methods of connecting them to the peripheral devices.
- To use all the above in the design of microprocessor/microcontroller based systems.

1. 8-BIT MICROPROCESSOR: **9**

8085 Architecture and Memory interfacing, interfacing I/O devices, Instruction set, Addressing Modes, Assembly language programming, counters and time delays, interrupts, timing diagram, Microprocessor applications.

2. MICROCONTROLLER: **9**

Intel 8031/8051 Architecture, Special Function Registers (SFR), I/O pins, ports and circuits, Instruction set, Addressing Modes, Assembly Language Programming, Timer and Counter Programming, Serial Communication, Connection to RS 232, Interrupts Programming, External Memory interfacing, Introduction to 16 bit Microcontroller

3. 80X86 PROCESSORS: 9

8086 Architecture, Pin Configuration, 8086 Minimum and Maximum mode configurations, Addressing modes, Basic Instructions, 8086 Interrupts, Assembly levels programming. Introduction to 80186, 80286,80386, 80486 and Pentium processors.

4. PERIPHERALS AND INTERFACING: **9**

Serial and parallel I/O (8251 and 8255), Programmable DMA Controller (8257), Programmable interrupt controller (8259), keyboard display controller (8279), ADC/DAC interfacing. Inter integrated circuits interfacing (I^2C standard).

5. MICROPROCESSOR BASED SYSTEMS DESIGN, DIGITAL INTERFACING 9

Interfacing to alpha numeric displays, interfacing to liquid crystal display (LCD 16 x 2 line), high power Devices and Optical motor shaft encoders, stepper motor interfacing, Analog interfacing and industrial control, microcomputer based smart scale, industrial process control system, Robotics and Embedded control, DSP and Digital Filters.

TOTAL : 45

TEXT BOOKS

1. Ramesh S. Gaonkar, Microprocessor Architecture Programming and Applications with 8085. Fourth edition, Penram International Publishing 2000.
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi, The 8051 Microcontroller, and Embedded Systems, Prentice Hall 2000.
3. Douglas V.Hall, Microprocessor and Interfacing, Programming and Hardware. Tata McGraw-Hill, Second Edition. 1999.

REFERENCES

1. Kenneth J.Ayala., "The 8051 Microcontroller Architecture Programming and Applications", Penram International Publishing (India). 1996.
2. Kenneth J.Ayala "The 8086 Microprocessor, Programming and Interfacing the PC", Penram International Publishing. 1995.

3. Barry.B.Brey. "The Intel Microprocessor 8086/8088. 80186, 80286, 80386 and 80486 Architecture Programming and Interfacing", Prentice Hall of India Pvt.Ltd.1995.
4. Ray A.K.Bhurchandi.K.M, "Advanced Microprocessor and Peripherals", Tata McGraw-Hill, 2002.

EC1316 MICROPROCESSOR LAB 0 0 3 100

1. Programming 8085.
2. Programming 8086.
3. Micro controller.
4. PC based systems.
5. Stepper motor control.
6. Display control.
7. A/D and D/A interfacing.
8. Mini Projects.

BM1304 BIOMEDICAL INSTRUMENTATION LAB 0 0 3 100

1. Study of Biological Preamplifiers.
2. Recording of ECG signal and Analysis.
3. Recording of Audiogram.
4. Recording of EMG.
5. Recording of EEG.
6. Re cording of various physiological parameters using patient monitoring system and telemetry units.
7. Measurement of pH, pO_2 and conductivity.
8. Study and analysis of functioning and safety aspects of surgical diathermy.
9. Mini project.

EC1361 DIGITAL IMAGE PROCESSING 3 0 0 100

AIM

To introduce the student to various image processing techniques.

OBJECTIVES

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedures.

1. DIGITAL IMAGE FUNDAMENTAL 9

Elements of digital image processing systems, Elements of Visual perception, Image sampling and quantization, Matrix and Singular Value representation of discrete images.

2. IMAGE TRANSFORMS 9

1D DFT, 2D DFT, Cosine, Sine Hadamard, Hear, Slant, KL, SVD transform and their properties.

3. IMAGE ENHANCEMENT 9

Histogram – Modification and specification techniques Image smoothing, Image sharpening, generation of spatial masks from frequency domain specification, Nonlinear filters, Homomorphic filtering, false color, Pseudocolor and color image processing.

4. IMAGE RESTORATION AND RECOGNITION 9

Image degradation models, Unconstrained and Constrained restoration, inverse filtering, Least mean square filter, Pattern Classes, optimal statistical classifiers, Neural networks and associated training methods and use of neural networks in image processing.

5. IMAGE COMPRESSION 9

Runlength, Huffman coding, Shift codes, arithmetic coding, bit plane coding, transform coding, JPEG Standard, wavelet transform, predictive techniques, Block truncation coding schemes, Facet modeling.

TOTAL : 45

TEXT BOOKS

1. Anil K.Jain, "Fundamentals of Digital Image Processing", Prentice Hall of India, 1997.
2. Rafel C. Gonzalez and Richard E. Woods, Digital Image Processing", Addison Wesley, 1993.

REFERENCES

1. William K. Pratt, "Digital Image Processing", John Wiley, NJ, 1987.
2. Sid Ahmed M.A., "Image Processing Theory, Algorithm and Architectures", McGraw-Hill, 1995.
3. Scott E.C. Umbaugh, "Computer Vision and Image processing", Prentice Hall, Eaglewood Cliffs, NJ 1998.

MG1351 PRINCIPLES OF MANAGEMENT 3 0 0 100

OBJECTIVE

Knowledge on the principles of management is essential for all kinds of people in all kinds of organizations. After studying this course, students will be able to have a clear understanding of the managerial functions like planning, organizing, staffing, leading and controlling. Students will also gain some basic knowledge on international aspect of management.

1. HISTORICAL DEVELOPMENT 9

Definition of Management – Science or Art – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organisation.

2. PLANNING 9

Nature & Purpose – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies & Planning Premises- Forecasting – Decision-making.

3. ORGANISING 9

Nature and Purpose – Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process - Techniques – HRD – Managerial Effectiveness.

4. DIRECTING 9

Scope – Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Communication – Process of Communication – Barriers and Breakdown – Effective Communication – Electronic media in Communication.

5. CONTROLLING 9

System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology in Controlling – Use of computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.

TOTAL : 45

TEXT BOOKS

1. Harold Kooritz & Heinz Weihrich "Essentials of Management", Tata McGraw-Hill, 1998.
2. Joseph L Massie "Essentials of Management", Prentice Hall of India, (Pearson) Fourth Edition, 2003.

REFERENCES

1 Tripathy PC And Reddy PN, "Principles of Management", Tata McGraw-Hill, 1999.
2. Decenzo David, Robbin Stephen A, "Personnel and Human Reasons Management", Prentice Hall of India, 1996.
3. JAF Stomer, Freeman R. E and Daniel R Gilbert Management, Pearson Education, Sixth Edition, 2004.
4. Fraidoon Mazda, " Engineering Management", Addison Wesley, 2000.

BM1351 RADIOLOGICAL EQUIPMENTS 3 0 1 100

AIM

- To get the clear understanding of X-ray generation and radio isotopes and various techniques used for visualising organs in detail.
- To understand the need for radiation protection and method of monitoring the radiation level.

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 radiodiagnostic unit.
- To know the techniques to visualise opaque, transparent organs.
- To study the special techniques adopted to visualise different sections of any organ.
- To study the principles and applications of radio isotopes for diagnosis.
- To understand the need for radiation protection and various monitoring and protection techniques used in radiological equipment.

1. X-RAYS 10

Principles and production of soft and hard X-rays, selection of anodes, Heel Pattern. Scattered radiation, Porter Bucky system, Cooling system.

2. RADIO DIAGNOSIS: 9

Radiography, Angiography, Fluoroscopy, Image Intensifier, Multi section radiography.

3. **SPECIAL RADIOLOGICAL EQUIPMENTS 10**

Principle, Plane of Movement, Multi section Radiography, CAT. Principle of NMR, MRI

4. **APPLICATION OF RADIOISOTOPES 10**

Alpha, Beta and Gamma emission, Principle of radiation detectors, dot scanners, Nuclear angiogram, Principles of Radiation therapy.

5. RADIATION SAFETY 6

Hazardous effect of Radiation, Radiation protection Techniques, Safety Limits, Radiation Monitoring.

TUTORIAL 15

TOTAL : 60

TEXT BOOKS

1. R.S.Khandpur, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1997. (Unit I - IV).
2. Steve Webb, "The Physics of Medical Imaging ", Adam Hilger Philadelphia 1988. (Unit V)

REFERENCES

1. William R.Hendee, E.Russel Ritenour," Medical Imaging Physics", Third Edition, Mosby Year Book, St. Louis, 1992.

BM1352 DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS – I 3 0 1 100

AIM

- To study the techniques of analysing cardiac, neural and skeletal muscular system by analysing biopotential recorded from the corresponding organs.
- To study the lung volume measuring techniques.
- To study in detail the units that can be used in the case of disfunction in the above mentioned organs.

OBJECTIVES

- To study the genesis and variation in ECG waveform.
- To understand functioning and uses of pacemaker and defibrillators.
- To study genesis and recording of EEG signals.
- To identify the epileptic discharges.
- To understand structure, method of muscle contraction, generation of EMG signals.
- To study the functioning of muscle and nerve stimulators.
- To clearly understand functioning and utilities of heart lung machine and respirators.

1. CARDIAC SYSTEM 9

ECG, sources of ECG, normal and abnormal waveform, diagnosis interpretation, cardiac pacemaker-external pacemaker, implantable pacemaker, different types of pacemakers, fibrillation, defibrillator, AC defibrillator, DC defibrillator, electrodes, synchronised and unsynchronised types.

2. NEUROLOGICAL SYSTEM 9

EEG, genesis, lead system, wave characteristics, frequency bands, spontaneous and evoked response, diagnostic interpretation, epileptic discharges.

3. SKELETAL MUSCULAR SYSTEM 9

Structure of muscles, sliding theory of contraction, stimulation of muscles, muscle potential generation, recording and analysis of EMG waveforms, muscle and nerve stimulation, fatigue characteristics.

4. HEART-LUNG MACHINE. 9

Need for the unit, functioning of bubble, disc type and membrane type oxygenerators, finger pump, roller pump, electronic monitoring of functional parameter.

5. RESPIRATORY MEASUREMENT AND VENTILATOR 9

Spiro meter, Respiratory volume measurement, pnemograph, artificial respirator – IPR type, functioning.

TUTORIAL 15

TOTAL : 60

TEXT BOOK

1. Joseph J.carr and John M. Brown, "introduction to Biomedical equipment technology", John Wiley and sons, New York, 1997.

REFERENCES

1. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 1998.
2. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 1997.

BM1353 VISUAL PROGRAMMING 3 0 0 100

AIM

To know and program in GUI based visual programming languages.

OBJECTIVES

- To get an introduction about Win32 environment.
- To be familiar with event driven programming.
- To know about MFC and how to work with App Wizard.

1. INTRODUCTION TO WINDOWS PROGRAMMING 8

GUI Concepts – Overview of Windows programming – Creating the window - Displaying the window - message Loop – windows procedure-WM_PAINT message - WM_DESTROY message – An Introduction to GDI – Scroll Bars – Keyboard – Mouse – Menus.

2. VISUAL BASIC PROGRAMMING 9

IDE – First Visual Basic Program - Introduction to Forms –Intrinsic Controls –working with Files - Accessing databases with data control - Classes and Objects – ADO Object Model.

3. VISUAL C++ PROGRAMMING 9

Windows Programming Model - Visual C++ components – Microsoft foundation classes Library Application Framework – Getting Started with AppWizard – Basic Event handling, Mapping modes, and a Scrolling View - Graphics Device Interface, Colors and fonts – Modal Dialog and Windows Common Dialogs – Modeless Dialog and windows Common dialogs – Using ActiveX controls – Windows Message Processing and Multithreading.

4. ADVANCED CONCEPTS 9

Menus – Keyboard Accelerators – Rich Edit Control – Tool bars – Status bars – A reusable Frame Window Base Class - Reading and writing documents - SDI and MDI environments – splitter windows and multiple views.

5. APPLICATIONS OF WINDOWS PROGRAMMING 10

Dynamic link library – Component Object Model - Object linking and embedding – Data Base Management With Microsoft ODBC.

TOTAL : 45

TEXT BOOKS

1. Charles Petzold, "Windows Programming", Microsoft press, 1996. Chapters: 2,5,6,9,10
2. Francesco Balena, "Programming Microsoft Visual Basic6.0", Microsoft press, Indian Reprint, 2001. Chapters: 1,2,3,5,6,13
3. David Kruglirski.J, "Programming Microsoft Visual C++", Fifth Edition, Microsoft press, 1998. Chapters: 1,2,3,4,5,6,7,8,12,13,14,15,17,18,20,22,24,31

REFERENCE BOOKS

1. G.Cornell, "Visual Basic 6", Tata McGraw-Hill, 1998.
2. Deitel & Deitel, T.R.Nieto, "Visual Basic 6, How to program", Prentice Hall of India, 1999.

EC1370 DIGITAL SIGNAL PROCESSING LAB 0 0 3 100

1. Representation of time-series; computation of convolution.
2. Response of a difference equation to initial conditions; stability.
3. DFT computation.
4. Computational experiments with digital filtering.
5. Sampling and waveform generation.
6. FIR and IIR filters implementation.
7. Fast Fourier Transform.
8. Quantization noise.
9. Adaptive filters.
10. Multirate signal processing.

BM1354 VISUAL PROGRAMMING LAB 0 0 3 100

1. VISUAL BASIC 15

i. Simple programs with control structures
ii. Adding menus to forms
iii. Creating dialog boxes with various options
iv. MDI applications
v. Writing code for various keyboard and mouse events
vi. OLE container control
vii. Simple programs with classes and objects
viii. Data access through Data control and DAO.

2. **VISUAL C++ 30**

xi. Creating applications with App wizard
xii. Drawing in documents
xiii. Working with MFC
xiv. Creating simple SDI and MDI applications
xv. Exception handling
xvi. Loading – Editing and – Adding resources – Linking resources to applications
xvii. Drawing bitmaps
xviii. Threads
xix. OLE
xx. Active X
xxi. DLL's

TOTAL : 45

MG1401 TOTAL QUALITY MANAGEMENT 3 0 0 100

OBJECTIVE

- To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.
- To understand the statistical approach for quality control.
- To create an awareness about the ISO and QS certification process and its need for the industries.

1. INTRODUCTION 9

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

2. TQM PRINCIPLES 9

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

3. STATISTICAL PROCESS CONTROL (SPC) 9

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

4. TQM TOOLS 9

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

5. QUALITY SYSTEMS 9

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 – Concept, Requirements and Benefits.

TOTAL : 45

TEXT BOOK

1. Dale H.Besterfiled, et al., Total Quality Management, Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6.

REFERENCES

1. James R.Evans & William M.Lidsay, The Management and Control of Quality, (5th Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).
2. Feigenbaum.A.V. "Total Quality Management, McGraw Hill, 1991.
3. Oakland.J.S. "Total Quality Management Butterworth – Hcinemann Ltd., Oxford. 1989.
4. Narayana V. and Sreenivasan, N.S. Quality Management – Concepts and Tasks, New Age International 1996.

5. Zeiri. “Total Quality Management for Engineers Wood Head Publishers, 1991.

BM1401 COMPUTERS IN MEDICINE 3 0 1 100

AIM

To have a clear understanding of computer hardwares and the applications of computers in data acquisition, monitoring, system modelling and medical research.

OBJECTIVES

- To study the 8086 architecture, instruction sets and various units of PC-AT.
- Study the technique of data acquisition, storage, retrieval and transmission of bioinformation.
- To understand the application of computers in patient monitoring.
- To understand the application of computers in system modelling and pattern recognition, medical imaging and development of expert systems.

1. OVERVIEW OF COMPUTER HARDWARE PC-AT 9

8086 architecture, system connections, Instruction set & programming, Microcontrollers, Motherboard and its logic, RS232-C and IEEE bus standards, CRT controllers, FDC, HDC and Post sequence, PC based video card, modems and networking.

2. SYSTEM DESIGN 9

Multichannel computerised ECG, EMG and EEG data acquisition, storage and retrieval, transmission of signal and images.

3. COMPUTERS IN PATIENT MONITORING 9

Physiological monitoring, automated ICU, computerised arrhythmia monitoring, information flow in a clinical lab, computerised concepts, interfacing to HIS.

4. COMPUTERS IN MEDICAL SYSTEMS MODELLING 9

Radiotherapy, drug design, drug delivery system, physiological system modelling and simulation.

5. COMPUTERS IN MEDICAL RESEARCH 9

Role of expert systems, pattern recognition techniques in medical image classification, ANN concepts.

TOTAL : 45

TEXT BOOKS

1. R.D.Lee, “Computers in Medicine”, Tata McGraw-Hill, New Delhi, 1999.
2. Douglas V.Hall, “Microprocessors and Interfacing : Programming and hardware”, McGraw-Hill, Singapore, 1999.

BM1402 MEDICAL OPTICS 3 0 0 100

AIM

- To offer clear understanding of tissue characteristics when it is exposed to optical energy.
- To know about various optical sources and applications of lasers.
- To know about Holography and its medical applications.

OBJECTIVES

- To study in-depth the various optical properties of tissues and light interactions with tissues.
- To study about various optical sources and instrumentation for various measurements.
- To study various applications of lasers.
- To understand the special techniques like photo dynamic therapy and optical holography.

1. OPTICAL PROPERTIES OF THE TISSUES 9

Refraction, Scattering, absorption, light transport inside the tissue, tissue properties, Light interaction with tissues, optothermal interaction, fluorescence, speckles.

2. INSTRUMENTATION IN PHOTONICS 9

Instrumentation for absorption, scattering and emission measurements, excitation light sources – high pressure arc lamp, solid state LEDs, LASERs, optical filters, polarisers, solid state detectors, time resolved and phase resolved detectors.

3. APPLICATIONS OF LASERS 9

Laser in tissue welding, lasers in dermatology, lasers in ophthalmology, otolaryngology, urology.

4. OPTICAL HOLOGRAPHY 9

Wavefronts, Interference patterns, principle of hologram, optical hologram, applications.

5. SPECIAL TECHNIQUES 9

Near field imaging of biological structures, in vitro clinical diagnostic, fluorescent spectroscopy, photodynamic therapy.

TOTAL : 45

TEXT BOOKS

1. Tuan Vo Dirh, "Biomedical photonics – Handbook", CRC Press, Bocaraton, 2003 (Unit I – III, V).
2. Leon Goldman, M.D., & R.James Rockwell, Jr., "Lasers in Medicine", Gordon and Breach, Science Publishers Inc., New York, 1971 (Unit IV).

BM1403 DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS – II 3 0 0 100

AIM

- To offer overall idea about the application of ultrasonics and diathermy principles in clinical applications and transmission of biosignals using telemetry techniques.
- Understand sources of leakage current and method of monitoring it.

OBJECTIVES

- To study various display techniques and use of ultrasonics in various fields of medicine.
- To understand various patient monitoring systems and transmission of biosignals using telemetry principles.
- To study the clinical application of diathermy principles.
- To understand diagnostic applications of endoscopy and tomography.
- To study sources of leakage current and method of monitoring it.

UNIT I ULTRASONIC TECHNIQUES FOR DIAGNOSIS 10

Basic principles of Echo technique, display techniques A, B, M modes, Echo cardiograms, Echo encephalogram, Ultrasonic applied as diagnostic tool in ophthalmology, obstetrics and gynaecology.

UNIT II PATIENT MONITORING AND BIOTELEMETRY 9

Patient monitoring system – ICU, post operative, ICCU, single channel telemetry, multichannel telemetry, frequency allotment, radiopill. Tranmsmission of Biosignals over telephone lines.

UNIT III DIATHERMY 9

Clinical applications of electrotherapy, short wave diathermy, ultrasonic diathermy, microwave diathermy, surgical diathermy unit, IR lamps, UV lamps.

UNIT IV SPECIAL DIAGNOSTIC TECHNIQUES 9

Principles of Cryogenic technique and application, Endoscopy, Laproscopy, Thermography.

UNIT V PATIENT SAFETY 8

Sources of leakage current, Micro and Macro shock, monitoring circuits, earthing schemes.

TOTAL : 45

TEXT BOOKS

1. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 1997.

REFERENCES

1. John G.Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 1998.
2. Joseph J.Carr and John M.Brown, "Introduction to Biomedical equipment technology", John Wiley and sons, New York, 1997.

BM1451 HOSPITAL MANAGEMENT 3 0 0 100

AIM

To get in-depth idea about management techniques used in the hospitals for the proper functioning of hospitals.

OBJECTIVES

- To define the need and role to be performed by technical persons in the hospital.
- To understand health policies that deal with health financing, health education and health insurance.
- To understand various standards and codes used in the health care and the type of training to be offered to the staff in the hospitals.
- To get an idea about the use of computers in various units of the hospitals.

1. NEED AND SCOPES OF CLINICAL ENGINEERING 9

Clinical engineering program, educational responsibilities, role to be performed by them in hospital, staff structure in hospital.

2. NATIONAL HEALTH POLICIES 9

Need for evolving health policy, health organization in state, health financing system, health education, health insurance, health legislation.

3. TRAINING AND MANAGEMENT OF TECHNICAL STAFF IN HOSPITAL 9

Difference between hospital and industrial organization, levels of training, steps of training, developing training program, evaluation of training, wages and salary, employee appraisal method.

4. STANDARDS AND CODES IN HEALTH CARE 9

Necessity for standardization, FDA, Joint Commission of Accreditation of hospitals, ICRP and other standard organization, methods to monitor the standards.

5. COMPUTER IN MEDICINE 9

Computer application in ICU, X-Ray department, laboratory administration, patient data, medical records, communication, simulation.

TOTAL : 45

TEXT BOOKS

1. Webster J.C. and Albert M.Cook, "Clinical Engineering Principle and Practice", Prentice Hall Inc., Englewood Cliffs, New Jersey, 1979 (Unit I).
2. Goyal R.C., " Handbook of hospital personal management", Prentice Hall of India, 1996 (Unit II – V).

BM1405 DIAGNOSTIC AND THERAPEUTIC EQUIPMENT LAB 0 0 3 100

1) Study of ultrasonic transducers and displays.
2) Study of pacemaker.
3) Multichannel biotelemetry.
4) Shortwave and ultrasonic diathermy.
5) Multichannel data acquisition system.
6) Simulation of biosignals.
7) Analysis of ECG signals.
8) Analysis of EEG signals.
9) Leakage current and electrical safety measurements.
10) Mini Project.

GE 1001 INTELLECTUAL PROPERTY RIGHTS (IPR) 3 0 0 100

UNIT I

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).

5

UNIT II

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.

10

UNIT III

International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT). **10**

UNIT IV

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. **10**

UNIT V

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. **10**

TEXT BOOK

1. Subbaram N.R. " Handbook of Indian Patent Law and Practice ", 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 1002 INDIAN CONSTITUTION AND SOCIETY 3 0 0 100

UNIT I

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. **9**

UNIT II

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review. **9**

UNIT III

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts. **9**

UNIT IV

Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries - Assessment of working of the Parliamentary System in India. **9**

UNIT V

Society : Nature, Meaning and definition; Indian Social Structure; Castle, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections. **9**

TEXT BOOKS

1. Durga Das Basu, " Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.
2. R.C.Agarwal, " (1997) Indian Political System ", S.Chand and Company, New Delhi.
3. Maciver and Page, " Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.

4. K.L.Sharma, " (1997) Social Stratification in India: Issues and Themes ", Jawaharlal Nehru University, New Delhi.

REFERENCES

1. Sharma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
2. U.R.Gahai, " (1998) Indian Political System ", New Academic Publishing House, Jalaendhar.
3. R.N. Sharma, " Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.
4. Yogendra Singh, " (1997) Social Stratification and Charge in India ", Manohar, New Delhi.

BM1001 BIO-MECHANICS 3 0 0 100

AIM

To understand mechanics involved in functioning of cardiac, respiratory and orthopaedic systems as well as at soft tissue level.

OBJECTIVES

- To study the mechanics involved in the blood flow to various vessels and valves.
- To study the breathing mechanism, airway resistance and lung diseases.
- To study the elasticity, properties of skin, ligaments and tendons.
- To study mechanical properties of bones, joints and cartilages.

UNIT I BIOFLUID MECHANICS 9

Newtons laws, stress, strain elasticity, Hookes-law, viscosity, Newtonian fluid, Non-Newtonian fluid, Viscoelastic fluids, Vascular tree. Relationship between diameter, velocity and pressure of blood flow, resistance against flow.

UNIT II CARDIAC MECHANICS 9

Cardio vascular system, Mechanical properties of blood vessels – arteries, arterioles, capillaries, veins, blood flow: laminar and turbulent, physics of cardio vascular diseases, prosthetic heart valves and replacement.

UNIT III RESPIRATORY MECHANICS 9

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, nonlinear stress-strain relationship, viscoelasticity, structure, function and mechanical properties of skin, ligaments and tendons.

UNIT V ORTHOPAEDIC MECHANICS 9

Mechanical properties of cartilage, diffusion properties of articular cartilage, mechanical properties of bone, kinetics and kinematics of joints, lubrication of joints analysis of force in orthopaedic implants.

TOTAL : 45

REFERENCES

1. Y.C.Fung, “Biomechanics: Mechanical properties of living tissues”, Springer, verlag, New York, 1981.
2. D.Dawson & Right, ”Introduction to bio-mechanics of joints and joint replacement”, Mechanical Engineering Publication Ltd, 1989.
3. Jacob cline, “Handbook of biomedical engineering”, Academic press Inc., Sandiego, 1988.

BM1002 COMPUTER ARCHITECTURE 3 0 0 100

AIM

To discuss the basic structure of a digital computer and to study in detail the organization of the Control unit, the Arithmetic and Logical unit, the Memory unit and the I/O unit.

OBJECTIVES

- To have a thorough understanding of the basic structure and operation of a digital computer.
- To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- To study in detail the different types of control and the concept of pipelining.
- To study the hierarchical memory system including cache memories and virtual memory.
- To study the different ways of communicating with I/O devices and standard I/O interfaces.

1. 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.

2. 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

3. CONTROL DESIGN 9

Hardwired Control, micro programmed control, Multiplier control unit, CPU control unit, Pipeline control, instruction pipelines, pipeline performance, super scaling processing, Nano programming.

4. 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.

5. SYSTEM ORGANIZATION 9

Communication methods, buses, bus control, bus interfacing, bus arbitration, IO and system control, IO interface circuits, DMA and interrupts, vectored interrupts, PCI interrupts, pipeline interrupts, IOP organization, operation systems, multiprocessors, fault tolerance.

TOTAL : 45

TEXT BOOKS

1. Morris Mano, “Computer System Architecture”, Prentice-Hall of India, 2000.
2. John P.Hayes, ‘Computer architecture and organisation’, Tata McGraw-Hill, Third edition, 1998

REFERENCES

1. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, " Computer Organisation" IV edition, McGraw-Hill Inc, 1996.
2. H.S. Stone, "High Performance computer architecture", Addison Wesley, Third Edition, 1993.
3. K.Hwang, "Advanced computer architecture", Tata McGraw-Hill, 1993.
4. J.Vaideeswaran, " Computer architecture", New Age International, 1999.
5. G.Kane & J.Heinrich, "MIPS RISC Architecture", Englewood cliffs, New Jersey, Prentice Hall, 1992.

BM1003 NEURAL NETWORKS AND ITS APPLICATION 3 0 0 100

AIM

1. ADAPTIVE LINEAR COMBINER 9

Elementary neurophysiology and biological neural network-Artificial neural network, Adeline and Madeline.

2. BACK PROPOGATION AND ASSOCIATE MEMORY 9

Back propogation network, generalized delta rule, Bidirectional associate memory, Hopefield memory architecture.

3. BOLTZMANN'S MACHINES AND COUNTER PROPOGATION NETWORK 9

Simulated Annealing, Boltzman completion network, Boltzman input output network, counter propogation network.

4. SELF-ORGANISING MAPS AND ADAPTIVE RESONANCE THEORY 9

Self organizing map,feature map classifier, adaptive resonance theory network, ART1,ART2.

5. SPATIOTEMPORAL NETWORKS AND NEOCOGNITRON 9

Architecture of spatiotemporal networks, Sequential competitive avalanche field, Neocognitron architecture and dataprocessing.

TOTAL : 45

TEXT BOOK

1. J.A. Freeman & David.M. Skapura, Neural networks, Algorithms applications and programming techniques, Addison Wesley, 1991. ISE Reprint 1999.

REFERENCES

1. David M. Skapura, "Building Neural Networks", Addison Wesley, 1996.
2. Bose, "Neural Network Fundamentals with graphs, algorithms and applications", Tata McGraw-Hill, 1995.

BM1004 ANALOG AND DIGITAL COMMUNICATION 3 0 0 100

AIM

By learning this subject, the student will understand various analog and digital communication fundamentals, transmitters and receivers and satellite.

OBJECTIVES

- To provide various amplitude, frequency and pulse modulation and demodulation systems.
- To provide some analysis of noise performance of various receivers.
- To study some basic information theory.
- To gain some knowledge about data access via satellite.

UNIT I MODULATION SYTEMS 9

AM – Frequency Translation – single sideband and double sideband modulation, vestigial sideband modulation. FM phase and frequency modulation, FM spectral analysis, FM bandwidth, AM Modulators and FM modulators, AM Transmitters and FM Transmitters.

UNIT II RECEIVERS 9

Sensitivity, Selectivity, AM receivers, FM receivers, Noise in AM & FM systems, SNR in AM Receivers, signal to noise power in FM, Pre-emphasis and deemphasis.

UNIT III ANALOG TO DIGITAL CONVERSION 9

Sampling theorem, pulse amplitude modulation(PAM), pulse width modulation(PWM), pulse position modulation(PPM), pulse code modulation(PCM). Digital modulation and demodulation system. ASK, FSK, PSK.

UNIT IV INFORMATION THEORY 9

Average information, Information rate, Shannon's theorem, channel capacity, bandwidth, S/N trade off.

UNIT V SATELLITE ACCESS 9

Modulation and multiplexing voice, data, video; Analog-Digital transmission system, Digital video broadcast, multiple access: FDMA, TDMA, CDMA, assignment methods, spread spectrum communication, compression, encryption.

TOTAL : 45

TEXT BOOK

1. Taub & Schilling, "Principles of Communication systems", McGraw-Hill, 1986.

REFERENCES

1. Wayne Tomasi, "Electronic communication systems", fundamentals through advanced, LPE, Pearson Education, Fourth Reprint, 2001.

BM1005 ARTIFICIAL INTELLIGENCE AND PATTERN RECOGNITION 3 0 0 100

AIM

- By learning various techniques of problem solving, searching and other knowledge representation, artificial intelligence will be formed.
- By understanding different types of pattern recognition techniques and decision making, any patterns in the clinical side can be recognised.

OBJECTIVES

- To study different components of artificial intelligence and basic problem solving methods.
- To learn the different techniques of pattern recognition and training.
- To learn various rules available in decision making.
- Study the different approaches of pattern classification and application in clinical diagnosis.

UNIT I INTRODUCTION 9

Definition of AI, Intelligent agents, perception and language processing, problem solving, searching, heuristic searching, game playing, Logics, logical reasoning.

UNIT II BASIC PROBLEM SOLVING METHODS 9

Forward Vs Background, knowledge representation, frame problems, heuristic functions, weak methods of matching.

UNIT III PRINCIPLES OF PATTERN RECOGNITION 9

Patterns and features, training and learning in pattern recognition, pattern recognition approach, different types of pattern recognition.

UNIT IV DECISION MAKING 9

Baye's theorem, multiple features, decision boundaries, estimation of error rates, histogram, kernels, window estimaters, nearest neighbour classification, maximum distance pattern classifier, adaptive decision boundaries.

UNIT V CLUSTER ANALYSIS AND FEATURE EXTRACTION 9

Unsupervised learning, hierarchical clustering, Graph theories approach to pattern clustering, fuzzy pattern classifier, application of pattern recognition in medicine.

TOTAL : 45

TEXT BOOKS

1. Elain Rich and Kevin Knight, "Artificial Intelligence", 2nd Edition, Tata McGraw-Hill, 1993.
2. Earl Gose, Richard Johnsonbaugh, Steve Jost, "Pattern Recognition and Inmage Analysis", Prentice Hall of India Pvt. Ltd., New Delhi, 1999.

BM1006 PHYSIOLOGICAL MODELLING 3 0 0 100

AIM

Understand the concept of modelling and learn how to model any physiological control system for purpose of analysis.

OBJECTIVES

- To study the different types of modelling and its utilities.
- To study the physiological system as various electrical parameters.
- To develop mathematical background to understand the order of the system using transfer function.
- Study the physiological activities taking place in controlling specific physiological parameter and convert this detail as an acceptable model.

UNIT I INTRODUCTION 9

System concept, system properties, piece-wise linear approximation, electrical analog for compliance, thermal storage, pulse response of first order systems, response of resistant and compliance system.

UNIT II TRANSFER FUNCTIONS 9

Transfer functions and its use, engineering concept in coupled system, example of Transformed signals.

UNIT III IMPEDANCE CONCEPT 9

Circuits for the Transfer function with impedance concept, prediction of performance, periodic signals.

UNIT IV FEEDBACK SYSTEMS 9

Characteristics of physiological feedback systems, uses and testing of system stability.

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

REFERENCES

1. William B.Blesser, "AS System approach to Bio-medicine", McGraw-Hill book co., New York, 1969.
2. Manfreo clynes and john H.Milsum, "Bio-medical engineering system", McGraw-Hill book co., NewYork, 1970.
3. Douglas S.Regs, "Control theory and physiological feedback mechanism", The William & Williams co., Baltimore, 1970.

BM1007 MEDICAL INFORMATICS 3 0 0 100

AIM

- To give comprehensive idea about multimedia applications in medical field to develop educational / training packages.
- To understand the component of virtual reality and virtual reality applications in medicine

OBJECTIVES

- To study the methods utilized for data storage ,data retrieval and analysis
- To study the concept of visual programming and to develop VB based medical information systems.
- To expose to various applications of computer in medical field like neural network, fuzzy system and virtual reality.
- Based on the above knowledge to develop packages for transmission of medical information and for training.

1. MEDICAL DATABASE IMPLEMENTATION 9

Medical data acquisition and database systems: PC based mutlichannel data acquisition system; storage, analysis and retrieval techniques.

2. VISUAL BASIC 9

Visual programming concepts; visual Basic environment, tools and controls; Dynamic data exchange; VB based Medical information System.

3. COMPUTERS IN SYSTEM DESIGN 9

Hospital Information System its design and functional characteristics; Principles and application of Artificial Intelligence, Pattern Recognition, Neural Network and Fuzzy Logic in Medicine.

4. MULTIMEDIA AND VIRTUAL REALITY APPLIED TO MEDICINE 9

Basic concepts of Multimedia; Design of Multimedia information systems; Components of virtual reality; Virtual reality applications in medicine.

5. COMPUTERS IN MEDICAL RESEARCH 9

Medical Informatics and its levels; Design and development of educational packages on medical sciences; Integrated design concepts; Interactive multimedia, Virtual and digital libraries, Internet and its applications.

TOTAL : 45

TEXT BOOK

1. R.D.Lele, "Computer in Medicine", Tata McGraw-Hill, New Delhi, 1997.

REFERENCES

1. Tay Vaughan, "Multimedia making it work', Tata McGraw-Hill, New Delhi, 1997.
2. Davis Chapman, "Teach Yourself Visual Basic 6 in 21 days", New Delhi, 1997.
3. Harold Sackman, "Biomedical Information Technology', Academic Press, New York, 1997.
4. Mary Brth Fecko, "Electronics Resources: Access and Issues", Bowker and Saur, London, 1997

BM1008 REFRIGERATION AND AIR CONDITIONING 3 0 0 100

1.REFRIGERATION CYCLES & 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 & Ozone Depleting Potential aspects.

2.SYSTEM COMPONENTS (9)

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

3.CYCLING CONTROLS AND SYSTEM BALANCING (9)

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

4.PSYCHROMETRY (9)

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

5.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.

(45)

TEXT BOOK

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

REFERENCES

1. R.J.Dossat, " Principles of Refrigeration ", John Wiley and Sons Inc., 1989.
2. Manohar Prasad, " Refrigeration and Air Conditioning ", Wiley Eastern Ltd., 1995.

BM1009 BIO-FLUID AND DYNAMICS 3 0 0 100

AIM

To study the properties and types of flow. The pressure developed and the flow pattern for different types of flows and tubes. This will help to analyse the fluid dynamics in cardiac vessel and across the valves.

OBJECTIVES

- To classify the fluids according to its characteristics.
- To study the pressure and flow patterns in blood vessels.
- To use this knowledge in studying the mechanics available at cardiac system.

1. INTRODUCTORY CONCEPTS 9

Fluids and non-fluids, continuum coordinate systems, force and moments, stress at a point, rate of strain, properties of fluids, classification of fluids.

2. FLUID FLOW 9

Different types of fluid flows, laminar and turbulent flow, transition from laminar to turbulent flow, laminar flow-annulus, laminar flow between parallel plates, measurement of viscosity.

3. BOUNDARY LAYER FLOW 9

Development of boundary layer, estimates of boundary layer thickness, boundary layer equation, nature of turbulence, smooth and rough surface, boundary layer separation.

4. PRESSURE AND FLOW IN BLOOD VESSELS 9

Friction loss in flow in a tube, velocity distribution of aortic system, waveform of pressure and velocity in aorta, wave reflections and impedance in arterial segments, blood flow in veins and blood flow in capillaries.

5. ANALYSIS OF CARDIO VASCULAR DYNAMICS 9

Control theory and system analysis, mechanical analysis of circulatory systems, basic concept of myocardial mechanics, index of contractibility, fluid dynamics of aortic and mitral valves.

TOTAL : 45

REFERENCES

1. K.L.Kumar, “Engineering fluid mechanics”, Eurasia Publishing House (P) Ltd., New Delhi, 1998.
2. D.H.Bergel, “Cardiovascular fluid dynamics”- Vol. I, Academic press, London & New York, 1972.

BM1010 MEDICAL IMAGING TECHNIQUES 3 0 0 100

AIM

- To have a clear understanding of concept and components of medical imaging techniques.
- To have an exposure on Quality assurance tests for X-rays, MRI.
- To understand the principles of 3D image and its clinical applications.

OBJECTIVES

- To understand need for Quality assurance and Quality assurance tests for radiography, methods of recording sectional images.
- To study the functioning of radioisotopic imaging equipments.

- To know about MRI, image acquisition and reconstruction and MRI safety.
- To understand the mathematical concept needed in image processing.
- To study 3D image display techniques and its clinical applications.

1. DIFFERENT MODES OF MEDICAL RECORDING 9

Quality assurance and image improvement in diagnostic radiology with X-Rays, specific Quality assurance tests for X-rays, need for sectional images, principles of sectional images recording, computer tomography with different trajectories.

2. RADIOISOTOPIC IMAGES 9

Radio isotopic imaging equipments, radiation detectors, radionuclide for imaging, static and dynamic planar scintillography.

3. NUCLEAR MAGNETIC RESONANCE IMAGING 9

Development of NMR, relaxation processes and their measurements, MRI-Image acquisition and reconstruction, MRI safety.

4. MATHEMATICS OF IMAGE FORMATION AND IMAGE PROCESSING 9

Concept of object and image, general image processing problem, discrete fourier representation and models for imaging, image restoration, image sampling, perception of moving images.

5. COMPUTER REQUIREMENT FOR IMAGING SYSTEM 9

Single/ multi user system, transferring of images, processing speed, display of medical images, 3-D image display and its clinical applications.

TOTAL : 45

TEXT BOOK

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

BM1012 ASSIST DEVICES 3 0 0 100

AIM

To understand functioning and usage of electromechanical units which will restore normal functional ability of particular organ which is defective temporarily or permanently.

OBJECTIVES

- To study various mechanical techniques that will help failing heart.
- To study the functioning of the unit which does the clearance of urea from the blood.
- To understand the tests to assess the hearing loss and development of electronic devices to compensate for the loss.
- To study the various orthodic devices and prosthetic devices to overcome orthopaedic problems.
- To understand electrical stimulation techniques used in clinical applications.

1. CARDIAC ASSIST DEVICES 9

Principle of External counter pulsation techniques, intra aortic balloon pump, Auxillary ventricle and schematic for temporary bypass of left ventricle, prosthetic heart valves.

2. HEMODIALYSERS 9

Artificial kidney, Dialysis action, hemodialyser unit, membrane dialysis, portable dialyser monitoring and functional parameters.

3. HEARING AIDS 9

Common tests – audiograms, airconduction, boneconduction, masking techniques, SISI, Hearing aids – principles, drawbacks in the conventional unit, DSP based hearing aids.

4. PROSTHETIC AND ORTHODIC DEVICES 9

Hand and arm replacement – different types of models, externally powered limb prosthesis, feedback in orthodic system, functional electrical stimulation, sensory assist devices.

5. RECENT TRENDS 9

Transcutaneous electrical nerve stimulator, bio-feedback.

TOTAL : 45

TEXT BOOKS

1. Levine S.N. (ed), "Advances in Bio-medical engineering and Medical physics", Vol. I, II, IV, inter university publications, New York, 1968 (Unit I, IV, V).
2. Kopff W.J, "Artificial Organs", John Wiley and sons, New York, 1976. (Unit II).
3. Albert M.Cook and Webster J.G, "Therapeutic Medical Devices", Prentice Hall Inc., New Jersey, 1982 (Unit III).

BM1013 VERY LARGE SCALE INTEGRATED CIRCUIT DESIGN 3 0 0 100

AIM

To introduce the technology, design concepts and testing of Very Large Scale Integrated Circuits.

OBJECTIVES

- To learn the basic CMOS circuits.
- To learn the CMOS process technology.
- To learn techniques of chip design using programmable devices.
- To learn the concepts of designing VLSI subsystems.
- To learn the concepts of modeling a digital system using Hardware Description Language.

1. MOS TECHNOLOGY AND CIRCUITS 9

MOS Technology and VLSI, Process parameters and considerations for BJT, MOS and CMOS, Electrical properties of MOS circuits and Device modelling.

2. MOS CIRCUIT DESIGN PROCESS 9

MOS layers, Stick diagram, Layout diagram, Propagation delays, Examples of combinational logic design, Scaling MOS circuits.

3. DIGITAL CIRCUITS AND SYSTEMS 9

Programmable Logic Array (PLA) and finite state machines, Design of ALU's Memories and Registers.

4. ANALOG VLSI AND HIGH SPEED VLSI 9

Introduction to analog VLSI, Models for analog switches, active resistors, current sources / sinks, current references, BJT and CMOS operational amplifiers for simulation. Layout of typical circuits like common source amplifier, current source and differential amplifier, Sub-micron technology and GaAs VLSI technology.

5. HARDWARE DESCRIPTION LANGUAGES 9

VHDL Background and basic concepts, Structural specification of hardware and Design organisation and parameterization.

TOTAL : 45

TEXT BOOKS

1. Dougles A. Pucknell and Kamran Eshrafhian, Basic VLSI Design systems and circuits", Prentice Hall of India Pvt., Ltd.
2. Randall L.Geiger and P.E.Allen, "VLSI design techniques for analog and digital circuits", McGraw-Hill Int., Co., 1990.
3. Peter J.Ashenden, "The Designer's guide to VDNL", Harcourt Asia Pvt., Ltd., 1995.

REFERENCES

1. Amar Murkherjee, "Introduction to NMOS and CMOS VLSI system design", Prentice Hall, 1986.
2. Fabious.E., "Introduction to VLSI design", McGraw-Hill, 1990.
3. Navabi.Z., "VHDL analysis and modeling of digital systems", McGraw-Hill, 1983.
4. Mohammed Ismail and Terri Fiez, "Analog VLSI, Signal and Information Processing", McGraw-Hill, 1994.
5. Neil H.E. Weste, Kamaran Eshraghian, Principles of CMOS VLSI Design", Addison Wesley, 1998.

BM1014 COMPUTER NETWORKS 3 0 0 100

AIM

To introduce the concepts, terminologies and technologies used in modern days data communication and computer networking.

OBJECTIVES

- To understand the concepts of data communications.
- To study the functions of different layers.
- To introduce IEEE standards employed in computer networking.
- To make the students to get familiarized with different protocols and network components.

1. DATA COMMUNICATION CONCEPTS 8

Transmission media – Data encoding – Interface and Modems – Multiplexing – Error detection and correction – Digital subscriber line – Circuit switching – Packet switching – Message switching.

2. WIDE AREA NETWORKS 10

ISO – OSI layered architecture – Function of the layers – Data link protocols – HDLC, LAPB, LAPD, Inter networking devices – Repeaters, Bridges, Routers, Routing algorithms – Distance vector routing, link state routing, X.25 protocol, congestion control.

3. FRAME RELAY AND ATM NETWORKS 9

Frame relay operation – layers and traffic control; ATM networks – Architecture switching, layers service classes.

4. LOCAL AREA NETWORK 10

LAN topology – Ethernet – Token bus – Token ring – FDDI – Wireless LAN, ATM LAN – IEEE 802 Medium access control layer standard – Random access protocols – ALOHA – Slotted ALOHA.

5. OSI LAYERS 8

Transport layer issues – Session layer – Synchronization – Presentation layer – Encryption, decryption, Application layer – Message handling system, file transfer, virtual terminal – E-mail.

TOTAL : 45

TEXT BOOK

1. William Stallings, “Data and Computer Communication”, sixth edition, Pearson education Asia, 2000.

REFERENCES

1. Behrouz A, Forouzan, “Data Communication and Networking”, second edition, Tata McGraw-Hill, 2000.
2. Fred Halsall, “Data Communication, Computer networks and Open Systems”, Fourth edition, Addison Wesley, 1995.
3. Andrew S.Tanenbaum, “Computer networks”, Third edition, PHI, 1996, Chapter 4.