

संत गाडगे बाबा अमरावती विद्यापीठ

SANT GADGE BABA AMRAVATI UNIVERSITY

(FACULTY OF ENGINEERING & TECHNOLOGY)

PROSPECTUS

PRESCRIBED FOR
FOUR YEAR DEGREE COURSE
BACHELOR OF ENGINEERING
BIOMEDICAL ENGINEERING
III & IV SEMESTER
EXAMINATIONS, 2009-2010
SEMESTER PATTERN



2009

visit us at www.sgbau.ac.in

Price Rs. 10/-

-
- © "या अभ्यासक्रमिकेतील (Prospectus) कोणताही भाग संत गाडगे बाबा अमरावती विद्यापीठाच्या पूर्वानुमती शिवाय कोणासही पुनर्मुद्रित किंवा प्रकाशित करता येणार नाही ."
- © "No part of this prospectus can be reprinted or published without specific permission of Sant Gadge Baba Amravati University.

**SYLLABUS
PRESCRIBED FOR
FOUR YEAR DEGREE COURSE
B.E. BIOMEDICAL ENGINEERING
IIIrd & IVth SEMESTER EXAMINATIONS
SEMESTER PATTERN
THIRD SEMESTER**

Inplant Training & Industrial Visit in the faculty of Engineering & Technology

- 1)
 - a) the inplant training shall not be compulsory,
 - b) the inplant training shall be taken by students strictly during Summer vacation. after IVth or VIth Semester examination and / or during Winter vacation after Vth or VIIth Semester examinations,
 - c) the inplant training shall not be part of examination system, however, student shall prepare and submit report after completion of training to the concerned Head of Department alongwith certificate issued by the industry,
 - d) the inplant training shall be of minimum two weeks duration,
 - e) there shall not be any liability whatsoever on the Institution with respect to inplant training of the students,
 - f) students shall undertake inplant training on their own risk and cost. An undertaking in this regards signed by student and parents shall be submitted before proceeding for training to the concerned Head of Department/ Head of Institution.
 - g) the students shall complete inplant training under the supervision of concerned person in the industry,
 - h) Institutes shall help students to organise inplant training by way of correspondance,
- 2) Industrial Visit : Industrial visit may be organised for the students. Students should prepare & submit the report on Industrial visit to the concerned Head of Department/Head of Institution.

3SB1 TRANSFORMS & PROBABILITY

Unit I: Fourier Series: Introduction: Euler's formula; Problems on general Fourier Series; Conditions for Fourier Expansion; Fourier Expansions of Discontinuous Functions; Even and Odd functions; Change of interval; Half range series; Typical Waveforms (Square, Sawtoothed, Triangular, Half Wave rectifier, Full Wave rectifier); Parseval's Identity

- Unit II Fourier Transform (FT) and its properties; Inverse Fourier Transform; Fourier transform of derivative; Convolution; Application of Fourier Transform in solving partial differential equations - Laplace's Equation (2D only), Heat Conduction Equation (1 D only) and Wave Equation (1 D only).
- Unit III Calculus of Complex Variable: Functions; Limits and Continuity; Analytic Functions; Cauchy Riemann Conditions; Analytic Continuation; Complex Integration and Cauchy's Theorem; Cauchy's Integral Formula; Taylor's and Laurent Series; Zeros of an Analytic Function; Poles; Essential Singularities; Residue Theorem (statement only) and it's application to evaluation of integral; Introduction to Conformal Mapping; Simple problems.
- Unit IV Probability and Statistics:
Mean, Median, Mode and Standard Deviation; Samples Space; Definition of Probability; Conditional Probability; . General Multiplication Theorem; Independent Events; Bayes' Theorem; Random Variable; Discrete and Continuous Probability
- Unit V Distributions - Probability mass function; Probability density function; Distribution Function; Expectation; Variance; Probability Distribution-Binomial, Poisson and Normal. Correlation and Regression; Method of Least Squares; Linear Curve Fitting.
- Unit VI Graph Theory:
Graphs; Digraphs; Isomorphism; Walk; Path; Circuit; Shortest Path, Tree; Properties of Tree; Binary Tree; Fundamental Circuit; Minimal Spanning Tree: Kruskal's Algorithm; Prim's Algorithm. Cut Set; Fundamental Cut Set and Cut Vertices; Matrix Representation of Graphs . Network; Flow Augmenting Path; Ford-Fulkerson Algorithm for Maximum Flow; Max Flow - Min Cut Theorem

Text Books:

1. Grewal B S: Higher Engineering Mathematics (thirtyfifth edn) - Khanna Pub.
2. Lakshminarayan- Engineering Math 1.2.3
3. Prasad: Partial Differential Equations, New Age International
4. Spiegel M R: Theory and Problems of Complex Variables (Schaum's Outline Series) - McGraw Hill
5. Ross S L: Differential Equations - John Willey & Sons.
6. Bhat: Modern Probability Theory, New Age International
7. Deo N: Graph Theory with Applications to Engineering and Computer Science - Prentice Hall.

3SB2**HUMAN PHYSIOLOGY**

Unit I

Basic Biological (Biophysical & Biochemical) Principles: Diffusion, surface tension and viscosity - their characteristics, factors influencing and biological applications. Osmosis - osmometers, laws of osmosis, biological applications, relation with depression of freezing points. Acids, bases and pH. Colloids - classification, properties - optical and electrokinetic, biological importance of colloids. Dialysis and ultra-filtration. Electrophoresis: Principles & applications, Gel electrophoresis. Adsorption. Gibbs-Donnan equilibrium. Radioactivity - radioisotopes and their biological applications. Principles of radioimmunoassay (RIA), autoradiography. The resting membrane potential. The action potential. Electrotonic potentials. Propagation of nerve impulse in different types of nerve fibers. Compound action potentials.

Unit II

Genetics:
Nucleic acid- I. Structure of DNA- Physical & Chemical properties of DNA & RNA, Ultra structure & types of DNA & RNA (in details), Brief idea about super coiling of DNA Semiconservative mode of replication of DNA, Mechanism of replication of DNA "Genetic code. Genetically relation of color blindness and ocular albinism. Chromosome aberration- Structural aberration- Deletion- Duplication- Inversion- translocation. Numerical aberration (Polyploidy - & aneuploidy- Hyper & hypo). Gene mutation- classification- spontaneous & Induced- Chemical mutation- Practical Application of mutation.

Unit III

Blood Vascular system
Composition and functions of blood. Plasma proteins - normal values, origin and functions. Brief idea on Bone marrow. Formed elements of blood - origin, formation, functions and fate. Hemoglobin - functions, compounds and derivatives. Abnormal hemoglobin - overview. Thalassemia - brief idea. Different types of anemia and their causes - overview. Erythrocyte sedimentation rate (ESR) and its significance. Hematocrit. PCV, MCV, MCH - MCHC. Blood volume - normal values, regulation. Blood coagulation - factors, process, anticoagulants, Prothrombin time. Clotting time. Bleeding time. Blood groups - ABO systems and Rh factors. Blood transfusion. Ultra structure & functions of blood vessels (artery & vein). Structure type and function of capillaries. Differences between artery & vein.

Unit IV

Muscular Physiology:

Microscopic and electron microscopic structure of skeletal, smooth and cardiac muscles. Difference between skeletal, smooth and cardiac muscles. The sarcotubular system. Red and white striated muscle fibers. Single unit and multi unit smooth muscle. Motor point. Properties of muscle: excitability and contractility, all or none law, summation of stimuli, summation of contractions, effects of repeated stimuli, genesis of tetanus, onset of fatigue, refractory period, tonicity, conductivity, extensibility and elasticity. Electromyography. Muscle contraction - E C Coupling, Muscle fatigue, Rigor mortis, Sliding filament theory, Slow & fast muscle fibers, Isotonic & Isometric contraction.

Unit V

Neuro Physiology:

Electron microscopic structure of nerve cell or neurons. Neuroglia. Myelinated and unmyelinated nerve fibers. Conduction velocity of nerve impulse in relation to myelination and diameter of nerve fibers. Synapses - types, structure, synaptic transmission of the impulse, synaptic potentials, neurotransmitters. Motor unit. Injury to peripheral nerves - degeneration and regeneration - brief idea. Automatic nervous system - Introduction, Comparison of autonomic & somatic nervous system, Anatomy of autonomic motor pathways - Pre-ganglionic neurons, autonomic ganglia, sympathetic ganglia, autonomic plexus, post-ganglionic neurons structure of sympathetic and parasympathetic division. ANS - neurotransmitter and receptors - cholinergic neurons & receptors. Receptor agonist & antagonist. Physiological effect of ANS - sympathetic & parasympathetic response. Integration & control of autonomic function - autonomic Reflexes, autonomic control by higher centers. Neural Transmission - Introduction, Autonomic Synaptic Transmission - Modes of transmission, sympathetic & parasympathetic response. CNS Synaptic transmission - Electrical synaptic transmission & chemical synaptic transmission. Neuro muscular Junction - The neuromuscular junctions - structure, events in transmission, end-plate potential, post tetanic potential.

Unit VI

Cardio Vascular System

Structure & function of Heart & blood vessels (artery, vein and capillary) (Anatomical position, chambers of heart.) Blood circulation through heart. Special Cardiac cycle. Heart Sound, Blood vessels - type, Structure & function, Systemic & pulmonary circulation. Blood - composition, Function,

blood group, Blood clotting. Cardiac cycle and cardiac output. Blood Pressure-regulation & controlling factors.

Renal System- Function of kidney, Anatomy & Histology of Nephron & collecting duct. - Urine formation (Filtration, reabsorption and secretion)- Counter - current system of urine concentration, Anomalies in urine concentration. Physiology Practical Code: BME 392

Text books

1. Snell, Bio Physical Principles of Structure and functions
2. Ruch and Patton, Bio Physics and Medical Physiology

Reference books

1. Concise medical physiology by Sujit K. Chaudari , New central book Agenc Pvt. Ltd.
2. Textbook of Physiology by Chattergi

3SB3 / 3SI4 TRANSDUCER AND SIGNAL CONDITIONING

SECTION A

UNIT I: Transducer : Definition, Classification, Selection criteria.Errors Loading effects, Basic configuration of control system Transducer specifications. (07)

UNIT II: Displacement, Force & Torque Transducers: Displacement Resistive, Inductive, Strain gauge, Capacitive, Piezo electric Digital, fibre optic, Laser type transducers. Force-Force measuring transducers, Electric load cell, LVDT, Piezo electric type. Torque Strain Gauge transducers. (08)

UNIT III: Temperature Transducers: Temperature scales, Glass thermometers, Bimetallic & memory shaped alloy thermometers, Semiconductor, temperature detector (thermistor & P-N junction). Resistance thermometer, Thermocouples, Ultrasonic, Crystal, Infrared thermometers Velocity Transducers: Tachometers, Toothed rotor tachometers, photo electric, Stroboscopic principles. (09)

SECTION-B

UNIT IV : Flow Transducers: Basic measurement principles, Bernoulli's theorem, Differential pressure type (Orifice, Ventury, Anubar Pitot tube), Variable area type, Magnetic, Ultrasonic, Positive displacement type, Mass flow meter, Annemometer, Total flow meter.

Level Transducers: For liquids & solids - float type displacer, Diaphragm box level gauge, DP cell Ultrasonic, Radioactive transducers, Microwave. (10)

UNIT V: Pressure Transducers: Pressure scales & standards, Manometers, Elastic (Bellows, Bourdon tube, Diaphragm) type, Electrical pressure sensors (LVDT, Strain gauge, load cell, Piezo-electric, Capacitive), Differential pressure sensors (Capacitive, Force balance & vibrating cylinder type), vacuum pressure measurement, thermal conductivity & ionization type, Transducers for very high pressure measurement. (09)

UNIT VI: Humidity Transducers: Psychrometer, Hygrometer (Hair, wire & Electrolysis type), Dew point meter. Piezo-electric humidity meter, Infrared conductance & Capacitive type probes for moisture measurement. Acoustic Transducer & sound level measurement. pH & Conductivity sensors: pH scales & standards, principle of pH measurement, Different types of reference & measuring electrodes. Principles of conductivity measurement, conductivity cells & bridges. (09)

LIST OF EXPERIMENTS

1. Testing & calibration of T, J, K, R & S thermocouples
2. Calibration of pt-100.
3. a) Calibration of strain indicator
b) Weight measurement by load cell.
4. Study of LVDT & its application in thickness measurement
5. Level measurement by capacitance probe.
6. Flow measurement by Differential pressure type transducers
7. Study of Bellows, Bourdon tubes & Diaphragms.
8. RPM measurements using photodetector technique.
9. Study of electrical pressure probes.
10. Study of pH meter, conductivity meter.
11. Humidity measurement by psychrometer.

Note : Students are expected to perform minimum eight experiments

REFERENCE BOOKS:

1. Measurement System by E.O. Doebelin
2. Principles of Industrial Instrumentation by Patranbis
3. Experimental Methods for Engineers by J.P. Holman
4. Mechanical Industrial Measurements by R.K. Jain

3 SRNB 4 ELECTRONIC DEVICES & CIRCUITS

SECTION-A

UNIT I: Diodes : Characteristics of semiconductor diodes, diode resistance. Rectifying circuits & dc power supplies, HWR, FWR, BR, comparison. Filter circuits for power supplies: Inductor, Capacitor, LC, IT Filters.

- UNIT II : Concept of amplification, A_i , A_v and A_p ; R_i , R_o . Conversion efficiency. Basic transistor operation, Basic characteristics of transistor amplifier. Transistor input characteristics, CB amplifier, CC amplifier.
- UNIT III: The CE amplifier Graphical analysis, Input & output resistance, Input wave form consideration, Comparison of amplifiers. Transistor biasing : Stability Factor, CB bias, Emitter bias, Bias compensation.

SECTION-B

- UNIT IV : Oscillators : Effect of positive feedback. phase-shift oscillator, Wein-Bridge oscillator, RC Oscillator, Transistor as a switch, switching time in transistors, Multivibrators.
- UNIT V : FET amplifiers: Advantages & disadvantages of FET. Principle of operation, characteristics, Common source AC amplifier. Fixed Bias. Source follower, Frequency Response. Introduction to MOSFETS.
- UNIT VI: Opto Electronic Devices : Fundamentals of light, photoconductive sensors, photodiodes, phototransistors, their principle of operation & applications. photovoltaic sensors. photoemissive sensors. Light emitters, Alphanumeric displays. photocouplers.

Text Books :

1. Malvino : Principles of Electronics (TMH)
2. Millman & Halkias : Electronic Devices & Circuits (Mc Graw Hill)
3. Millman & Halkias: Integrated Electronics (Mc Graw Hill)
4. David A Bell "Electronic Devices & Circuits" (5/e) (Oxford University Press).

3SB5

BIOPHYSICS

- Unit I :- Body fluid: Properties of body fluid, determination of conduction of body fluid, measurement of EMF of cells, temperature and reaction rates: Arrhenius equation. Photochemical reaction, the law of photochemistry, fluorescence and phosphorescence, Principles of colorimeter, Beer-Lambert's law.
- Unit II :- Biophysical activity of heart: electrical activity of the heart, junctional tissue of heart. (Myogenic and neurogenic heart-conducting system of heart). monophonic and biphasic recordings, origin and propagation of excitation & contraction, refractoriness, regular and ectopic pace makers, electrocardiography, waveform and measurement, ECG in diagnosis, arrhythmias, flutter, fibrillation, vulnerable period, phonocardiography, ballistocardiography.

- Unit III :- Biophysical activity of brain and other organs: electrical activity of brain, waveforms & measurements, electrogastrography, electroneurography, nerve conduction studies, electroretinography, electrooculography, recording electrodes, interfaces, skin contact impedance, biological transducers, receptor potentials.
- Unit IV :- Introduction to electrical simulation: Properties of nerve fibers - excitability, conductivity, all-or-none law, accommodation, adaptation, summation, refractory period, indefatigability impedance & current distribution, dielectric properties of biological materials, skin impedance, total body impedance, impedances at high frequencies, high voltage & transient properties, patient safety, electrical shocks and hazards, leakage currents, types & measurements, protection against shock, burn & explosion hazards.
- Unit V :- Radioactivity: Radio emission, radioisotopes, law of radioactive decay, half life period, production of radio isotopes for medical use, electromagnetic radiation, interaction of radiation with matter, exponential attenuation, half value thickness, photoelectric, Compton and pair production process and their significance in radiology, radiation units, detection and measurements of radiation
- Unit VI :- Introduction of ultrasonic wave: Ultrasonic wave motion, wave characteristics, intensity, and ultrasound properties in body (velocity, attenuation, reflection, refraction and absorption). Use of ultrasound in biological field. Introduction of magnetic field: Optical activity and magnetic rotation of substances, dipole moments, magnetic properties of substances. Useful and harmful effects of magnetic fields, radio waves, micro waves, ultra violet radiation and infrared radiation on human beings.

Text books

1. W.R.Hendee & E.R.Ritenour, Medical Physics.
2. Massey and Meredith, Medical Physics.

Reference books

1. Plummer, Bio Chemistry - The Chemistry of Life, Mc Graw Hill.
2. Patrick Rcully, Electrical Simulation & Electropathology, Cambridge University press
3. Joseph Bronzino, Biomedical Instrumentation.
4. Khandpur R S, Handbook of Analytical Instrumentation, Tata Mc Graw Hill
5. W.R.Hendee & E.R.Ritenour, Medical Imaging Physics (3rd eds), Mosby Year-Book.

FOURTH SEMESTER
OBJECT ORIENTED TECHNOLOGIES

4SB1/3SR5

SECTION-A

- UNIT I. Objects & Classes in C++ : Declaring & using classes, Constructors, Objects as functions arguments, Copy Constructor, Static class data. Arrays of objects, C++ String class.
- UNIT II. Operator overloading : Overloading unary & binary operators. Data conversion. Pitfalls of operator overloading. Pointers & arrays. Pointers & functions. new & delete operators. Pointers for objects.
- UNIT III. Inheritance in C++ : Derived class & base class, Derived class constructors, Function overloading, class hierarchies, Public and private inheritance, Multiple inheritance. Containership : classes within classes.

SECTION-B

- UNIT IV. Virtual functions concepts, Abstracts classes & pure virtual functions. Virtual base classes, Friend functions, Static functions, Assignment and copy initialization, the this pointer. Dynamic type information.
- UNIT V. Streams & Files in C++ : Stream classes, stream errors, disk file I/O with streams, File pointers, Error handling in file I/O. File I/O with members functions, overloading the extractions & insertion operators, Memory as a stream object, command-line arguments. Multifile programs.
- UNIT VI. Function Template, Class templates, Exception syntax, Multiple exceptions, exception with arguments. Introduction to the Standard Template Library. Algorithms, Sequential Containers, Iterates, Specialized iterates, Associative containers. Function objects.

Text-Book :

1. Robert Lafore Object-Oriented Programming in C++ (Galgotia)
2. Herbert Schildt C++ : Complete Reference (TMH)

References :

1. Bjarne Stroustrup C++ Programming Language (Addison-Wesley)
2. Venugopal Mastering C++ (TMH)
3. Lipmann C++ Primer (Addison-Wesley)

LIST OF PROGRAMS

The sample list of program is given below. This list can be used as guide line for problem statements but the scope of the laboratory should not be limited to the same. Aim of the list is to inform about minimum expected outcomes.

- 1 Write a C++ program to implement a stack with its constructor and two member functions PUSH and POP
- 2 Write a C++ program to find product of two same numbers from 0 to 9 stored in an object array of 10 objects and then free the memory space occupied by an object array
- 3 Write a C++ program to overload minus operator as an unary and binary operator
- 4 Write a C++ program using friend operator function to overload plus binary operator
- 5 Write a C++ program to calculate the circumference of an earth (subclass) after getting distance of it measured from sun from planet (super class)
- 6 Write a C++ program for an inventory that stores the name of an item, the number on hand, and its cost. Include an inserter and an extractor for this class
- 7 Write a C++ program that creates an output file, writes information to it, closes the file and open it again as an input file and read the information from the file
- 8 Write a C++ program that counts number of words in a file
- 9 Write a C++ program to create an abstract class area having an abstract function get Area which will find an area of derived classes rectangle and triangle
- 10 Write a C++ program to create a generic function that swaps the values of the two variables it is called with"

4 SB 2/4SR3

ANALOG AND DIGITAL ICS**SECTION-'A'**

(8 hrs/unit)

- UNIT-I: Introduction to ICs: Monolithic IC technology, the planner process, fabrication, BJT, FETs, CMOs Technology, characteristic of IC components, LST, Operational amplifier, Block schematic internal circuits, Level shifting, Overload protection, study of IC 741 op-amp, Measurement of op-amp parameter.
- UNIT-II: Linear and Non-Linear Application Op-amp: Inverting and noninverting amplifiers, Voltage follower, integrator, differentiator differential amplifier, Sinusoidal RC-phase shift and Wein bridge oscillators, clipping, clamping and comparator circuits using opamps. Astable, bistable and monostable multivibrator using opamps.

UNIT-III: Other linear ICs:- Block schematic of regulator IC 723, and applications, SMPS, Block schematic of timer IC 555 and application as a timer, astable, monostable, bistable multivibrator and other applications.

SECTION-'B'

UNIT-IV: Basic Logic Circuits:
Logic gate characteristics, NMOS inverter, propagation delay, NMOS logic gate, CMOS inverter, CMOS logic gates, BJT inverter, TTL NAND gate, TTL output stage. TTL logic families, ECL circuits, comparison of logic families.

UNIT-V: Combinational Digital Circuits: Standard gate assemblies, Binary address, Arithmetic functions, Digital comparator, Parity check generators, Decode-multiplexer, Data selector multiplexer, Encoder, ROM, 2-dimensional addressing of ROM, ROM applications, PROM.

UNIT-VI: Sequential Circuits and Systems: Bistable Latch, Flip-Flops clocked SR, J-K, T, D type shift Registers, F.F. Design of counters, Ripple and synchronous types, application of counters, Dynamic MOS shift registers, RAM Bipolar RAM cells.

BOOKS :

1. Millaman : Microelectronic : 2nd Ed. Mc Graw Hill.
2. David A Bell "Electronic Devices & Circuits" (5/e) (Oxford University Press).
3. Gayakwad : Op-Amp & Linear IC's, 2nd Ed.
4. Malvino & Leach : Digital Principles & Applications, 4th Ed. Mc Graw Hill.

Analog & Digital ICs Laboratory

List of Experiments:

1. INV-NON INV Amplifier using IC 741.
2. INTEGRATOR & DIFFERENTIATOR using IC 741.
3. Voltage follower using IC 741.
4. Weinbridge oscillator using IC 741.
5. Astable Multivibrator using IC 741.
6. Astable Multivibrator using IC 555.
7. Voltage regulator using IC 723
8. Verification of MUX using IC 74151.
9. Study of various DEMUX chips & verification of DEMUX using IC 74155.
10. Verification of transistor inverter.
11. Verification of BCD to seven segment using IC 7447.
12. Verification of J-K FF by using IC 7476.

13. Verification of Comparator using IC 7485.
14. Verification of BCD to decimal decoder using IC 7442.
15. Verification of decade counter.
16. Code converters using PLAs.

NOTE : Any six from Sr.No. 1 to 7 and six from Sr.No. 8 to 16.

4SULEIB3

NETWORK ANALYSIS

SECTION-'A'

Unit-I : Basic Circuit elements: Circuit components- assumptions for Circuit analysis, sources of electrical energy-standard input signals- Kirchoff's laws-source transformation- mesh and node analysis-network equation for RLC network-magnetic coupling. (10)

Unit-II : Graph theory and network equation:- Graph of a network-Trees and loops, cut set of a network, Tie-set matrix and loop currents- analysis of network, Network equilibrium equation, duality-network transformation. (10)

Unit-III: Laplace transformation and its applications:- Laplace transformations-basic theorems-gate function-Impulse function-Laplace transform of periodic functions. Solution of linear differential equations-Heaviside's partial fraction expansion-Solution of network problems. (10)

SECTION-'B'

Unit-IV: Network theorems:- Superposition theorem-Reciprocity theorem, Thevenin's theorem-Norton's theorem-Millman's theorem-Max. power transfer theorem-Substitution theorem-Compensation theorem, Tellegen's theorems. (10)

Unit V : Twoport network:- Open circuit impedance parameters-short circuit admittance parameters-Transmission parameters-Inverse transmission parameters-Hybrid and inverse hybrid parameters. interrelationship between the parameters-two port symmetry interconnection of two port networks, input impedance in terms of two-port parameters output impedance-image impedance. (10)

Unit-VI: Network functions:- Ports and terminal pairs-network functions-poles and zeros-necessary conditions for driving point function-necessary conditions for transfer function-Applications of network analysis in driving network functions-positive real functions-driving point and transfer impedance function-LC network (10)

TEXT BOOK :

Network and systems-D,Roy Choudhary (Wiley Eastern Ltd.1988)

REFERENCES-

1. Circuit Theory-ISKV Iyer (Tata Mcgraw Hill)
2. Network Analysis, M.E.Van Valkenburg (Prentice Hall India) 3rd Ed.

PRACTICALS-

About 10 experiments based on above syllabus.

4SRULEINB4 SOCIAL SCIENCES & ENGINEERING**ECONOMICS****SECTION - A (8 hrs/unit)**

- Unit I : Study of Social Science : Importance to Engineer, salient features of Indian constitution. Fundamental Rights and Duties. Directive Principles of State Policy.
- Unit II : Indian Parliament : composition and powers. President of India : Election and Powers. Council of Ministers and Prime Minister
- Unit III: Impact of Science and Technology on culture and Civilization. Human Society : Community Groups, Social Control : Meaning, Types and Agencies. Marriage and Family : Functions, Types and problems.

SECTION - B

- Unit IV: Nature and scope of Economics : Special significance of Economics to Engineers. Production : Factors of production, Laws of return, Various Economic systems, Forms of Business Organisation.
- Unit V : Banking : Functions of Central and Commercial Banks. Taxation : Principle of taxation, Direct and Indirect taxes. Market : Forms, perfect and imperfect competition, pricing under perfect and imperfect competition, prices discrimination under monopoly.
- Unit VI: Economics of Development : Meaning, Characteristics of under development, obstacles to Economic growth and vicious circle of poverty. Economic Planning : meaning, objective and salient features of current five years plan of India. Planning horizons, life structuring the alternatives. Economics of comparison of different alternative projects.

Books Recommended :

1. Pylee M.V. : Constitutional Govt. in India, S.Chand and Co.
2. Joshi G.N. : The Constitution of India, Macmillan India Ltd.
3. Mahajan : The Constitution of India, S.Chand, New Delhi.

4. Maclaver and Page : Principle of Sociology.
5. Davis K. : Human Society
6. Dewett and Varma J.D. : Elementary Economic Theory, S.Chand and Co.
7. A.N.Agrawal : Indian Economy, Problem of Development and Planning (Wiley Eastern Ltd), New Delhi.
8. S.K.Mishra : Indian Economy, Its Development Experience. Himalaya Pub.House, Bombay.
9. Datt R.K. : Indian Economy, S.Chand and Comp. New Delhi P.M.Sundharam
10. Dhingra I.C. : Indian Economy
11. E.Kuper : Economics of W.R.Development, McGraw Hill Co.,
12. James L.E., R.R.Lee : Economics of W.R.Planning, McGraw Hill Co.

4SB5**BIOMATERIALS & BIOMECHANICS**

- Unit I :- Introduction: Definition of biomaterials, requirements of biomaterials, classification of biomaterials, Comparison of properties of some common biomaterials. Metallic implant materials: Stainless steel, Co-based alloys, Ti and Ti-based alloys. Importance of stress-corrosion cracking. Host tissue reaction with biometal, corrosion behavior and the importance of passive films for tissue adhesion. Hard tissue replacement implant: Orthopedic implants, Dental implants.
- Unit II :- Introduction of polymers, Polymeric implant materials, Polyolefins, polyamides, acrylic polymers, fluorocarbon polymers, silicon rubbers, acetals. Physiochemical characteristics of biopolymers. Biodegradable polymers for medical purposes, Synthetic polymeric membranes and their biological applications. Ceramic implant materials: Definition of bioceramics. Common types of bioceramics: Aluminium oxides, Glass ceramics, Composite implant materials: Mechanics of improvement of properties by incorporating different elements. Composite theory of fiber reinforcement (short and long fibers, fibers pull out).
- Unit III :- Biocompatibility & toxicological screening of biomaterials: Definition of biocompatibility, blood compatibility and tissue Compatibility. Toxicity tests: acute and chronic toxicity studies, sensitization, carcinogenicity, mutagenicity and special tests. Sterilisation techniques: ETO, gamma radiation, autoclaving. Effects of sterilization on material properties. Testing of biomaterials/Implants: In vitro testing (Mechanical testing): tensile, compression, wears, fatigue, corrosion studies and fracture toughness. In-vivo testing (animals):

biological performance of implants. Ex-vivo testing: in vitro testing simulating the in vivo conditions.

Unit IV :- Hard tissues: Bone structure & composition mechanical properties of bone, cortical and cancellous bones, viscoelastic properties, Maxwell & Voight models - anisotropy, Electrical properties of bone, fracture mechanism and crack propagation in bones, fracture fixators, repairing of bones, mechanical properties of collagen rich tissues, teeth and its properties.

Unit V :- Soft tissues: Structure and functions of cartilages, tendons, ligaments, soft tissue mechanics, mechanical testing of soft tissues standard sample preparation, cross-section measurement, clamping of the specimen, strain measurement, environmental control, time dependent properties of testing. Biomechanics of joints: Skeletal joints, skeletal muscles, basic considerations, basic assumption and limitations, forces and stresses in human joints, mechanics of the elbow, mechanics of shoulder, mechanics of spinal column, mechanics of hip, mechanics of knee, mechanics of ankle.

Unit VI :- Locomotion: Human locomotion, gait analysis and goniometry, Ergonomics, Foot Pressure measurements - Pedobarograph, Force platform, mechanics of foot. Total Hip Prosthesis: requirements, different types of components, Stress analysis & instrumentation, Knee Prosthesis. Cardiovascular mechanics: Heart valves, artificial heart valves, biological and mechanical valves development. Fluid mechanics: introduction, viscosity and capillary viscometer, laminar flow, turbulent flow.

Test books

1. J B Park, Biomaterials - Science and Engineering, Plenum Press,
2. Sujata V. Bhat, Biomaterials, Narosa Publishing House,
3. Alexander R Mc Neill, Biomechanics, Chapman and Hall,

Reference books

1. Jonathan Black, Biological Performance of materials, Marcel Decker,
2. Piskin and A S Hoffmann, Polymeric Biomaterials (Eds), Martinus Nijhoff Publishers.
3. Eugene D. Goldbera, Biomedical Ploymers, Akio Nakajima.
4. Lawrence Stark & Gyan Agarwal , Biomaterials
5. L. Hench & E. C. Ethridge, Biomaterials - An Interfacial approach.
6. A Z Tohen and C T Thomas, Manual of Mechanical Orthopaedics
7. D N Ghista and Roaf, Orthopaedic Mechanics, Academic Press
8. VC Mow and W C Hayes, Basic Orthopedic Biomechanics, Lippincott, Raven publishers.

Total Marks : 100

PART-A

SHORT ANSWER PATTERN

25 Marks

1. The Multidisciplinary nature of environmental studies

- . Definition, scope and importance.
- . Need for public awareness.

(2 lecture hours)

2. Social Issues and the Environment

- . From Unsustainable to Sustainable development
- . Urban problems related to energy
- . Water conservation, rain water harvesting, watershed management
- . Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- . Environmental ethics : Issues and possible solutions.
- . Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- . Wasteland reclamation.
- . Consumerism and waste products.
- . Environment Protection Act.
- . Air (Prevention and Control of Pollution) Act.
- . Water (Prevention and Control of Pollution) Act.
- . Wildlife Protection Act.
- . Forest Conservation Act.
- . Issues involved in enforcement of environmental legislation.
- . Public awareness.

(7 lecture hours)

3. Human Population and the Environment

- . Population growth, variation among nations.
- . Population explosion - Family Welfare Programme.
- . Environment and human health.
- . Human Rights.
- . Value Education.
- . HIV / AIDS.
- . Women and Child Welfare.
- . Role of Information Technology in Environment and human health.
- . Case Studies.

(6 lecture hours)

4. Natural resources :**Renewable and non-renewable resources :**

- . Natural resources and associated problems.
 - Forest resources : Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
 - Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
 - Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
 - Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer - pesticide problems, water logging, salinity, case studies.
 - Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, Case studies.
 - Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- . Role of an individual in conservation of natural resources.
- . Equitable use of resources for sustainable lifestyles.

(8 lecture hours)

5. Ecosystems

- . Concept of an ecosystem.
- . Structure and function of an ecosystem.
- . Producers, consumers and decomposers.
- . Energy flow in the ecosystem.
- . Ecological succession.
- . Food chains, food webs and ecological pyramids.
- . Introduction, types, characteristic features, structure and function of the following ecosystem :-
 - Forest ecosystem
 - Grassland ecosystem
 - Desert ecosystem
 - Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

(6 lecture hours)

6. Biodiversity and its conservation

- . Introduction - Definition : genetic, species and ecosystem diversity.
- . Biogeographical classification of India.
- . Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.
- . Biodiversity at global, National and local levels.
- . India as a mega-diversity nation.
- . Hot-spots of biodiversity.

- . Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- . Endangered and endemic species of India.
 - . Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity. (8 lecture hours)

7. Environmental Pollution

- . Definition
 - . Causes, effects and control measures of :-
 - Air pollution
 - Water pollution
 - Soil pollution
 - Marine pollution
 - Noise pollution
 - Thermal pollution
 - Nuclear hazards
- . Solid Waste Management : Causes, effects and control measures of
 - . Role of an individual in prevention of pollution.
 - . Pollution case studies.
 - . Disaster management : floods, earthquake, cyclone and landslides. (8 lecture hours)

PART-C ESSAY ON FIELD WORK 25 Marks

8. Field work

- . Visit to a local area to document environmental assets - river / forest / grass land / hill / mountain
- . Visit to a local polluted site - Urban / Rural / Industrial / Agricultural
- . Study of common plants, insects, birds.
- . Study of simple ecosystems - pond, river, hill slopes, etc. (5 lecture hours)

- (Notes :**
- i) Contents of the syllabys mentioned under paras 1 to 8 shall be for teaching for the examination based on Annual Pattern.
 - ii) Contents of the syllabys mentioned under paras 1 to 4 shall be for teaching to the Semester commencing first, and
 - iii) Contents of the syllabys mentioned under paras 5 to 8 shall be for teaching to the Semester commencing later.

LIST OF REFERENCES :-

- 1) Agarwal, K.C., 2001, Environmental Biology, Nidi Publ. Ltd., Bikaner.
- 2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad - 380 013, India, Email : mapin@icenet.net (R)
- 3) Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p.
- 4) Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)

- 5) Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T., 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p.
- 6) De A.K., Environmental Chemistry, Wiley Eastern Ltd.
- 7) Down to Earth, Centre for Science and Environment (R)
- 8) Gleick, H.P. 1993, Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press. 473p.
- 9) Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Mumbai (R)
- 10) Heywood, V.H. & Watson, R.T. 1995, Global Biodiversity Assessment, Cambridge Univ. Press 1140p
- 11) Jadhav, H & Bhosale, V.M. 1995, Environmental Protection and Laws, Himalaya Pub. House, Delhi. 284 p.
- 12) Mckinney, M.L. & Schoch, R.M. 1996, Environmental Science Systems & Solutions, Web Enhanced Edition. 639 p.
- 13) Mhaskar A.K., Matter Hazardous, Techno-Science Publications (TB)
- 14) Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. (TB)
- 15) Odum, E.P., 1971, Fundamentals of Ecology, W.B.Saunders Co., U.S.A., 574p.
- 16) Rao M.N. & Datta A.K., 1987, Waste Water Treatment, Oxford & IBH Publ. Co. Pvt. Ltd. 345 p.
- 17) Sharma B.K., 2001, Environmental Chemistry, Goel Publ. House, Meerut.
- 18) Survey of the Environment, The Hindu (M)
- 19) Townsend C., Harper J., and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
- 20) Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media (R)
- 21) Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, Techno-Science Publications (TB)
- 22) Wagner K.D., 1998, Environmental Management, W.B.Saunders Co., Philadelphia, USA 499p.
- 23) डॉ. विठ्ठल घारपुरे : पर्यावरणशास्त्र- पिंपळापूरे अॅन्ड कंपनी पब्लीशर्स, नागपूर.(R)
- 24) Dr. Deshpande, A.P.Dr. Chudiwale, A.D., Dr. Joshi, P.P., Dr. Lad, A.B.: Environmental Studies, Pimpalpure & Co., Publishers, Nagpur. (R)
- 25) R.Rajagopalan : Environmental Studies, Oxford University Press, New Delhi, 2005 (R)

(M) Magazine
(R) Reference
(TB) Textbook

L: Theory Lecture
T: Tutorial
P: Practical
D: Drawing/ Design

APPENDIX-B
FOUR YEAR B.E. DEGREE COURSE
BRANCH : BIOMEDICAL ENGINEERING
SEMESTER PATTERN
SEMESTER: THIRD

ABBREVIATIONS :-
S – Semester
B- Biomedical Engineering, R- Computer Sc. & Engg.
N- Information Technology, U-Electronics & Tele.,
L- Industrial Electronics, E-Electrical, I-Instrumentation

Sr. No.	Sub. Code No.	SUBJECT	Teaching Scheme				Examination Scheme								Grand Total
			L	T	P/D		Theory				Practical				
						Total Hours/Week	Duration of Papers (Hrs)	Max. Marks Theory Papers	Maximum Marks College Assessment	Total	Min. Pass Marks	Max. Marks External	Max. Marks Internal	Total Marks	Minimum Pass Marks
1.	3 SB 1	Transforms & Probability	4	1	-	5	3	80	20	100	40	-	-	-	-
2.	3 SB 2	Human Physiology	4	-	2	6	3	80	20	100	40	25	25	50	25
3.	3 SB 3/3SI4	Transducers & Signal Conditioning	4	-	2	6	3	80	20	100	40	25	25	50	25
4.	3 SRNB 4	Electronic Devices & Circuits	4	-	2	6	3	80	20	100	40	25	25	50	25
5.	3 SB 5	Bio Physics	4	1	-	5	3	80	20	100	40	-	-	-	-
TOTAL			20	2	6	28				500				150	650
SEMESTER: FOURTH															
1.	4SB1/3SR5	Object Oriented Technologies	4	-	2	6	3	80	20	100	40	25	25	50	25
2.	4 SB2/4SR3	Analog & Digital ICs	4	-	2	6	3	80	20	100	40	25	25	50	25
3.	4 SULEIB 3	Network Analysis	4	-	2	6	3	80	20	100	40	25	25	50	25
4.	4SRULEINB 4	Social Sciences and Engineering Economics	4	-	-	4	3	80	20	100	40	-	-	-	-
5.	4 SB 5	Biomaterial & Biomechanics	4	1	-	5	3	80	20	100	40	-	-	-	-
TOTAL			20	1	6	27				500				150	650