BUNDELKHAND UNIVERSITY

JHANSI

SYLLABUS

B.TECH. BIOMEDICAL ENGINEERING
Institute of Engineering & Technology

(1st 2nd 3rd and 4th YEAR)

2nd YEAR (Revised and Modified as per UPTU)
(Effective from Session 2010-11)

Compiled by

Dr. Garima Sharma
Coordinator, Biomedical Engineering, IET
Bundelkhand University, Jhansi

Course structure and Evaluation Scheme
B.Tech. Biomedical Engineering,

Year 1st , semester I

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME				SUBJECT TOTAL
						SESSIONAL			ESE	
			L	T	P	TA	CT	Total		
THEORY SUBJECTS										
1.	PH-101	Physics	3	1	0	30	20	50	100	150
2.	HU-101	Professional Communication	3	1	0	30	20	50	100	150
3.	MA-101	Mathematics-I	3	1	0	30	20	50	100	150
4.	EE-101	Electrical Engineering	3	1	0	30	20	50	100	150
5.	EC-101	Electronics Engineering	3	1	0	30	20	50	100	150
PRACTICAL LABORATORY										
6.	PH-151	Physics Lab	0	0	3	10	10	20	30	50
7.	EE-151	Electrical Engineering Lab	0	0	3	10	10	20	30	50
8.	WS-151	Workshop Practice	0	0	3	10	10	20	30	50
9.	CE-151	Engineering Graphics	0	0	3	10	10	20	30	50
10.	GP-101	General Proficiency	-	-	-	-	-	50	-	50
								GRAND TOTAL		**1000**

L-Lecture, T-Tutorial , P-Practical, TA- Teacher's Assessment, CT-Class Test, ESE-End Semester Examination

Course structure and Evaluation Scheme
B.Tech. Biomedical Engineering,

Year 1st, Semester-II

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME				SUBJECT TOTAL
						SESSIONAL			ESE	
	THEORY SUBJECTS		**L**	**T**	**P**	**TA**	**CT**	**Total**		
1.	CY-201	Chemistry	3	1	0	30	20	50	100	150
2.	CE-201	Environmental Studies	3	1	0	30	20	50	100	150
3.	MA-201	Mathematics-II	3	1	0	30	20	50	100	150
4.	ME-201	Mechanical Engineering	3	1	0	30	20	50	100	150
5.	IT-201	Information Technology	3	1	0	30	20	50	100	150
	PRACTICAL LABORATORY									
6.	CY-251	Chemistry Lab	0	0	3	10	10	20	30	50
7.	ME-251	Mechanical Engineering	0	0	3	10	10	20	30	50
8.	IT251/ CS-251	Information Technology Lab	0	0	3	10	10	20	30	50
9.	HU-251	Professional Communication Lab	0	0	3	10	10	20	30	50
10.	GP-201	General Proficiency	-	-	-	-	-	50	-	50
								GRAND TOTAL		**1000**

MODIFIED

Course structure and Evaluation Scheme
B.Tech. Biomedical Engineering,
[Effective from the session 2010-11]

Year 2nd, Semester-III

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME				SUBJECT TOTAL
						SESSIONAL			ESE	
	THEORY SUBJECTS		**L**	**T**	**P**	**TA**	**CT**	**Total**		
1.	BM-301	Electronic Devices and Components	3	1	0	30	20	50	100	150
2.	BM-302	Human Anatomy and Physiology	3	1	0	30	20	50	100	150
3.	BM-303	Fundamentals of Networks Analysis and System	3	1	0	30	20	50	100	150
4.	BM-304	Electronic Measuring and Measurement Instruments	3	1	0	30	20	50	100	150
5.	BM-305	Biomedical Statistics	3	1	0	30	20	50	100	150
	PRACTICAL LABORATORY									
6.	BM-351	Electronic Devices Lab	0	0	3	10	10	20	30	50
7.	BM-352	Human Anatomy and Physiology Lab	0	0	3	10	10	20	30	50
8.	BM-353	Network and System Lab	0	0	3	10	10	20	30	50
9.	BM-354	EMMI Lab	0	0	3	10	10	20	30	50
10.	GP-301	General Proficiency Lab	-	-	-	-	-	50	-	50
									GRAND TOTAL	**1000**

MODIFIED

Course structure and Evaluation Scheme
B. Tech. Biomedical Engineering,
[Effective from the session 2010-11]

Year 2nd, Semester-IV

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME				SUBJECT TOTAL
						SESSIONAL			ESE	
	THEORY SUBJECTS		L	T	P	TA	CT	Total		
1.	BM -401	Digital Electronics	3	1	0	30	20	50	100	150
2.	BM-402	Analogue Electronic Circuits	3	1	0	30	20	50	100	150
3.	BM-403	Sensors and Transducers in Biomedical Instrumentation	3	1	0	30	20	50	100	150
4.	BM-404	Signal and Systems	3	1	0	30	20	50	100	150
5.	BM-405	Electromagnetic Field Theory	3	1	0	30	20	50	100	150
	PRACTICAL LABORATORY									
6.	BM-451	Digital Electronics Lab	0	0	3	10	10	20	30	50
7.	BM-452	Electronics Instruments Lab	0	0	3	10	10	20	30	50
8.	BM-453	Sensors and Transducers Lab	0	0	3	10	10	20	30	50
9.	BM-454	Electronics Workshop and PCB Lab	0	0	3	10	10	20	30	50
10.	GP-401	General Proficiency	-	-	-	-	-	50	-	50
								GRAND TOTAL		1000

Course structure and Evaluation Scheme
B.Tech. Biomedical Engineering

Year 3rd, Semester-V

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME				SUBJECT TOTAL
						SESSIONAL			ESE	
	THEORY SUBJECTS		**L**	**T**	**P**	**TA**	**CT**	**Total**		
1.	BM-501	Biomedical Instrumentation-I	3	1	0	30	20	50	100	150
2.	BM-502	Radiology and Medical Imaging	2	1	0	15	10	25	50	75
3.	BM-503	Microprocessor	3	1	0	30	20	50	100	150
4.	BM-504	Analogue and Digital Integrated Circuits	3	1	0	30	20	50	100	150
5.	BM-505	Hospital Management and Engineering	2	1	0	15	10	25	50	75
6.	BM-506	Control Systems	3	1	0	30	20	50	100	150
	PRACTICAL LABORATORY									
7.	BM-551	Biomedical Instrumentation Lab	0	0	3	30	20	50	50	100
8.	BM-552	Control System Lab	0	0	3	10	10	20	30	50
9.	BM-553	Microprocessor Lab	0	0	3	10	10	20	30	50
10.	BM-554	Analogue Integrated Circuit Lab	0	0	3	10	10	20	30	50
								GRAND TOTAL		**1000**

Course structure and Evaluation Scheme
B.Tech. Biomedical Engineering

Year 3rd, Semester-VI

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME				SUBJECT TOTAL
						SESSIONAL			ESE	
	THEORY SUBJECTS		**L**	**T**	**P**	**TA**	**CT**	**Total**		
1.	BM-601	Biomedical Instrumentation-II	3	1	0	30	20	50	100	150
2.	BM-602	Biochemistry and Histology	2	1	0	15	10	25	50	75
3.	BM-603	Biomechanics, Prosthetics and Orthotics	3	1	0	30	20	50	100	150
4.	BM-604	Microcontroller and its Biomedical applications	3	1	0	30	20	50	100	150
5.	BM-605	Clinical Science and Engineering	2	1	0	15	10	25	50	75
6.	BM-606	Communication Engineering	3	1	0	30	20	50	100	150
	PRACTICAL LABORATORY									
7.	BM-651	Biomedical Instrumentation Lab-II	0	0	3	30	20	50	50	100
8.	BM-652	Biochemistry Lab	0	0	3	10	10	20	30	50
9.	BM-653	Biomechanics Lab	0	0	3	10	10	20	30	50
10.	BM-654	Microprocessor and Microcontroller Lab	0	0	3	10	10	20	30	50
									GRAND TOTAL	**1000**

Course structure and Evaluation Scheme
B.Tech. Biomedical Engineering

Year 4th, Semester-VII + VIII

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME				SUBJECT TOTAL
						SESSIONAL			ESE	
	THEORY SUBJECTS		L	T	P	TA	CT	Total		
1.	BM-751	Industrial Training * (16 weeks)	-	-	-	50	50	100	100	200
2.	BM-801	Biological Control System	3	1	0	30	20	50	100	150
3.	BM-802	Biomedical Digital Signal processing	3	1	0	30	20	50	100	150
4.	BM-803	**Departmental Elective –I	3	1	0	30	20	50	100	150
5.	BM-804	**Departmental Elective -II	3	1	0	30	20	50	100	150
	PRACTICAL LABORATORY									
6.	BM-853	Biomedical Signal Processing Lab	0	0	3	10	10	20	30	50
7.	BM-855	Project	0	0	6	30	20	50	100	150
									GRAND TOTAL	1000

* In Industrial Training each student must undergo training of 16 weeks at various Hospital / Biomedical Research Center / Biomedical Company/ Medical College/ Small-scale industries, which expertise in designing/ manufacturing/ working with the latest biomedical equipments and technologies.
There is no theory paper/ lab in the 7th semester.

** **Elective I:** 1. Nuclear Medicine
2. Artificial Neural Networks
3. VLSI Technology

Elective II: 1. Laser & Fiber Optics in Medicine
2. Advanced Biomedical Digital Signal Processing
3. Biomedical Nanotechnology

BM-301 ELECTRONIC DEVICES AND COMPONENTS

Unit-I

Energy band theory of solids. Metals, semi-:Conductors and Insulators. Crystal Properties and charge Carriers in Semiconductors: Extrinsic and intrinsic-: semiconductors. Elemental and compound semiconductor materials, crystal lattice structure, Bonding forces and energy bands in solids, charge carriers in semiconductors, carrier concentrations, drift of carriers in electric and magnetic fields.
Excess Carriers in Semiconductors: Optical absorption, luminescence, carrier life time and photo conductivity, diffusion of carriers.

Unit- II

Junction Properties: Equilibrium conditions, biased junctions, steady state conditions, reverse bias break down, transient and AC conditions. Metal semiconductor junctions.

Unit-III

Transistors: Metal-semiconductor-field-effect-transistors (MESFET), Metal-insulator-semiconductor-field-effect-transistors (MISFET), Metal oxide semiconductor field effect transistor (MOSFET): Construction, Operation and characteristics of above devices.
Bipolar junction transistors: Fundamentals of BJT operation, amplification with BJTs.

Unit-IV

Some special devices: Photodiodes, photo detectors, solar cell, light emitting diodes, semiconductor lasers, light emitting materials.
Tunnel Diode: degenerate semiconductors,
IMPATT diode;
The transferred electron mechanism: The GUNN diode.
P-N-P-N diode, semiconductor controlled rectifier (SCR), bilateral devices: DIAC, TRIAC, IGBT.

Unit-V:

Integrated Circuits: Principles of fabrication of Ics: Thin film. MOS devices, system design.
Printed circuit technology: Type design and fabrication, materials and fabrication processing the manufacture of electronic equipment. PCB design sequence art work generation layout design and layout procedure. PCB design aspects of analog, digital and power electronic circuit solders and soldering techniques.

REFERENCES AND SUGGESTED READINGS

- B. G. Streetman and S. Banerjee “Solid state electronics devices”, 5th Edition, PHI.
- Alok Dutta, “Semiconductor Devices and circuits”, Oxford University Press.
- Donald A Neaman, “Semiconductor Physics and Devices Basic Principles”
- Dummer, G.W.A.: Modern Electronic Components, Sir Esac Pitman& Sons LTD, London (II ed)
- Bosshart C Walters: Printed Circuit Board Design and Technology TMH New Delhi 1985
- Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Prentice hall

BM-302 HUMAN ANATOMY AND PHYSIOLOGY

Unit-I
Structure and functions of cell, polarization and depolarization of cell. Basic tissues structure and functions in brief.

Unit-II
Structure of Cardiovascular system, Heart, conductive tissues of heart, heart valves, cardiac cycle, systemic and pulmonary circulation.
Blood – composition of Blood – Blood cells and their functions, Blood cell counting, Hemoglobin, Types of Blood groups, Blood coagulation, Blood transfusion.
Structure of Respiratory system, lungs, Respiration (internal and external) Exchange in gases in the alveoli, Artificial respiration;

Unit-III
Structure of Alimentary canal, organs of the digestive system. Physiology of digestion, deglutition and defecation.
Excretory system- structure of nephron, formation of urine and functions of kidneys, urinary bladder, Urethra, internal/ external sphincters.

Unit-IV
Structure of Nervous system, brain, spinal cord, cranial and spinal nerves, reflex action and reflex arc. Functions of sympathetic and parasympathetic nervous system. Nerve conduction and action potentials.
Endocrine system – All glands, their secretions and functions.

Unit-V
Structure of sensory organs: Eye, Ear and skin. Eyes structure, refractive media of the eye, formation of image on the retina.
Ear structure of chochlea, hearing mechanism.
Structure and Physiology of skin.
Types of muscles, Muscle physiology, Skeletal system, Types of joints in the body and mechanism of locomotion.

REFERENCES AND SUGGESTED READINGS

- Anatomy and physiology in Health and illness- Ross and Wilson (ELBS pub)
- Review of medical physiology: William Ganong (Prentice Hall Int)
- Physiology of Human Body: Guyten (Prism Books)
- Principles of Anatomy and Physiology- Tortora & Grabowski (Harper Callin Pub)

BM-303 FUNDAMENTALS OF NETWORK ANALYSIS AND SYSTEMS

Unit I:
Introduction to Graph theory: Definitions, graph, tree, spanning tree, walk, Trail, path, loop, co-tree basic cut set and Loop & cut set matrices for planar networks, loop and nodal method of analysis.
Introduction to continuous time signals and systems. Basic continuous time signals, unit step ramp and impulse, differential equation Formulation for linear time invariant (I.T.I.) continuous time systems.

Unit II:
Network Theorems: Principle of Superposition theorem, Tellegen's Theorem. Thevenin, Norton, Millman, maximum Power transfer, Block diagram representation of I.T.I. continuous time networks and systems. Time- domain analysis of LTI network using Laplace transform (transient and steady-state). Relation between impulse response and system function

Unit III:
Concept of poles and zeros, relation between locations of poles. Time-response and stability, frequency response and bode plots, interrelation between frequency response and time response. Convolution integral

Unit IV:
Two port networks, two port parameters, inter conversion of 2-port parameters, network functions: driving point and transfer, interconnections of 2 port networks, reciprocity, ladder networks, image impedance, characteristic impedance, T-□ transformation.

Unit V:
Review of Laplace transform (LT), initial value and final value theorem, properties and solution of differential equations using LT, waveform synthesis and LT of complex waveforms: concept of transform impedance.

Positive real function definition and properties, synthesis of LC, RL and RC using Cauer's and Foster's first and second form

REFERENCES AND SUGGESTED READINGS

- Franklin F. Kuo, "Network Analysis and synthesis", 2nd Edition, Wiley India Pvt Ltd.
- Behrouz Peikari, "Fundamentals of Network Analysis & synthesis", Jaico Publishing House, 2006.
- M. E. Van Valkenberg, "Network Analysis", 2nd Edition, Prentice Hall of India Ltd.M.E.
- J.D. Ryber, 'Network Fields and Transmission Lines' Prentice Hall
- V.K.Aatre, Network Theory and Filter design, New age International Pub

BM-304 ELECTRONIC MEASUREMENT AND MEASURING INSTRUMENTS

UNIT 1:
Theory of measurement: Introduction, Performance, Characteristics: Static & Dynamic standards. Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, other unit systems, dimension and standards.
Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures,

UNIT 2:
Transducers: Passive transducers: Resistive, inductive, & Capacitive, Active transducers: Thermoelectric, piezoelectric & photoelectric; Bridges: Direct current & alternating current bridges LCR bridges
Wheatstone bridge, low resistance measurements, low resistance measuring instruments AC bridge theory, capacitance bridges, Inductance bridges, Q meter .

UNIT 3:
Analog Meters: Ac analog meters: Average, Peak and RMS Responding voltmeters, sampling, Voltmeters. Electronics Analog meters: Electronics analog DC and AC voltmeter and ammeter, Electronics analog ohmmeter and multimeter.

UNIT 4:
Analog to digital converters: transfer characteristics, A/D conversion techniques: Simple potentiometer and servo method, Successive approximation, ramp type, integrating and dual slope integrating methods.
D/A converters: transfer characteristics, D/A conversion techniques, digital mode of operation, performance characteristics of D/A converters.
Display Devices: Decimal, BCD and straight binary number, indicating system, numeric and alpha number display using LCD and LED, specifications of digital meters. : display digit and count resolution, sensitivity, accuracy, speed and settling time etc.

UNIT 5:
Oscilloscope and RF measurements: Types of oscilloscopes, controls, measurement voltage, frequency, time and phase, high frequency measurements- RF impedancy, probes: types of probes, probe loading and measurement effects, probe specifications.
Signal Generators and analyzers: Signal generators: Sine – wave, non-sinusoidal and function generators, frequency synthesis techniques and digital signal generators, Signal analyzers: Distortion, wave and network spectrum analyzers

REFERENCES AND SUGGESTED READINGS

- A.K Sawhney, 'Electrical and Electronic Measurement and Instrumentation' Dhanpat Rai & Sons
- W.D. Cooper, 'Electronic Instrumentation and Measurement Technique' Prentice Hall Int.
- David A. Bell, "Electronic Instrumentation and Measurements", 2nd Ed., PHI , New Delhi 2008
- Oliver and Cage, "Electronic Measurements and Instrumentation", TMH, 2009.
- Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Buterworth Heinmann), 2008.

BM-305 BIOMEDICAL STATISTICS

Unit I

Introduction, Difference between biostatistics and statistics, application and use of biostatistics in medical, types of data, collection of data, morbidity, mortality, fertility and demography indicators, sources of medical data, Diagram representation of medical data, bar, pie, line, scatter, histogram, polygon, chart.

Unit-II

Measures of central tendency: Arithmetic mean, Geometric mean, Harmonic mean, Median, Mode, percentile, decile, quartile, tertile. Measures of Dispersion: Range, mean deviation, standard deviation, variance, coeffecient of variance, skewness, methods of measuring skewness, kurtosis, measures of kurtosis.

Unit-III

Introduction of probability, addition and multiplication laws of probability, Bayes' theorem, binomial distribution, Poisson distribution, Normal distribution, Application of distribution.

Unit-IV

Correlation, type of correlation, Method of determining correlation: Scatter diagram method, Karl Pearson's coefficient of correlation, Spearman' rank coefficient of correlation, regression analysis, types of regression, models, curve of regression, line of regression.

Unit-V

Sampling, methods of sampling, random, non random sampling hypotheses test, Null hypotheses, chi square test, F test, Z-test, Student's t-test, degree of freedom, one way analysis of variants, ANOVA

REFERENCES AND SUGGESTED READINGS

- B.V. Ramana, Higher Engineering Mathematics, Tata Mc Graw Hill Publication
- R.P. Tripathi & Harendra Sing, Engineering Mathematics Vol-III, Ram Prasad & Sons Publications
- A. Indrayan & L. Satyanarayana, Biostatistics for Medical, Nursing and Pharmacy Students, Prentice hall of India Ltdv
- Irfan Ali Khan & Atiya Khanum, Fundamentals of Biostatistics, Ukaz Publications
- B.K. Mahajan, Methods in Biostatistics

BM- 351 ELECTRONIC DEVICES LAB

Objective: To attain expertise in lab equipment handling and understanding the basic devices, their properties, characteristics, along with their practical usage in the circuit.

1. Study of lab equipments and components their testing: CRO, Multimeter, Function Generator, Power supply & Bread Board. Identification and testing of the components resistors, diodes, transistors, trimpots by multimeters
2. Applications of PN junction diode: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor-use of filter- ripple reduction (RC Filter)-Clipper & Clamper
3. Properties of junctions: Zener diode characteristics. Heavy doping alters the reverse characteristics. Graphical measurement of forward and reverse resistance.
4. Application of Zener diode: Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
5. Characteristic of BJT: BJT in CB and CE configuration- Graphical measurement of h parameters from input and output characteristics. Measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.
6. Characteristic of FET: FET in common source configuration. Graphical measurement of its parameters gm, rd & m from input and output characteristics.
7. Realization of various' combinational digital' circuits

Institute may add any experiments in the above list as per the available infrastructure

BM-352 HUMAN ANATOMY AND PHYSIOLOGY LAB

Objective: To attain expertise in identification of various parts and components of human skeleton.

1. Identification of all the long and small bones, different joints, skull, jaw and facial bones in human skeleton.
2. Study of human eye and ears with help of 3D model.
3. Identification of respiratory passage components and various lobes of Human lungs.
4. Study of human kidney with the help of 3 D model.
5. Study of blood cells, their morphological identification and counting.
6. Study of human blood groups.
7. Preparation of slides of various tissues (epithelial, connective) and their microscopic study.

BM-353 NETWORK SYSTEM AND ANALYSIS LAB

1. Verification of principle of superposition with dc & ac sources
2. Cross verification of Thevenin. Norton, Maximum power transfer theorem in ac input power consumption.
3. Verification of Tellegen's Theorem for two networks of some topology
4. Transient response of RC circuits.
5. Transient response of RLC circuits.
6. Frequency response of RLC circuits
7. Determination of two port-z and h-parameters (dc only and computation of other parameters.
8. Determination of z-parameters of a T-network and computation and realisation of corresponding □-network. Write Demo for the following (in MS-Powerpoint)
9. Verification of parameter properties in inter-connected two port networks: series parallel and cascade (loading effect in cascade)
10. Frequency response of twin-T notch filter.

    Institute may add any three experiments in the above list as per the infrastructure available.

BM-354 MEAUSRING INSTRUMENTS LAB

1. Study of semiconductor diode voltmeter and its us as DC average responding AC voltmeter.
2. Study of L.C.R. bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given oscillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Measurement of phase difference and frequency using CRO (lissajous figure)
6. Measurement of low resistance Kelvin's double bridge.
7. Measurement of displacement with the help of LVDT
8. Draw the characteristics of the following temperature transducers: (a) RTD (Pt-100) (b) Thermistors (c) Thermocouple
9. Draw the characteristics between temperature & voltage of a K type thermocouple.
10. Measurement of strain/ force with the help of strain gauge load cell.

    Institute may conduct any 7 experiments depending on infrastructure available

BM-401 DIGITAL ELECTRONICS

Unit-I

Digital system and binary numbers: Signed binary numbers, binary codes, cyclic codes, error detecting and correcting codes, hamming codes.

Floating point representation

Gate-level minimization: The map method up to five variable, don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc-Clusky method (Tabular method).

Unit-II

Combinational Logic: Combinational circuits, analysis procedure, design procedure, binary adder-subtractor, decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers

Unit-III

Synchronous Sequential logic: Sequential circuits, storage elements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure.

Registers and counters: Shift registers, ripple counter, synchronous counter, other counters.

Unit-IV

Memory and programmable logic: RAM, ROM, PLA, PAL.

Design at the register transfer level: ASMs, design example, design with multiplexers.

Unit V

Asynchronous sequential logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state.

REFERENCES:

- M.Morris Mano Digital Design Prentice Hall
- Zvi Kohavi, Switching & Finite Automate Theory Prentice Hall
- A.S.Tannenbaun, Structured Computer Organization, Prentice Hall
- R.P. Jain 'Modern Digital Electronics TMM'

BM-402 ANALOG ELECTRONIC CIRCUITS

Unit-I

Operational Amplifier: Inverting and non-inverting configurations, difference amplifier, Effect of finite open loop gain and bandwidth on circuit performance, Large signal operation of op-amp.

Unit-II

MOSFET: Review of device structure operation and V-I characteristics.

Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier

Unit-III

BJT: Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.

Unit-IV

Differential Amplifier: MOS differential pair, small signal operation of the MOS differential pair, BJT differential pair, other non-ideal characteristic of the Differential amplifier (DA), DA with active load.

Unit-V

Feedback: The general feed back structure, properties of negative feed back, the four basic feed back topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt series feedback amplifier.

Oscillators: Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator

REFERENCES AND SUGGESTED READINGS

- J.Millman & C. Halkias, Integrated Electronics: Mc Graw Hill 1971
- Boylestad and Nashelsky: Electronic Devices and Circuit Theory, ed 6 PHI 1993
- Ludeman, Introduction to Electronic Devices & Circuits, Saunders College Pub 1990.
- P.M. Chirlian, Analysis & Design of Integrated Electronics, II ed, John Wiley, 1987.

BM403 SENSORS AND TRANSDUCERS IN BIOMEDICAL INSTRUMENTATION

Unit I

Generalized instrumentation system, general properties of transducers

Static Characteristics: Accuracy, Precision, Resolution, Reproducibility, Sensitivity, Drift, Hysterisis, Linearity, Loading Effect, Input Impedance and output Impedance.

Dynamic characteristics: First and second order characteristics, time delay, error free instrument, Transfer Functions, design criteria, Generalized instrument specifications.

Unit II

Strain gauges, Bridge Circuits. Displacement and pressure measurement, Resistive – Potentiometers. Inductive – variable inductance and LVDT, Capacitive type, piezoelectric transducers. Types of diaphragms, bellows, bourdon tubes.

Unit-III

Temperature measurement: Thermistor, Thermocouple, Resistive Temperature detector Radiation thermometry, Fibre Optic Sensor, Optical measurement, Geometrical.

Flow measurement: Plethysmography, Electromagnetic, Indicator, Indicator dilution, Thermal convection and ultrasonic.

Unit-IV

Chemical Transducers: Blood gas and acid - Base Physiology, reference electrode, pH, pO_2, pCo_2, electrodes, Transcutaneous arterial Oxygen tension, Carban dioxide tension monitoring, enzyme electrode.

Unit-V

Bipotential electrodes- Electrode electrolyte interface, half cell potential polarization, polarizable and non polarizable electrodes, calomel electrode circuit model electrode skin interface and motion artifact, body surface electrodes. Internal electrodes-needle and wire electrodes (different types), Micro electrodes-metal, supported metal, micropipete (metal filled glass and glass micropipete electrodes), microelectronic, properties of microelectrodes, method of use, electrodes used for measurement of ECG, EEG and EMG.

REFERENCES AND SUGGESTED READINGS

- Handbook of Biomedical Instrumentation by R.S. Khandpur
- Medical Instrumentation, Applications and Design by John G. Webster (Mareel Dekkar Pub)
- Biomedical Sensor- Fundamentals and Applications by Harry N. Narton (pLenum Press)
- Biomedical Instrumentation and Measurement by Leslie Cromwell, Fred J. Weibell
- Transducers in Biomedical Instrumentation by Cobbold, John Wiley Pub

BM 404 SIGNALS AND SYSTEMS

Unit-I

Signals: Definition, types of signals and their representations: continuous-time/discrete-time, periodic/non-periodic, one-dimensional/multidimensional; even/odd, energy/power, deterministic/ random, commonly used signals (in continuous and discrete-time): unit impulse, unit step, unit ramp (and their inter relationships), exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete-time signals (including transformations of independent variables).
Sampling: Sampling theorem, reconstruction of signals from samples, effect of under sampling, discrete time processing of continuous time signals.

Unit- II

Laplace-Transform (LT) and Z-transform (ZT): (i) One-sided LT of some common signals, important theorems and properties of LT, inverse LT, solutions of differential equations using LT, Bilateral LT, Regions of convergence (ROC) (ii) One sided and Bilateral Z-transforms, ZT of some common signals, ROC, Properties and theorems, solution of difference equations using one-sided ZT, s- to z-plane mapping

Unit-III

Fourier Transforms (FT): (i) Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse FT, relation between LT and FT (ii) Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT

Unit- IV

Systems: Classification, linearity, time-invariance and causality, impulse response, characterization of linear time-invariant (LTI) systems, unit sample response, convolution summation, step response of discrete time systems, stability, convolution integral, co-relations, signal energy and energy spectral density, signal power and power spectral density, properties of power spectral density,

Unit-V

Time and frequency domain analysis of systems Analysis of first order and second order systems, continuous-time (CT) system analysis using LT, system functions of CT systems, poles and zeros, block diagram representations; discrete-time system functions,
block diagram representation, illustration of the concepts of system bandwidth and rise time through the analysis of a first order CT low pass filter

REFERENCES AND SUGGESTED READINGS

- A.V. Oppenheim, A.S.Willsky and S.H. Nawab, Signal & Systems, Prentice Hall
- B.P. Lathi-Modern analogue and Digital Communication System, Oxford University Press, New
- S.Haykins, Communication System, John Wiley
- Taub & Schilling, Principle of Communication System-TMH

BM 405 ELECTROMAGNETIC FIELD THEORY

Unit- I

Coordinate systems and transformation: Cartesian coordinates, circular cylindrical coordinates, spherical coordinates. Vector calculus: Differential length, area and volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector and divergence theorem, curl of a vector and Stoke's theorem, Laplacian of a scalar.

Unit- II

Electrostatics: Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses's Law – Maxwell's equation, Electric dipole and flux lines, energy density in electrostatic fields. Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, dielectricconstants, continuity equation and relaxation time, boundary condition. Electrostatic boundary value problems: Poission's and Laplace's equations, general procedures for soling Poission's or Laplace's equations, resistance and capacitance, method of images.

Unit-III

Magnetostatics: Magneto-static fields, Biot-Savart's Law, Ampere's circuit law, Maxwell's equation, application of ampere's law, magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential. Magnetic forces, materials and devices: Forces due to magnetic field, magnetic torque and moment, a magnetic dipole, magnetization in materials, magnetic boundary conditions, inductors and inductances, magnetic energy.

Unit-IV

Waves and applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, displacement current, Maxwell's equation in final form. Electromagnetic wave propagation: Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence.

Unit-V

Transmission lines: Transmission line parameters, Transmission line equations, input impedance, standing wave ratio and power, The Smith chart, Some applications of transmission lines.

REFERENCES AND SUGGESTED READINGS

- J.F.D. Kraus, Electromagnetic
- E.D.Jorden and D.G.Balmein, Electromagnetic Waves and radiating system
- W. H. Hayt and J. A. Buck, "Electromagnetic field theory", 7 ed, Tata Mc Graw Hill
- J.D. Kraus and R.C.Keith, Electromagnetic.

BM-451 LOGIC CIRCUITS LAB

Objective: To understand the digital logic and create various systems by using these logics.

1. Implementation and testing of OR Gate & AND Gate using diodes
2. Study of IC 74LS32
3. Study of IC 74LS00
4. Study of IC 74LS04
5. Study of IC 74LS08
6. Implementation and testing of Decoder circuit using AND gate
7. Implementation and testing of Combinational circuit using Gates
8. To study and perform the following Operation of digital multiplexer and demultiplexer, Binary to decimal encoder Characteristics of CMOS integrated circuits.
9. To study and perform experiment- Compound logic functions and various combinational circuits based on AND/NAND and OR/NOR Logic blocks.
10. To study and perform experiment -Digital to analog and analog to digital converters.
11. To study and perform experiment- Various types of counters and shift registers.
12. To study and perform experiment - (a) Astable (b) Monostable (c) Bistable Multivibrators and the frequency variation with different parameters, observe voltage waveforms at different points of transistor.

Institute may conduct any seven experiments as per the infrastructure available

BM-452 ELECTRONICS INSTRUMENTS LAB

Objective: To design and implement the circuits to gain knowledge on performance of the circuit and its application.

1. Measurement of Operational Amplifier Parameters-Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.
2. Applications of Op-amp- Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator
3. Field Effect Transistors- Single stage Common source FET amplifier –plot of gain in dB Vs frequency, measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier
4. Two stage Amplifier. Plot of frequency Vs gain. Estimation of Q factor, bandwidth of an amplifier
5. Common Collector Configuration-Emitter Follower (using Darlington pair)-Gain and input impedance measurement of the circuit.
6. Differential Amplifier –Implementation of transistor differential amplifier .Non ideal characteristics of differential amplifier
7. Oscillators -Sinusoidal Oscillators- (a) Wein-bridge oscillator (b) phase shift oscillator
8. Simulation of Amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

Institute may conduct any seven experiments as per the infrastructure available

BM-453 TRANSDUCERS LAB

1. To draw the characteristics of following temperature transducers:
   a) PT 100 (b) Thermistor (c) Thermocouple
2. Load Cell Kit.
   a) To perform experiment and plot curve between load and strain.
   b) To study about excitation.
   c) To plot error curve at different loads.
   d) To study Piezo electric vibration pickup.
3. LVDT
   a) To study excitation and balancing network.
   b) To study phase difference.
   c) To plot curve between displacement and output voltage.
4. Torque measurement
   a) To study about unbalanced strain.
   b) To plot the curve between torque vs strain.
5. To draw characteristics of speed vs voltage on various transducers (For e.g. Magnetic pickup, Hall effect, Inductive pickup.
6. To draw characteristics of LDR.
7. To Draw characteristics of variable capacitance type transducer.
8. To draw characteristics of variable Inductance type transducer.

BM-454 ELECTRONIC WORKSHOP AND PCB LAB

1. Winding Shop: Step down transformer winding of less than 5VA.
2. Soldering Shop: Fabrication of DC unregulated power supply.
3. Artwork & Printing of a Simple PCB.
4. Etching & drilling of PCB.
5. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.
6. Testing and fabrication of power supply using voltage regulator.
7. Breadboard implementation of circuits (like ECG Amplifier, EMG Amplifier, nerve stimulator etc.)

BM-501 BIO MEDICAL INSTRUMENTATION - I

Unit- I

Introduction to biomedical instrumentation: development of biomedical instrumentation, sources of biomedical signals, medical instrumentation system, physiological systems of body, general constraints in design of medical instrumentation systems, Biometrics.

Unit- II

General consideration of signal conditioners, preamplifiers, main amplifiers and driving stage, sources of noise in low level measurements, biomedical signal analysis techniques, signal processing techniques, writing and recording system, direct writing system, Ink jet recorder, Potentiometric recorder, Ultraviolet recorder, Electrostatic recorder, Thermal array recorder, Light gate array recorder, Instrumentation Tape recorder, X-Y recorder, Medical oscilloscope.

Unit-III

Electrocardiography, waveform and measurement, ECG in diagnosis, arrhythmias, flutter, fibrillation, Phonocardiography, Ballistocardiography.
Electromyography, Electroencephalography.

Unit-IV:

Patient monitoring System: Concepts, Heart rate meter & alarm, Respiration rate meter, Blood pressure meter, Temperature indicator.
Foetal Monitoring System: - Cardiotacography, Foetal heart Rate (FHR) measurement.
Pulmonary Function Analyzer: Pulmonary Function Measurement, Spirometry, Respiratory Gas Analyzer.

Unit-V

Analytical equipments: Blood gas analyzer, Blood pH measurements, Measurement of Blood PCO2 & PO2.
Blood cell counters: Method of cell counting, coulter counters, Automatic and Differential counting.
Oximetery, PH meter,
Colorimeter, spectrophotometer, Flame photometer, electrophoresis, Centrifuge, Autoanalyzer.
Impedance Plethysmography & Electrical safety

REFERENCES AND SUGGESTED READINGS

- Handbook of Biomedical Engineering by R.S. Khandpur.
- Introduction to Analytical Instruments by R.S.Khandpur.
- Introduction to Biomedical Equipment Technology by Carr- Brown.
- Biomedical instrumentation, Application and Design by J.G. Webster.

BM 502 RADIOLOGY AND MEDICAL IMAGING

Unit-I
Basic Principles of Ultrasound transducer, Display Modes, measurement of imaging system, Application to imaging and tissues, Theory and construction of array transducer for imaging, Doppler ultrasound imaging and their application to the study of blood flow, Principles of Echocardiography.

Unit- II
Properties and production of X-rays, XRT, Engineering principles of X-ray system, image intensifier, angiography technique, digital radiography, Radiological instruments safety standards, Radiation Exposure and Biological Impact.

Unit-III
Tomographic Imaging: Computerized X-Ray tomography, Principles & Schematic of Magnetic resonance Imaging (MRI), Positron emission tomography (PET), SPECT, Thermography, C-Arm Technique.

Unit- IV
CT scan: Principle and Working
Angiography: General Angiography, Magnetic Resonance Angiography, Digital subtraction Angiography, Cine angiography
Radiograph: General Radiography, Digital Radiograph and Computed Radiograph
Teleradiology:

Unit-V
Medical Thermography: Physics of thermography, thermographic equipment, Applications of thermography.

REFERENCES AND SUGGESTED READINGS

- Handbook of Biomedical Engineering by R.S. Khandpur.
- Introduction to Biomedical Equipment Technology by Carr- Brown.
- Test book of Radiology by Christensens.

BM-503 MICROPROCESSOR

Unit-I
Introduction to Microprocessors: Features, Programmer's Model, External and Internal Organization.
8085 Architecture: 8085 organization and architecture, Instruction Cycles, Machine Cycles and T-States, Address decoding techniques, Minimum system design, Memory Interfacing with timing consideration, Clock, Reset and buffering circuits.

Unit-II
8085 Instruction Set: Instruction Format, Addressing Modes, Classification of instruction set.
8085 Programming: Assembly language programming:- basic structure, Data transfer, Arithmetical, Logical, Transfer of control and miscellaneous instruction types.

Unit-III
Stack & Subroutines: Stack operations, limitations, Subroutine concepts, parameter passing techniques, Subroutine design, Delay Subroutine design and applications, Re-entrant & Recursive subroutines, concept of counters and timers.

Unit-IV
I/O Data Transfer Techniques: I/O Interface concepts, speed consideration, program controlled I/O, asynchronous and synchronous I/O techniques, Interrupt driven program controlled I/O, Direct Memory Access data transfer controlled techniques, Handshake signals, concepts of serial communications, Matrix keyboard and multiplexed display interfacing.
Interrupts: Requirements, Single level interrupt, Multilevel interrupt and Vector interrupt system, 8085 interrupt structure and its operation, 8259 A Interrupt controller.

Unit-V
I/O Controllers: Features, organization & Operating modes of 8155 Multi function device, 8255 Programmable Peripheral interface 8253 Programmable Timer, 8257 Programmable DMA Controllers, 8251 usart, 8279 KEYBOARD DISPLAY INTERFACE.

REFERENCES AND SUGGESTED READINGS

- Microprocessor by R.S. Gaonkar.
- Microprocessor and Programmable Logic by K. Short.
- Microprocessor by P.P.Tawade & P.B. Borole.
- 8085 Assembly language programming by Leventhal.
- Microprocessor by Glimore.

BM-504 ANALOG AND DIGITAL INTEGRATED CIRCUITS

Unit-I
IC OP-Amp applications: Op AMP fundamentals (brief review of differential amplifier, current mirror, active load, level shifter output stage, ac and dc characteristics) Basic building blocks using OP AMPs.

Unit-II
Linear Applications of OP - AMP - Inverting and non inverting, summing amplifier, Differentiation, Integrater.
Adder, subtractor, instrumentation Amp, voltage follower V-I, I-V converter, Precision Rectifiers, Peak detector, Clipper, clamper, sample / Hold, log, Antilog, multiplier, gyrator op-amp as conparatos, schmitt trigger square and Triangular wave generator.
Active filters - LP, HP] BP and Notch (Band reject)

Unit-III
Specifications functional Block diagram and applications of 723, 3 T regulator ICs like 78 xx series and LM 317.
Principles and working of switching mode regulator.
x SSS Timer functional diagram and specifications Application as monostable, Astable, Bisable Pulse width modulator.

Unit-IV
Basic digital circuits Basic operation of gates noise margin, Transfer characteristics, propagation delay and fan out, propagation delay of following.
CMOS inverter TTL gates ECL circuits, comparison and interfacing of above logic families.

Unit-V
Combination Digital circuits - functional logic diagram of following ICS, their working and applications standard gate ICS, Digital comparator Decoder, Demultiplexer multiplexer Encodor and their applications.
Sequential circuits & systems : Latch, clocked SR flip flop, JK, T, D type flip flop, Asynchronous counters including design, syncronous counters including design.

REFERENCES AND SUGGESTED READINGS

- OP AMP and Linear Integrated Techniques by Gaikwad, PHI.
- Linear Integrated Circuit by R. Roychoudhary and Shail Jain, Wiley Eastern.
- Digital Electronics, R.P. Jain.
- Digital Electronics, Schilling and Taub.
- Designing with TTL ICS, Texas Instruments.
- Sedra Smit/ Microelectronic Circuit/ Oxford University Press, 2000.
- Design of Analog Integrated Circuit & Systems/ TMH-Keneth Laker.

BM-505 HOSPITAL MANAGEMENT

Unit-I

Organizational Behaviour: Definitions, various approaches to study OB, Personality, Different theories of personality, Leadership, characteristics of leadership, role of leadership in organization, conflict, process of conflict with illustrations, aggression, managerial grid, perception, learning, human engineering.

Unit-II

Hospital general medical services- subcomponents of it, objective and scope of OPD, nursing services, admitting department, radiological examination, laundry and linen services, salient features of amendment of drug and cosmetics law 1972, food services, house keeping department, role and functions of pharmacy, registration and record area, physical medicine and rehabilitation, quality assurance.

Unit-III

Hospital Planning and commissioning-financial planning for securing funds, duties and responsibilities of hospital consultant, services of engineers in hospital construction, recruitment policy, manpower planning, wage and salary administration, benefits of grievance, classification of hospitals.

Unit-IV

Hospital administration- hospital administration as a science and art, duties responsibilities and functions of CEO, engineering functional areas in hospitals, facilities management, accreditation manual of hospitals, waste, scrap and spoilage. Pricing in materials, organizational ethics, bin card, bill of materials.

REFERENCE

Hospital, Planning, Designing and Management – Kunders, Gopinath, Katakam.

BM-506 CONTROL SYSTEM

Unit - I

Input/ Output Relationship: Introduction to Open Loop Control Systems, Mathematical Modelling and representation of physical systems (Electrical Mechanical and Thermal) derivation of transfer function for different types of systems. Block Diagram & signal flow graph. Reduction algebra Mason's Gain formula.

Unit – II

Time Domain Analysis: Time domain performance criterion, transient response for first, second & higher order systems Steady state errors and static errors error constants in unity feedback control systems. Error criteria. Generalized error constants. Performance indices response with P, PI and PID controllers.

Unit – III

Frequency Domain Analysis: Polar, Inverse polar plots. Frequency domain specification Logarithmic plots (Bode plots), gain and phase margin. Relative stability Correlation with time domain. Constant M & N circles. Closed loop frequency response from open loop response.

Unit – IV

Concept of stability: Asymptotic and conditional stability. Routh - Hurwitz criterion. Nyquist stability criterion. Root locus plots and their applications.

Unit – V

Compensation Techniques: Concept of Compensation Lag. Lead networks. Design of closed loop systems using compensation techniques Feedback compensation using P,PI,PID controllers.
Non - Linear Systems: Linearization techniques of non-linear systems. Phase plane and describing function techniques. Introduction to optimization techniques.

REFERENCES AND SUGGESTED READINGS

- Principles of Control Systems, S.P. Eugene Xavier, S.Chand & Company.
- Modern Control Engineering by K. Ogata, PHI.
- Automatic Control System by B.C. Kuo, PHI.
- Control System Engineering by I.G. Nagrath and Gopal, New Age International Publisher.
- Control System Engineering by Norman S. Wise, John Wiley & Sons, Singapur.

BM-551 BIOMEDICAL INSTRUMENTATION LAB

1. Measurement of Blood pressure
2. Study of Transducers
3. Designing of active filters - LP, BP, HP, Notch
4. Study of and Design of Instrumentation Amplifier
5. Study of ECG, EMG, EEG machines,
6. Amplitude modulation and detection
7. Servicing of circuit boards of biomedical instrument
8. Frequency modulation and detection
9. Pulse modulation techniques
10. Pulse code modulation.

BM-552 CONTROL SYSTEM LAB

1. D.C. Position servomechanism.
2. A.C. Position Control.
3. Study and performance of Synchro transmitter receiver pair.
4. Speed control of D.C. motor using SCR.
5. Study and determination of control characteristics of: Flow control system, Temperature control system, Liquid level control system, Pressure control system, Temp/ pressure/ flow/ Control using PLC.
6. Determination of ON-OFF control characteristics following control systems.
   i. Fluid flow ii. Temperature iii. Liquid level.
7. Microprocessor based switching control (relay sequence of LEDs).
8. Microprocessor based feed-back control.
9. PC interface with the different control systems.
10. Determine the characteristics of P, PI, PD, PID controller.
11. Design and realization of P,PI,PD, PID controller.
12. Study and realization of Lead, Lag and lead - lag compensation networks.
13. Determine the transient response of 2^{nd} order system with step/square Input.
14. Tuning of P, PI, PD, PID controller using MATLAB.
15. Determination of Time response characteristics of a 4^{th} order system using MATLAB.
16. Study the stability of a control system using.
    - ♦ Bode Plot
    - ♦ Nyquist Plot
    - ♦ Root locous with the help of MATLAB

BM-553 MICROPROCESSOR LAB

1. Data Transfer operation
2. Addition and subtraction of single and multibytes binary numbers.
3. Addition and subtraction of single and multibyte BCD numbers (subtraction using 9's and 10's complement schemes)
4. Multiplication and divisions of binary numbers
5. Logical operations

6. Counting, looping, searching and sorting
7. Programming examples for code conversion subroutines, tables handling and study of interrupts.
8. Study of 8255
9. Study of 8253, generation of Square wave using 8253, calculation of time period between two events.
10. Interfacing a DAC to generate staircase, rectangular, triangular, ramp, sinusoidal and arbitrary waveforms, Interfacing ADC.
11. Keyboard Interfacing using 8255
12. Multiplexed display & interfacing using 8255
13. 8251 programming.

BM-554 ANOLOG AND DIGITAL CIRCUITS LAB

1. Measurement of OPAMP parameters such as gain & frequency response. CMRR offset voltage.
2. Some linear & nonlinear applications of OPAMP such as V to I & I to V converter precision rectifier, Integrator.
3. Operation of a Digital to Analog converter.
4. Operation of a A/D converter.
5. Testing of a PLL, locking & range capture ranges.
6. Design of high & low voltage regulator using IC 723.
7. Waveform generation using IC 555 in astable & Monostable modes.
8. Frequency multiplier using PLL.
9. Voltage of frequency conversion.
10. Second order Active filter-High pass and Low pass realisation by hardware.
11. Higher order filter realisation, Analysis & design on MATLAB
12. Experiments with Digital ICs

BM-601 BIO MEDICAL INSTRUMENTATION - II

Unit- I
Biomedical Telemetry - Wireless Telemetry, Single Channel telemetry Systems, Temperature telemetry system, multichannel wireless telemetry system, multipatient telemetry, Transmission of analog physiological signals over telephone lines.

Unit-II
Blood flowmeters - Electromagnetic blood flowmeter, Ultrasonic blood flowmeters, NMR blood flow meter, Laser Doppler flowmetry.
Cardiac output measurement - Indicator dilution methods, measurements of continuous cardiac output derived from the aortic pressure waveform, Impedance Technique.

Unit-III
Instrument for surgery-surgical diathermy machine, Electrodes used with surgical diathermy, safety aspects in electrosurgical units, surgical diathermy analyzers.

Unit-IV
Physiotherapy and electrotherapy equipment Shortwave diathermy machine, microwave diathermy machine, ultrasonic therapy unit, electrodiagnostic therapeutic apparatus, pain relief through electrical stimulation

Unit-V
Cardiac pacemakers - External pacemakers, Implantable pacemakers, programmable, pacemaker, performance aspects of implantable pacemakers, power sources for implantable pacemakers, leads and electrodes, pacing system analyzers.
Cardiac defibrillators- Dc-defibrillator, defibrillator electrodes defibrillator with synchroniser, performance aspects of dc-defibrillators, implantable defibrillators, defibrillator analyzer.

REFERENCES AND SUGGESTED READINGS

- Handbook of Biomedical Engineering by R.S. Khandpur.
- Introduction to Analytical Instruments by R.S.Khandpur.
- Introduction to Biomedical Equipment Technology by Carr- Brown.
- Biomedical instrumentation, Application and Design by J.G. Webster

BM-602 BIOCHEMISTRY

Unit-I

Introduction to Biochemistry and Medicine - Cell, Eukaryotic cell structure, Functional role of each cell organells, subcellular fractionation- Differential Centrifugation, Redox potentials and oxidative phosphorylation, Transport of substances across biological membrane function.

Unit-II

Enzymes (Proteins)- Chemical nature of enzymes, General properties of enzymes. Spectrophotometric measurement of enzyme activity, Enzymes (proteins) isolation methods. Study of enzyme properties, Diagnotic enzymes, Enzyme biotechnology.

Nucleic Acids- Composition and functions of nucleic acids (A brief account). Genes outlines of DNA structure, Recombinant DNA and its applications.

Blood Chemistry- Chemical composition of blood.

Urine Chemistry - Chemical composition of urine under normal and abnormal conditions.

Unit-III

Instrumentation- Principles and applications of photometry, Spectrophotometry, Fluorometry, Nephalometry and Turbidimetry. Biochemical analysis carried out in the estimation of blood constituents like glucose, urea creatinine, proteins, cholesterol, bilirubin etc. Separation of serum proteins by electrophoresis. Automation in biochemical analysis.

Unit-IV

Acid base homeostasis - Acids, bases, Measurement of pH and glass electrodes. Role of kidney and lungs in acid base balance Biochemical measurement of acid base status of patients. Blood gas analyser disorders of acid base balances.

Unit-V

Isotopes- Definitions, units, radioactive decay rates, Detection and production of radioactive isotopes. Applications of isotopes in life sciences and medicine.

REFERENCES AND SUGGESTED READINGS

- Harper's Review of Biochemistry by D. W. Martin, P.A. Maves and V.W. Podwell, Lange Medical Pub, Asia.
- The Text Book of Biochemistry by A.V.S.S. Rama Rao, L.K. & S. Publications, Tirupati.

BM-603 BIOMECHANICS, PROSTHETICS, ORTHOTICS AND IMPLANTS

Unit-I

General principles of biomechanics, Cardio-vascular and pulmonary mechanics, haemodynamics, Rheology of blood, Mechanics of heart valves, heart assist devices, blood vessels with special reference to atheleroscleroses, aneurysm. Mechanical properties of RBCs and WBCs and Microcirculation. Mechanics of lymphatic system.

Unit-II

Tissue Biomechanics - Direct, shear, bending and torque actions the corresponding stresses and strains in biological tissues. Stress relaxation and creep, stability and instablity. Bio-mechanical characterisation of bone and the soft connective (skin, tendon, ligaments etc.) covering structure their function and physiological factors.

Unit-III

Movement Biomechanics - Gait Analysis, body and limb mass and motion characteristics, muscle actions, forces transmitted by joints. Joint forces results in the normal and disabled human body. Slow normal and fast gait on the level. Joint replacements.

Unit-IV

Positions of anatomical axis and corresponding movements of the body part, International conventions with respect to above. Types of mechanical forces on joints and their effect. Repetitive and static load.

Unit-V

Principles of designing Prosthesis and orthotics, three point pressure, total contact, partial weight reliving, purpose for providing prostheses and Orthoses, Various aspects regarding diagnosis, prognosis, stature and Socio-economic conditions etc.

Classification of Prosthetics and Orthotics:

a. Lower Extremity Orthoses and Prostheses
b. Upper Extremity Orthoses and Prostheses.
c. C. Spinal Orthoses.

Material Technology for designing Prosthetics and Orthotics, indigenous metals and their alloys, leather, rubber, thermosplastic and thermosetting resins, wood and binding materials

REFERENCES AND SUGGESTED READINGS

- A Text Book of Biomedical Engineering, Ed R.M. Kenedi
- Handbook of Bioengineering by Richard Skalak and Shu Chien.

BM-604 MICROCONTROLLER AND ITS BIOMEDICAL APPLICATIONS

Unit-I
Introduction: 8051, Comparison with microprocessor, pin diagram explanation, internal diagram 8051.

Unit-II
Instruction Set: Addressing mode, data transfer instruction, logical, arithmetic instruction, bit instruction, branching instruction.

Unit-III
Timers: Control Word, mode of timers, simple programming, generation of square wave.
Serial Interface: Introduction, Control Word, mode of serial interface, simple Programming.

Unit-IV
Interrupts: Introduction, Control word Simple Programming, generation of waveforms using interrupt, serial interface using interrupt.

Unit-V
Applications: Interfacing of memory, intelligent LCD, 8255, ADC, DAC, LED display.

REFERENCES AND SUGGESTED READINGS

- Micro controllers & its applications by B.S. Chhabra, Dhanpat Rai Pub. Co., India
- 8051m C, Scott Mackenizie, PHI, Englewood Cliffs, New Jersey.
- Myke Predko,'Programnming & Customizing the 8051 Microcontroller,' Tata McGraw- Hill Pub. Co. Ltd., New Delhi.
- 8051 m C Architecture Programming & Applications, K.J. Ayata: Penram International Publishers, India.
- S.K. Venkata Ram,'Advanced Microprocessor & Microcontrollers,'Luxmi Pub. Pvt. Ltd., New

BM 605 CLINICAL SCIENCE AND ENGINEERING

Unit-I

Cardiology- heart lung machine, applications, clinical significance, CPV and SWAN catheters fibrillation atrial, ventricular, application of cardiac assist devices, cardiac catheterization, echocardiography, cine angiography, treadmill, ergometer, applications, clinical significance open heart surgery grafts, bypass surgery, instrumentation used for open heart surgery.

Unit-II

Anaesthesiology- basic physical principles and their applications in anaestheis and intensive care, Description of general and regional anaesthetic techniques, fundamentals of the practice of anaesthesia before describing the anaesthesia machine.

Unit-III

ENT: Anatomy of ear and central connection, Mechanics of hearing and equilibrium, Auditory receptors and genesis of different potential changes in the internal ear. Audimeter- Principles of equipment and technique including impedance, hearing aids, electronystagmography.

Unit-IV

Opthalamology: Physiology of eye, Snellens chart, Keratometer, Refractometer, Colour vision, Opthalmoscope, Retinoscope.

REFERENCES AND SUGGESTED READINGS

- Rach/Patton – Biophysics/ Physiology
- Glasser- Medical Physics
- Glasser- Cardiovascular Assist Devices
- Rushmer-Cardiovascular Dynamics
- R. D. Miller- Text Book of Anaesthesia

BM-606 COMMUNICATION ENGINEERING

Unit- I

Continuous wave modulation: Elements of Communication system and its limitation, Motivation for modulation Time and Frequency domain representation of signals. Review of Fourier series and Fourier Transforms. Amplitude Modulation & Detection, Suppressed Carrier modulation, Single Side Band Modulation and detection, Vestegial Side and Modulation Phase Modulation, Frequency Modulation, Wideband and Narrow-band Frequency Modulation, FM detection, Stereohonic FM, Frequency Division Multiplexing Thermal Nose shot noise, Noise in Communication systems.

Unit-II

Pulse Modulation : Base Band signal characterization, Sampling Theorem, Signal reconstruction in time domain, Practical and Flat Top sampling, Sampling of band pass signals, Analog pulse Modulation systems - Pulse Amplitude Modulation, Pulse Position Modulation and Pulse width Modulation.

Unit-III

Waveform coding Techniques : Discretization in time and amplitude, Quantization-Uniform & Non-uniform, Quantization Noise, Encoding and Pulse code Modulation, Binary and M' ary systems, B.W. requirements of PCSI Differential Pulse code Modulation, Delts Modulation and Detection. Coding speech at low bit rates.

Unit -IV

Time division Multiplexing : Fundamentals, Electronic commutator, Bit/Byte Interleaving, T1 carrier system Synchronization and Signaling of T1, TDM PCM hierarchy, Synchronization Techniques.

Unit-V

Digital Modulation Techniques: Types of Digital Modulation, Waveforms for Amplitude, Frequency and Phase shift keying Method of generation and detection of coherent and non coherent ASK, FSK & PSK, Probability of error, comparison of above digital Modulation Techniques.

Introduction to Information Theory: Measure of Information, Entropy & Information rate, Channel capacity, Hartely Shannon law, Huffman coding Shannon-Fano coding.

REFERENCES AND SUGGESTED READINGS

- An Introduction to Analog and Digital Communication Systems by S.S. Haykin, Wiley Eastern, 1989.
- Modern Analog and Digital Communication by B.P. Lathi, John Wiley.
- Communication System by Simon Haykin, John Wiley Sons.
- Principles of Communication Systems by Taub & Schilling, TMH.

BM-651 BIOMEDICAL INSTRUMENTATION-II LAB

1. Study of Biomedical Instrumentation circuits.
2. Study of ECG machine.
3. Study of Pulse Oximeter.
4. Designing of circuit of any biomedical equipment.

BM-652 BIOCHEMISTRY LAB

1. Estimation of Blood glucose
2. Study of chromatography
3. Study of Electrophoresis
4. Use of pH meter
5. Application of spectrophotometer.
6. Estimation of reducing sugars in Urine
7. Demonstrations of other analytical instruments
8. Servicing of some circuit boards of Analytical instruments

BM-653 BIOMECHANICS LAB

Industrial tour/ visit to any of the artificial limb manufacturing unit of India

BM-654 MICROPROCESSOR AND MICROCONTROLLER LAB

1. Interfacing temperature sensor
2. Interfacing light sensor
3. Interfacing ADC
4. Interfacing DAC
5. Study of microcontroller 8031
6. Interfacing I/O
7. Study of 8086 microprocessor

SEMESTER VII

BM-751 INDUSTRIAL TRAINING

The students are to undergo training for a period of at least 16 weeks in a organization/ research institute/ biomedical industry/ hospital. The concerned department of the college must continually assess the students during the entire period of training.

The students are required to submit a report at the end of the training. The report shall have at least 25 typewritten A4 size papers and should be supported by a certificate of satisfactorily completion of training from the industry or organization in which the training was undertaken.

This report shall be duly graded by the guide/department of the college. The students are required to give a seminar presentation based on the work carried out by them. The assessment would be based on the clarity of concepts, quality of work and open discussion.

SEMESTER VIII

BM-801 BIOLOGICAL CONTROL SYSTEM

Unit-I

Introduction to biological control system: Introduction, Dynamic systems and their control, modeling and block diagrams of Open and closed loop systems, basic concept of feedback control systems, stability criteria, speed of response.

Modeling the body as compartments, behavior in simple compartmental system, pharmacokinetic model, multi compartmental system. Distribution and accessibility of body water & tissue compartments, basis for zero order & first order chemical kinetic behavior in the biological system. Practical applications of stochastic models to tracer kinetics and pharmaco kinetics

Unit-II

Models of neurons: the Hodgkin-Huxeley model, the iron-wire model. Models for human eye movement: the eye-movement control system, four eye movement systems, quantitative eye movement models, techniques for validation models, validation of the physiological models, parameter estimation, linearlising the model

Unit-III

Mathematical modeling of the system: Thermo regulation, Thermoregulation of cold bloodedness & warm bloodedness, the anatomy of thermo regulation, lumping & partial differential equations, heat transfer examples, mathematical model of the controlled process of the body.

Unit-IV

The neuromuscular system: the stretch reflex, the antagonist muscle, two control mechanisms, golgi tendon organs, experimental validation of the models, Parkinsons syndrome.

Unit-V

Biological receptors: -Introduction, receptor characteristics, transfer function models of receptors, receptor and perceived intensity. Respiratory model & systems, Neuromuscular model, Cardiovascular control system.

REFERENCES AND SUGGESTED READINGS

- Bio Engineering, Bio Medical, Medical & Clinical Engg. by A Teri Bahil.
- Mathematics and Computers in Biomedical Applications by J. Elseatedel, C. Delisi.

BM-802 BIOMEDICAL DIGITAL SIGNAL PROCESSING

Unit-I

Signal conversion: Sampling basics, simple signal conversion system, conversion requirements for biomedical signals, signal conversion circuits.
Basics of digital filters: Digital filters, The z transform, Elements of digital filters, Types of digital filters, Transfer function of a differential equation, Z-plane pole zero plot, The rubber membrane concept.

Unit-II

Finite impulse response filters Characteristics, Smoothing Filters, Notch Filters, Derivatives, window design, frequency sampling minimax design.
Infinite impulse response filters: Generic equation of HR filter, Simple one pole example, integrator, Design method of two pole filters, HR filter for ECG Analysis.
Integer filter: Basic Design Concept, LP, HP, BP and Band reject filters, The effects of filter cascades, Other fast operating design techniques, Design examples and tool.

Unit-III

Adaptive filters: Principle of noise canceller model, 60 Hz adaptive canceling using a since wave model, other applications of adaptive filtering.
Signal Averaging: Basics of Signal Averaging, Signal averaging as a digital filter, A typical averager, software for signal averaging, limitations of signal averaging.

Unit-IV

Data reduction techniques: Turning point algorithm, AXEC algorithm, CORTES, Fan algorithm, Huffman algorithm.
Other time and frequency domain techniques
The Fourier transform, Correlation, Convolution, Power spectrum estimation

Unit-V

ECG QRS Detection: Power spectrum of ECG, Bandpass filtering Techniques, Differentiation techniques, Template matching techniques, QRS detection algorithm.
ECG Analysis System: ECG interpretation, ST segment analyzer, portable arrhythmia monitor.
DSP563 xx Architecture and Programming

REFERENCES AND SUGGESTED READINGS

- Biomedical Digital Signal Processing by W. J. Tompkins, Prentice Hall, Engleweed Cliffs, New Jersy.
- Biomedical Signal Processing by Metin Akay, ACADEMIC PRESS.
- Design of Micro Computer based Instrumentation by I.C. Webster and W.J. Tompkins Prentice Hall.

BM-803 -1 NUCLEAR MEDICINE

UNIT-I

Basic Physics and Radiation Safety in Nuclear Medicine, Interaction of Radiation with Matter,
Types of radioactivity, units of radioactivity, Formation of Radionuclides.
Radiopharmacy: Basics. Technetium-99m Radiopharmaceuticals, Radiopharmaceuticals, Pharmacokinetics.

UNIT-II

Single-Photon Emission Computed Tomography (SPECT)
Elements of Gamma Camera, Positron Emission Tomography (PET):
Combined PET/CT Imaging

UNIT-III

Detectors: Nonscintillation Detectors, Nonimaging Scintillation Detectors, 52
Radiation Dosimetry: Definitions and Basic Quantities. Formulations, Models, and Measurements.

UNIT-IV

Image Analysis, Reconstruction and Quantitation in Nuclear Medicine
Fundamentals of Image Processing in Nuclear Medicine.
Emission Tomography and Image Reconstruction
Quantitative SPECT Imaging
Quantitative Cardiac SPECT Imaging

UNIT-V

Radiotherapy: Metabolic radiotherapy, Radioimmunitherapy, Local radiotherapy, Targeted radiotherapy, alpha immunotherapy, neutron capture therapy, dose and mechanism

REFERENCES AND SUGGESTED READINGS

- Essential Nuclear Medicine Physics by Rachel A. Powsner and Edward R. Powsner, Blackwell Publishing, 2006
- Basic Sciences of Nuclear Medicine by Khalil, Springer publications
- Text book of Nuclear medicine by A.F.G. Roche
- Medical radiation Physics by William Hendey

BM-803-2 ARTIFICIAL NEURAL NETWORKS

Unit-I

Neural Networks-1(Introduction & Architecture)

Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions,

Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule,

Auto-associative and hetro-associative memory.

Unit-II

Neural Networks-II (Back propagation networks)

Architecture: perception model, solution, single layer artificial neural network, multilayer perception model; back propagation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting back propagation training, applications.

Unit-III

Fuzzy Logic-I (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

Unit-IV

Fuzzy Logic –II (Fuzzy Membership, Rules)

Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications.

Unit-V

Genetic Algorithm (GA)

Basic concepts, working principle, procedures of GA, flow chart of GA, Genetic representations, (encoding) Initialization and selection, Genetic operators, Mutation, Generational Cycle, applications.

REFERENCES AND SUGGESTED READINGS

- Artificial Neural Network by B. Rangnarayana, Prentice Hall
- An Introduction to Neural Networks by J. A. Anderson- Anderson

BM- 803-3 VLSI DESIGN

Unit-I
Introduction to integrated circuit analog IC, SSI, MSI, LSI, VLSI.
IC fabrication techniques: A brief review of basic lab process, oxidation, diffusion, ion implantation, exitaxy metallization, Photolithography, Photo mask making.
Bipolar technology: Basic TTL, ECL, IIL circuit and their characteristics.

Unit-II
Review of MOSFET/ IGFET technologies, MOS/ IGFET devices, enhancement mode and developmental mode devices their characteristics, scaling effect.

Unit-III
MOS basic circuits: inverter, NAND, NOR, AND, OR, inverter circuit. Design considerations, layout micron and submicron technologies, parasitic effect, physical limitations, and circuit simulation.

Unit-IV
Standard digital ICS: Combinational and sequential circuits, design of standard cells for LSI, VLSI circuits, use of CAD software, memory circuit, ASICs.

Unit-V
Programmable logic devices: PLKA, PAL, PGA, FPGA, VLSI testings.

REFERENCES AND SUGGESTED READINGS

- Basic VLSI design by D.A. Pucknell and Eshraghian, PHI, 2000
- Modern VLSI design- System on Silicon by Wayne Wolf, 2nd ed Addition Weseley, 2000.
  VLSI Design techniques for Analog and Digital Circuits, by R.L. Geiger, P.E. Allen and N.R. Strader, MH, 1990

BM-804-1 LASERS AND FIBRE OPTICS IN MEDICINE

Unit-I

Introduction to Fiber Optics: Basic fiber links, Application ,Principal of Light: Introduction, E M spectrum, Light as wave, Light as a Particle, Speed of Light, Internal and external Reflections, Snell Law, Optical Fibre, Numerical Aerture, Fresnal Reflections.

Unit-II

Optic Fiber and its Properties: Introduction, Basic Fiber construction, Propagation Of Light, Modes of Operation, Refractive index Profile, Type of Fibers, Dispersion, Data Rate and Band width, Attenuation, Losses.

Connectors, Splices and Couplers: Introduction, Splices: Mechanical, Fusion, Protection of splices, Connectors: SMA, STC, Bionic etc, Coupling Stan, TEE types.

Unit-III

Optical Sources and Photo Detectors: Introduction: Creation of Photons, LED, The Injection Laser Diode (ILD),Characteristics of LED and ILD.

Photodetectors.- Introduction, PIN, Photodiode, Avalanche photodiode, Photodiode Parameters, Detector noise. Speed of Response, SNR.

Modulation Scheme for Fiber optics transmission: Introduction, Digital Modulation, Analog Modulation Schemes, Multiplexing.

Unit-IV

Introduction to Lasers: Laser Physics: Introduction, principal components of Laser system, Laser Emission: Sequence of events, Characteristics of Laser Light and Basic Technology, Mode of emission.

Laser Tissue Interaction: Introduction: The Eye, Skin, and other tissue. Terminology: Spectral Band Designations, Energy and Power irradiant and Radiant Exposure, Fluence. Thermal Diffusion, Fibers and contact Tips. Type of Laser-Laser tissue. Interaction: -Photocoagulation, Photothermal ablation, photochemical ablation. Photo disruption, photochemical interaction.

Unit-V

Laser systems:-Introduction, Type of lasers-Solid state Lasers, Gas lasers, and dye Lasers, Lasers used in Medical Practice-Ruby laser, Co_2 Lasers, Nd :YAG Laser and related Solid state Laser.

Laser Application in Medical Practice. Introduction, General Surgery, Dermatology, Ophthalmology, Cardiovascular & Chest Surgery, Gynecologic Laser, Neuro Surgery, Tumor Surgery, Urology, and Otolaryngology &neck and head surgery.

REFERENCES AND SUGGESTED READINGS

- Therapeutic Lasers—Theory and practice by G.David Baxter, Churchill Livingstone Pub.
- Medical Lasers and their Safe Use by David H. Shiney, Stephen and L. Trokel, Springer Verlag Pub.
- Elements of Fibre Optics by S.L. Wymer, Prentice hall.
- Laser and Optical Fibers in Medicine by Katzer and Abraham, academic Press Publications.

BM 804-2 ADVANCED BIOMEDICAL DIGITAL SIGNAL PROCESSING

Unit-I
Frequency domain analysis, spectral analysis, homomorphic filtering.

Unit-II
Time series analysis, linear prediction, AR, MA, ARMA models, Levinson and Derbon Method, Burg method.

Unit-III
Spectral estimation, autoregressive method.
Adaptive filtering, general structure of adaptive noise cancellation, improved adaptive filtering.

Unit-IV
Signal classification and recognition, statical signal classification, linear discremenant, KLE, Direct feature selection and ordering, time wrapping.

Unit-V
Time frequency and wavelet representation of signals.

REFERENCES AND SUGGESTED READINGS

- Biomedical Signal Processing by Arnon Cohen, CRC press (Vol I and II)
- Detection and Estimation of Biomedical Signals by M. Akay, Academic press, 1993
- Biomedical Signal Processing by M. Akay, Academic Press 1994

BM 804-3 BIOMEDICAL NANOTECHNOLOGY

UNIT -I

Introduction of Nano-Science and Nano Technology. Scope and applications of Nano-Technology in Biomedicine and Biomedical imaging systems.

Introduction to Physics of Solid State: Size dependence of properties; crystal and amorphous, face centered cubic nanoparticles, lattice vibrations, Excitons.

UNIT-II

Properties of Nano particles, Metal Nano clusters: Magic Numbers; Theoretical Modelling of Nanopraticles; geometric structure; electronic structure; Reactivity; Fluctuations Magnetic Clusters; Bulle to Nano structure .

Optical Properties; Luninscence.

UNIT-III

Growth Techniques of Nanomaterials: Chemical Vapour deposition(CVD), Sol-Gel Technique, Sonochemical method, Vapor-Liquid –Solid (VLS) method of nanowires.

Characterization techniques for nanoparticles: Crystallography, particle size determination, surface structure, Scanning Prob Microscopy (SPM), Atomic Force Microscopy (AFM), Field Ion Microscopy, Scanning Electron Microscopy, Transmission Elecrtron Microscopy (TEM)

Optical Spectroscopy,.

UNIT-IV

Applications of Nanotechnology in drug delivery system, implants and prosthesis, biomemetics. Techniques for nanofabrication. Role of nanocomponents as sensors for biodefense.

UNIT-V

Role of Nanotechnology tools in Biomedicine. High throughput screening (HTPS) and diagnostics techniques and their applications in cancer, genetic diseases, infectious diseases and epidemiology studies. Introduction to MEMS and NEMS. Social and economical aspects of Biomedical nanotechnology. Potential risks and toxicities of nanomaterials and their regulation path.

REFERENCES AND SUGGESTED READINGS

- C.P.Poole Jr F.J. Owens, “Introduction to Nanotechnology”.
- Neelina H. Malsch, Biomedical nanotechnology, CRC PRESS, Taylor & Francis title, 2005
- Handbook of Nanostructured Materials & Nanotechnology” vol.-5. Academic Press 2000
- A.K.Bandyopadhyay, “Nano Materials” New Age International.

BM-853 BIOMEDICAL SIGNAL PROCESSING LAB

1. Designing of digital filters
2. Designing of FIR filters
3. Designing of IIR filters
4. AZTEC algorithm
5. Turning point algorithm
6. Fan algorithm
7. Huffman algorithm
8. ECG QRS detection
9. ECGH analysis system
10. DSP563XX programming

BM-855 PROJECT

The students are expected to take up a project under the guidance of teacher from the institute either individually or a team (maximum 4 members).

This may include:

- Experimental analysis/verification
- Development of design methods and verification
- Design and fabrication of a model or a circuit
- Developing a software for analysis and / or design or decision making during engineering and management practice

The student/group shall prepare and submit report on the project. This shall be typewritten on A4 size paper, hard-bound and prepared in the academic style.

Acquaintance with survey and research methods and their use in conducting a systematic investigation would be the criteria for evaluation of the project work. The style of report preparation and presentation at the time of oral shall form the basis of internal evaluation.

An oral examination shall be conducted at the end of the Semester VIII.