COCHIN UNIVERSITY OF SCIENCE & TECHNOLOGY

B.TECH DEGREE COURSE IN ELECTRONICS & BIOMEDICAL ENGINEERING

SCHEME OF EXAMINATIONS & SYLLABUS

I - VIII SEMESTERS

(With effect from 2012 Admission onwards)

B.TECH DEGREE COURSE IN ELECTRONICS & BIOMEDICAL ENGINEERING
SCHEME OF EXAMINATIONS (2012 ADMISSION ONWARDS)

SEMESTER I & II (Common to all branches)

Course Code	*Subject*	*L Hrs/ Wk*	*T Hrs/ Wk*	*P Hrs/ Wk*	*Credits*	*Internal*	*University*	*Total*
1101	Engineering Mathematics –I	2	1		4	50	100	150
1102	Engineering Physics	3			4	50	100	150
1103	Engineering Chemistry	3			4	50	100	150
1104	Engineering Mechanics	3	1		5	50	100	150
1105	Engineering Graphics	1	-	3	5	50	100	150
1106	Basic Civil and Mechanical Engineering	2			4	50	100	150
1107	Basic Electrical and Electronics Engineering	2			4	50	100	150
1108	Computer Programming	1			4	50	100	150
1109	Environmental Studies and Technical Communication	2*			3	50	100	150
11 L1	Electrical and Mechanical Workshop	-	-	3	4	100	-	100
11 L2	Computer Programming Laboratory	-	-	2	2	100	-	100
11 L3	Language Laboratory	-	-	1	1	100	-	100
TOTAL		**19**	**2**	**9**	**44**			

** 1 hour/ week each for Environmental Studies and Technical Communication.*

SEMESTER III

Course Code	*Subject*	*L Hrs/ Wk*	*T Hrs/ Wk*	*P Hrs/ Wk*	*Credits*	*Internal*	*University*	*Total*
CE/CS/EB/EC/EE/EI/ FT/IT/ME/SE 1301	Engineering Mathematics-II	3	1	0	3	50	100	150
EB 1302	Electrical Machines and Circuits	3	1	0	3	50	100	150
EB 1303	Principles of Anatomy and Physiology	3	1	0	3	50	100	150
EB/EC 1304	Digital Electronics	3	1	0	3	50	100	150
EB 1305	Medical Physics	3	1	0	3	50	100	150
CS/EB/EE 1306	Electronic Devices and Circuits	3	1	0	3	50	100	150
EB 13 L1	Analog Circuits Laboratory-I	0	0	3	2	100	-	100
EB 13 L2	Electrical Machines Laboratory	0	0	3	2	100	-	100
TOTAL		**18**	**6**	**6**	**22**			

SEMESTER IV

Course Code	*Subject*	*L Hrs/ Wk*	*T Hrs/ Wk*	*P Hrs/ Wk*	*Credits*	*Internal*	*University*	*Total*
CE/CS/EB/EC/EE/EI/ FT/IT/ME/SE 1401	Engineering Mathematics-III	3	1	0	3	50	100	150
CS/EB 1402	Microprocessors	3	1	0	3	50	100	150
EB 1403	Integrated Circuits and Systems	3	1	0	3	50	100	150
EB 1404	Bioelectric Phenomena	3	1	0	3	50	100	150
EB 1405	Communication Techniques	3	1	0	3	50	100	150
EB 1406	Power Electronics	3	1	0	3	50	100	150
CS/EB 14 L1	Digital Electronics Laboratory	0	0	3	2	100	-	100
EB 14 L2	Analog Circuits Laboratory-II	0	0	3	2	100	-	100
TOTAL		**18**	**6**	**6**	**22**			

SEMESTER V

Course Code	*Subject*	*L Hrs/ Wk*	*T Hrs/ Wk*	*P Hrs/ Wk*	*Credits*	*Internal*	*University*	*Total*
CE/CS/EB/EC/EE/EI/ FT/IT/ME/SE 1501	Engineering Mathematics-IV	3	1	0	3	50	100	150
EB 1502	Biosensors and Transducers	3	1	0	3	50	100	150
EB 1503	Hospital Engineering	3	1	0	3	50	100	150
EB 1504	Biosignal Processing-I	3	1	0	3	50	100	150
EB 1505	Bioinstrumentation-I	3	1	0	3	50	100	150
CS/EB 1506	Microprocessor based System Design	3	1	0	3	50	100	150
EB 15 L1	Microprocessor Laboratory	0	0	3	2	100	-	100
EB 15 L2	Medical Electronics Laboratory-I	0	0	3	2	100	-	100
TOTAL		**18**	**6**	**6**	**22**			

SEMESTER VI

Course Code	*Subject*	*L Hrs/ Wk*	*T Hrs/ Wk*	*P Hrs/ Wk*	*Credits*	*Internal*	*University*	*Total*
EB 1601	Medical Imaging Techniques	3	1	0	3	50	100	150
EB 1602	Biosignal Processing-II	3	1	0	3	50	100	150
EB 1603	Bioinstrumentation-II	3	1	0	3	50	100	150
EB 1604	Principles of Object Oriented Programming	3	1	0	3	50	100	150
CS/EB 1605	Modern Control Systems	3	1	0	3	50	100	150
EB 1606 E	Elective-I	3	1	0	3	50	100	150
EB 16 L1	Medical Electronics Laboratory-II	0	0	3	2	100	-	100
EB 16 L2	Mini Project	0	0	3	2	100	-	100
TOTAL		**18**	**6**	**6**	**22**			

EB 1606 E Elective-I

EB 1606 E1 **Artificial Neural Networks**
EB 1606 E2 **Computer Communications**
EB 1606 E3 **Digital System Design**
EB 1606 E4 **BioMEMS and Nanotechnology**

SEMESTER VII

Course Code	*Subject*	*L Hrs/ Wk*	*T Hrs/ Wk*	*P Hrs/ Wk*	*Credits*	*Internal*	*University*	*Total*
CS/EB/EC/EE/EI/IT 1701	Industrial Organization and Management	3	1	0	3	50	100	150
EB 1702	Biomechanics	3	1	0	3	50	100	150
EB 1703	Medical Image Processing	3	1	0	3	50	100	150
EB 1704	Therapeutic Equipments	3	1	0	3	50	100	150
EB 1705 E	Elective-II	3	1	0	3	50	100	150
EB 17 L1	Biosignal Processing Laboratory	0	0	3	2	100		100
EB 17 L2	Bioengineering Laboratory	0	0	3	2	100	-	100
EB 17 L3	Project Design	0	0	2	1	50		50
EB 17 L4	Seminar	0	0	2	2	50	-	50
TOTAL		**15**	**5**	**10**	**22**			

EB 1705 E Elective-II

EB 1705 E1	**Modeling of Physiological Systems**
EB 1705 E2	**Biostatistics and Design of Experiments**
EB 1705 E3	**Embedded Systems and Applications**
EB/EC 1705 E4	**Mechatronics**

SEMESTER VIII

Course Code	*Subject*	*L Hrs/ Wk*	*T Hrs/ Wk*	*P Hrs/ Wk*	*Credits*	*Internal*	*University*	*Total*
EB 1801	Principles of Radio diagnosis and Radiotherapy	3	1	0	3	50	100	150
EB 1802	Biomaterials	3	1	0	3	50	100	150
EB 1803	Biophotonics	3	1	0	3	50	100	150
EB 1804 E	Elective-III	3	1	0	3	50	100	150
EB 18 L1	Project	0	0	14	8	300	-	300
EB 18 L2	Viva voce	-	-	-	2	-	100	100
	TOTAL	**12**	**4**	**14**	**22**			

EB 1804 E Elective-III

EB 1804 E1	**Telemedicine**
EB 1804 E2	**Bioinformatics**
EB 1804 E3	**Computer Graphics and Volume Visualization**
EB 1804 E4	**VLSI Design**

B.TECH DEGREE COURSE IN ELECTRONICS & BIOMEDICAL ENGINEERING

SYLLABUS I - VIII SEMESTERS

(2012 ADMISSION ONWARDS)

SEMESTER I & II

1101 ENGINEERING MATHEMATICS-I

Module I

Ordinary differential equations: First order differential equations - exact differential equations, Bernoulli's equations--Methods of solution and Simple applications.

Linear differential equations of higher orders with constant co-efficients-Methods of solution of these equations. Cauchy's linear differential equations. Simultaneous linear differential equations- Simple applications of linear differential equations in engineering problems –Electrical Circuits, Mechanical Systems.

Module II

Infinite series: Integral test, comparison test, ratio test, Cauchy's root test, Raabe's test, seies of positive and negative terms, concept of absolute convergence, alternating series, Leibniz test(No proofs for any of the above tests)

Power series : Taylor and Maclaurin series of functions, Leibniz formula for the nth derivative of the product of two functions (No proof),use of Leibniz formula for the determination of co-efficients of the power series.

Module III

Partial differentiation: Partial differentiation-Concept of partial derivative - Chain rule- Total derivative- Euler's theorem for homogeneous functions, Differentials and their applications in errors and approximations, Jacobians - Maxima minima of functions of two variables(Proof of the result not required)-Simple applications.

Co-ordinate systems: Rectangular co-ordinates-Polar co-ordinates-In plane and in Space-Cylindrical polar co-ordinates-Spherical polar co-ordinates.

Module IV

Integral calculus:

Application of definite integrals: Area, Volume, Arc length, Surface area.

Multiple integrals : Evaluation of double integrals-Change of order of integration. Evaluation of triple integrals-Change of Variables in integrals.

Applications of multiple integrals. Plane Area, Surface area &Volumes of solids

References:

1. S.S.Sastry, Engineering Mathematics -Vol1, PHI publishers.
2. Erwin Kreyzig, Advanced Engineering Mathematics, Wiley Eastern.
3. T.Veerarajan, Engineering Mathematics, TMGH Publishers.
4. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

1102 ENGINEERING PHYSICS

Module 1

Laser-introduction--spontaneous and stimulated emission-principle of laser- properties of laser-Einstein coefficients and the analysis of lasing conditions- Basic components of a laser-Different types of lasers- construction,working and applications of Ruby laser-Neodymium YAG laser- He-Ne laser- semiconductor laser-Applications of laser in medicine, industry, science and communication.

Holography-basic principle-Comparison with ordinary photography-Recording and reconstruction of holograms-applications.

Fibre optics - Basic structure of an optical fibre - step-index fibre and graded index fibre- propagation of light in an optical fibre-acceptance angle and acceptance cone- Numerical aperture of a step-index fibre-Numerical aperture of a graded index fibre-modes of propagation-step index monomode fibre-Multimode stepindex fibre- Graded multimode fibre-Attenuation in optic fibres-fibre losses-material loss,scattering loss,absorption loss,leaky modes- dispersion in optical fibres- Applications.

Module II

Crystallography – Space lattice- Basis- Unit cell- Unit cell parameters- Crystal systems- Bravais lattices-Three cubic lattices-sc, bcc, and fcc- Number of atoms per unit cell- Co-ordination number- Atomic radius-Packing factor- Relation between density and crystal lattice constants- Lattice planes and Miller indices-Separation between lattice planes in sc-Bragg's law- Bragg's x-ray spectrometer- Crystal structure analysis.

Liquid crystals- Liquid crystals, display systems-merits and demerits- Metallic glasses- Types of metallic glasses (Metal-metalloid glasses, Metal-metal glasses) – Properties of metallic glasses (Structural, electrical,magnetic and chemical properties).

Shape memory alloys- Shape memory effect, pseudo elasticity.

Module III

Introduction to nanoscale science and technology- nanostructures-nanoring, nanorod, nanoparticle, nanoshells- Properties of nanoparticles- optical, electrical, magnetic, mechanical properties and quantum confinement- Classification of nanomaterials- C60, metallic nanocomposites and polymer nanocomposites-Applications of nanotechnology.

Superconductivity-Introduction--transition temperature-Meissner effect-properties of super conductors.Types of superconductors-type 1 and type 2- AC Josephsons effect- DC Jospehsons effect- Flux quantisation-Squid-High temperature superconductors-Applications of super conductivity.

Special Theory of Relativity - Michelson-Morley experiment. Einstein's postulates. Lorentz transformation equations (no derivation). Simultaneity. Length contraction. Time dilation. Velocity addition. Relativistic mass. Mass energy relation. Mass less particle.

Module IV

Quantum mechanics-Introduction-origin of quantum theory-black body radiation and photo electric effect (brief ideas only)-matter waves- wave packet-uncertainty principle-(two forms)Time dependent Shrodinger equation for a free particle-Particle in force field and time dependent Schrodinger equation-Time independent schrodinger equation-Physical intrepretation of wave function-application -Particle in a Box (one dimensional) –Energy eigen values and wave functions

Ultrasonics-piezo electric effect-Magnetostriction effect-production of ultrasonics-properties of ultrasonics- ultrasonic diffractometer and determination of velocity of ultrasonics in a liquid-Application of ultrasonics in non destructive testing - Accoustics of building-reverberation- Absorption Coefficient- Sabines formula for reverberation time(Derivation)-Accoustic intensity- loudness-decibel-phon-conditions for good acoustics(Qualitative study).

References:

1. S. Mani Naidu, A Text book of Engineering Physics, Pearson, 2010
2. M.C. Santosh Kumar, Engineering Physics, Nalpat Publishers.
3. B. Premlet, Advanced Engineering Physics, Phasor Books, Kollam.
4. A.S. Vasudeva, Modern Engineering Physics, S. Chand & Co.
5. Prabir K. Vasu and Hrishikesh Dhasmana, Engineering Physics, Ane books Pvt. Ltd., 2010.
6. S.O. Pillai & Sivakami, Applied Physics, New Age International (P) Ltd., Second Edition 2008.
7. G.S. Raghuvanshi, Engineering Physics, Prentice Hall of India.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

1103 ENGINEERING CHEMISTRY

Module I

Solid state chemistry: Fundamentals, Bonding in solids, Born-Haber cycle, Point defects, Methods to improve reactivity of solids, Free electron theory, Band theory, Fermi level in semiconductors, Molecular field theory of magnetic materials.

Spectroscopy: Molecular energy levels-Types of molecular spectra- Electronic spectra (Classification of electronic transitions- Beer Lamberts law, Vibrational spectra (mechanism of interaction and application), Rotational spectra (Determination of bond length and application). NMR spectra (Basic principle, chemical shift, spin-spin splitting)

Solid surface characterisation: Electron spectroscopy for chemical analysis, Chemical shift, BET isotherm, Thermodynamics of adsorption.

Module II

Electrochemistry: Fundamentals, Electrode potential, Nernst's equation, Types of electrodes, Salt bridge, E.M.F measurement. Concentration cells, Calculation of E.M.F of a concentration cell.

Acids and bases, Arrhenius concept, Bronsted-Lowry concept of acids and bases, Lewis concept, Buffer solutions, pH measurement, Polarisation, Overvoltage.

Power generation: Secondary cells, Fuel cells, Photovoltaic effect, Solar cells.

Corrosion and its control: Theories of corrosion - Galvanic series- Types of corrosion - Factors affecting corrosion and different methods of corrosion control.

Chemical Kinetics: reaction rate, rate constant, rate law, reaction order, first order, second order, pseudo-first order reactions, integrated rate laws, half-life of a reaction and its relation to rate constant. Molecularity, simple unimolecular and bimolecular reactions. Arrhenius equation.

Module III

Chemical Thermodynamics: Fundamentals, Molecular interpretation of internal energy, enthalpy and entropy, Heat of reaction, Kirchhof's equation, Trouton's rule, Entropy changes accompanying different processes, Nernst heat theorem, Third-law.

Free energy: Dependence on pressure and temperature, Gibbs-Helmholtz equation, Free energy changes and equilibrium constant, chemical potential, Fugacity, Thermodynamics of biochemical reactions.

Phase Rule: Terms involved in phase rule and examples, Application of phase rule to one component water system, Application of phase rule to two-component systems.

Module IV

Engineering materials:

Polymers- Classifications- Mechanism of polymerisation (Addition, free radical, cationic, anionic and coordination polymerisation)- Thermoplastics and thermosetting plastics-Compounding of plastics-Moulding techniques of plastics (Compression, Injection, Transfer and Extrusion moulding)-Preparation, properties and uses of PVC, PVA, Nylon, PET - Silicon polymers- Biodegradable plastics. Elastomers- structure of natural rubber- vulcanisation- synthetic rubbers (Buna-S, Butyl rubber and Neoprene).

Lubricants- Introduction-Mechanism of lubrication- solid and liquid lubricant- Properties of lubricants-Viscosity index-flash and fire point- cloud and pour point- aniline value.

Refractories: Classification – Properties of refractories.

Cement- Manufacture of Portland cement- Theory of setting and hardening of cement.

References:

1. Peter Atkins, Julio de Paula, Elements of Physical Chemistry, Oxford University Press, 2005.
2. John E. McMurry and Robert C. Fay, Chemistry, 5th Edition, Pearson, 2008.
3. O. G Palanna, Engineering Chemistry, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2009.
4. R.N. Goyal, Harmendra Goel, Textbook of Engineering Chemistry, 2nd Edition, Ane Books Pvt. Ltd., 2011.
5. R Gopalan, D Venkappayya, Sulochana Nagarajan, Textbook of Engineering Chemistry, 2nd Edition, Vikas Publishing House Pvt. Ltd., New Delhi, 2005.
6. Shashi Chawla, A Text Book of Engineering Chemistry, Dhanpat Rai & Co, New Delhi, 2003.
7. Kochubaby Manjooran, Modern Engineering Chemistry, Kannantheri Publication, Kochi.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

1104 ENGINEERING MECHANICS

A) STATICS

Module I

Concurrent forces in a plane: Principles of statics. Composition and resolution of forces. Equilibrium of concurrent forces in a plane. Method of projection. Method of moments. Friction.

Parallel forces in a plane: Two parallel forces. General case of parallel forces in a plane. Centre of parallel forces and centre of gravity, Pappus theorems, centroids of composite plane figures and curves. Distributed forces in a plane.

Module II

Properties of areas: . Moment of inertia of a plane figure with respect to an axis in its plane. Polar moment of inertia. Product of inertia. Principal axes. Mass moment of inertia of material bodies.

General case of forces in a plane: Composition of forces in a plane. Equilibrium of forces in a plane. Plane trusses - Method of joints. Method of sections. Plane frames : Method of members. **Principle of virtual work:** Equilibrium of ideal systems, stable and unstable equilibrium.

B) DYNAMICS

Module III

Rectilinear translation: Kinematics of rectilinear motion. Differential equation of rectilinear motion. Motion of a particle acted upon by a constant force, by a force as a function of time and by a force proportional to displacement. Simple harmonic motion. D'Alembert's principle. Momentum and impulse. Work and energy, ideal systems, conservation of energy. Impact.

Module IV

Curvilinear translation: Kinematics of curvilinear translation. Differential equations of motion. Motion of a projectile. D'Alembert's principle in curvilinear motion. Moment of momentum. Work and energy in curvilinear motion.

Rotation of a rigid body: Kinematics of rotation. Equation of motion of a rigid body rotating about a fixed axis. Rotation under the action of a constant moment. Compound pendulum. General case of moment proportional to the angle of rotation. D'Alemberts principle of rotation. Resultant inertia force in rotation. Principle of angular momentum in rotation. Energy equation for rotating bodies.

References:

1. Timoshenko and Young, Engineering Mechanics, McGraw Hill Book Company.
2. Beer F. P. and Johnston E. R, Mechanics for Engineers (Vol. 1- Statics and Vol.2 -Dynamics), Tata McGraw Hill.
3. Merriam H. L. & Kraige L. G, Engineering Mechanics (Vol. 1- Statics and Vol.2 -Dynamics), John Wiley and Sons.
4. Biju N, Engineering mechanics, Educational Publications.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

1105 ENGINEERING GRAPHICS

Module I

Introduction to engineering graphics. Drawing instruments and their use. familiarisation with current Indian Standard Code of Practice for general engineering drawing.

Scales- plain scale ,vernier scale, diagonal scale.

Conic sections- Construction of ellipse, parabola, hyperbola - construction of cycloid, involute, archimedian spiral and logarithmic spiral- drawing tangents and normals to these curves.

Module II

Introduction to orthographic projections- plane of projection- principles of first angle and third angle projections, projection of points in different quadrants.

Orthographic projection of straight lines parallel to one plane and inclined to the other plane- straight lines inclined to both the planes- true length and inclination of lines with reference planes- traces of lines.

Projection of plane laminae of geometrical shapes in oblique positions.

Module III

Projection of polyhedra and solids of revolution- frustum, projection of solids with axis parallel to one plane and parallel or perpendicular to other plane- projection of solids with axis inclined to both the planes- projection of solids on auxiliary planes.

Section of solids by planes inclined to horizontal or vertical planes- true shape of sections.

Module IV

Development of surface of cubes, prisms, cylinders, pyramids and cones

Intersection of surfaces- methods of determining lines of intersection - intersection of prism in prism and cylinder in cylinder.

Module V

Introduction to isometric projection- isometric scales, isometric views- isometric projections of prisms, pyramids, cylinders, cones and spheres.

Introduction to perspective projections: visual ray method and vanishing point method- perspective of circles- perspective views of prisms and pyramids.

References:

1. K.C. John. Engineering Graphics, PHI Learning
2. P.I. Varghese and K.C. John, Engineering Graphics, JET Publishers
3. N.D.Bhat , Elementary Engineering Drawing, Charotar publishing house
4. P.S.Gill , Geometric Drawing, B.D Kataria &Sons, Ludhiana
5. P I Varghese , Engineering Graphics, VIP Publishers.

University Examination Question Paper pattern

Two questions of 20 marks each from all the five modules. Answer one question from each module. (5x20 = 100 marks)

1106 BASIC CIVIL AND MECHANICAL ENGINEERING

PART- A BASIC CIVIL ENGINEERING

Module I

Engineering Materials: Cement - varieties and grade of cement and its uses. Cement mortar- Steel- types of steel for reinforcement bars, steel structural sections. Brick- varieties and strength, tests on bricks.

Aggregates- types & requirements. Concrete- grades of concrete as per IS code, water cement ratio, workability, mixing, batching, placing, compaction and curing.

Construction: Foundation- types of foundations- isolated footing, combined footing, raft, pile & well foundations- Foundation for Machinery

Module -II

Super structure: Brick masonry, English bond and Flemish bond, Stone masonry-Ashlar masonry- Rubble masonry. Roofing- Steel trusses, roofing for industrial buildings

Surveying: Principles, instruments, ranging and chaining of survey lines, errors in chaining, field work, field book, selection of survey stations, reconnaissance.

Leveling: Leveling instruments, different types, temporary adjustments, mean sea level, reduced level of point, booking of field notes, reduction of levels by height of collimation method.

References:

1. S.C. Rangawala, Engineering Materials, Charotar Publishing House, Anand.
2. Roy M. Thomas, Fundamentals of Civil Engineering, Educational Publishers,Ernakulam
3 Surendra Singh, Building Materials, Vikas Publishing Company, New delhi.
4 S.C. Rangawala, Building Construction, Charotar Publishing House, Anand.
5. P. Kanetkar, Surveying and Levelling, Volumes 1 and 2, United Book Corporation, Poona.

PART A - Type of Questions for University Exam. (Maximum Marks: 50) (To be answered in separate answer book)

Q 1. Four short answer questions of 5 marks each with two questions from each module. (4x5 = 20 marks)

Q 2 to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (2 x 15 = 30 marks)

PART – B BASIC MECHANICAL ENGINEERING

Module I

Thermodynamics: Thermodynamics systems – open, closed and isolated systems, equilibrium state of a system, property and state, process, cycle, Zeroth law of thermodynamics- concept of temperature, temperature scales. First law – internal energy, enthalpy, work and heat, Different processes, isobaric, isochoric, isothermal and adiabatic processes Second law – Kelvin-plank and Claussius statements, Carnot Cycle.

Internal Combustion Engines: Air standard cycles – Otto and Diesel cycles, working of two stroke and four stroke Petrol and Diesel engines, Carburatted and MPFI engines, fuel pump, fuel injector, ignition system, cooling system, lubricating system.

Module II

Refrigeration and Air conditioning: Vapour compression and vapour absorption refrigeration systems, summer, winter and comfort air conditioning.

Manufacturing processes – Casting (sand and die casting processes), Forging (open &closed die forging), Rolling, Extrusion, Welding (resistance, arc and gas), brazing and soldering

Elementary ideas of **simple reaction and impulse turbines**, compounding of turbines.

Transmission of power: Belt drives (open and closed), Chain drives.

References:

1. P.K. Nag, Engineering Thermodynamics, Tata McGraw Hill
2. J.P. Holman, Thermodynamics, Mc Graw Hill
3. Rogowsky, Elements of Internal combustion Engines, Tata McGraw Hill
4. Gill, Smith & Ziurys, Fundamentals of Internal Combustion Engines, Oxford & IBH
5. Stoecker, Refrigeration and Air Conditioning, Tata McGraw Hill
6. Raghavan : Material Science and Engineering, Prentice Hall of India

PART B - Type of Questions for University Exam. (Maximum Marks: 50) (To be answered in separate answer book)

Q 1. Four short answer questions of 5 marks each with two questions from each module. (4x5 = 20 marks)

Q 2 to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (2 x 15 = 30 marks)

1107 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(A) ELECTRICAL ENGINEERING

Module I

Resistance : Circular wires – Wire Tables – Temperature Effects – Types of Resistors – Colour Coding and Standard Resistor Values – Conductance – Ohmmeters – Metric Units –The Memristor.

Ohm's Law, Power and Energy : Ohm's Law – Plotting Ohm's Law – Power – Energy – Efficiency – Circuits Breakers, GFCI's and Fuses – Applications .

Series dc Circuits: Series Resistors – Series Circuits – Power Distribution and Series circuit – Voltage Sources in a Series – Kirchoff's Voltage Law – Voltage Division in a Series Circuit – Interchanging Series Elements – Notation – Voltage Regulation and the Internal Resistance of Voltage Sources.

Parallel dc Circuits: Parallel Resistors – Parallel Circuits – Power Distribution in a Parallel Circuit – Kirchhoff's Current Law – Current Divider Rule – Voltage Sources in Parallel – Open and Short Circuits.

Capacitors: The Electric Field – Capacitance – Capacitors.

Inductors: Magnetic Field – Inductance.

Module II

AC Fundamentals: Sinusoidal Alternating Waveforms - Sinusoidal ac Voltage Characteristics and Definitions – Frequency Spectrum – The Sinusoidal Waveform – General format for the sinusoidal Voltage of current – Phase Relations – Average Value – Effective (rms) Values – ac Meters and Instruments. Elementary Concepts of Energy Meter Watt Meter, Volt Meter and Ammeter.

The Basic Elements and Phasors: Response of Basic R,L and C Elements to a Sinusoidal Voltage or Current – Frequency Response of the Basic Elements – Average Power and Power Factor – Complex Numbers – Rectangular Form – Polar Form – Conversion between Forms.

Series and Parallel ac Circuits: Impedance and the Phasor Diagram- Series Configuration – Voltage Divider Rule – Frequency Response for Series ac Circuits –Admittance and Susceptance – Parallel ac Networks – Current Divider Rule – Frequency response of Parallel Elements.

Introduction to 3 phase Systems: StarΔ Connection

Elementary Concepts of Generation, Transmission, and Distribution: Various Levels of Power Transmission – Conventional Sources of Electrical Energy, Hydro, Thermal, Nuclear and Diesel Power Station - Introduction to Primary and Secondary distribution - Basic Concepts of Transformers - Principle of Operation – Applications to Power Systems.

(B) ELECTRONICS ENGINEERING

Module III

The Diode - Biasing the Diode, Voltage - Current Characteristic of a Diode, Diode Models, Testing a Diode.

Diode Applications - Half Wave and Full Wave Rectifiers, Power supply Filters and Regulators

Special Purpose Diodes - Zener Diodes- Applications, Varactor Diodes, Optical Diodes-Other Types of Diodes- system application.

Bipolar Junction Transistors (BJTs) - Transistor Structure - Basic Transistor Operation, Transistor characteristics and parameters, Transistor as an Amplifier, Transistor as a Switch.

Module IV

Sensors-Temperature, light, force and sound sensors; **Actuators** – Heat, Light, force and sound actuators.

Electronic measurements - measurements of voltages and currents, voltmeter, ammeter, multimeter, CRO (Block level treatment only)

Introduction to Electronic Communication systems: Modulation and Demodulation, Analog communication system, Electromagnetic frequency spectrum, Bandwidth and information capacity, Principles of Amplitude and angle modulation, Bandwidth requirements of angle modulated waves.

Optical communication: Fundamental concepts, Block diagram of an optical fibre communications system.

Cellular Telephone: Fundamental concepts, Frequency reuse, Block diagram of a simplified cellular telephone system, Roaming and handoffs

Satellite communication: Block diagram of Satellite system link models – Uplink, Transponder Downlink.

References:

1. Boylestad, *Introductory Circuit analysis*, Pearson Education, 12/e, 2012.
2. Thomas L. Floyd, Electronic Devices, Pearson Education Inc. 7th edition.
3. Neil Storey, Electronics A systems approach, Pearson Education Inc. 2011
4. Wayne Tomasi, *Electronic Communication Systems: Fundamentals through Advanced*, Pearson Edn. Inc. 5th edn.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

1108 COMPUTER PROGRAMMING

Module I

Basics of Computer and Information Technology: Digital Computer System (CPU, Memory, I/O devices)- Working of a digital computer- Hardware and Software : Definition - Categories of Software, Application of Computers – Role of Information Technology – Internet Services

Problem Solving Methodology: Program - Programming Process (Problem statement, Analysis, Design a solution, Implement/Coding the solution, Test the solution, Iteration through the phases to refine/correct the program)- Design tools (Algorithm, Flow-chart, Pseudo-code)- Develop algorithms for simple problems.

Module II

Programming Languages: Types and generation of programming languages- Compiler – Interpreter-Linker –Loader – Execution of Program

Basics of C: Character set-Identifier- Keywords- Constants –Data Types- Variables and declaration –Operators and Expressions – Operator precedence and associativity – Expression Evaluation (Simple Examples) - Input and output functions – Simple computational problems involving the above constructs.

Module III

Control Statements: Selection, Conditional operator, Iteration (for, while, do-while), Branching (switch, break, continue, goto), Nesting of control statements- Problems using control statements.

Arrays and Strings: 1D and 2D arrays –Searching (Linear and Binary) - Sorting (Bubble, Selection) – Matrix manipulation programs – Strings and basic operations on strings – Strings functions - Programs on string manipulation

Functions: Definition – Calling – Declaration – Parameter Passing (by value and by reference) – Recursion – Library functions –Programs based on functions

Module IV

User defined data types: Structure – Union - Enumerated data type - Programs involving structure and union.

Pointers: Declaration, Initialization – Pointers and arrays – Pointers and structures – Pointers and functions – Command line arguments – Dynamic memory allocation – Operations on pointers – Programs involving the above concepts

Files: File concept – File pointer – File handling operations (open, close, read, write etc) on sequential and random access files. Programs on file manipulations using fgetc(), fgets), fseek.

References:

1. Pradip Dey and Manas Ghosh, Computer Fundamentals and Programming in C, Oxford.
2. Samarjit Ghosh, All of C, PHI Learning
3. Byron Gottfried , Programming with C , 2nd edition, TMH publication.
4. B.W. Kernighan and D.M. Ritchie, The C Programming Language, Pearson Education.
5. R G Dromey , How to solve it by Computer, Prentice Hall
6. D.E. Knuth, The Art of Computer Programming – Volume 1,2 &3, Addison Wesley.
7. Yashwant P. Kanetkar, Let Us Use C, 8th Edition (Paperback).
8. Sukhendu Dey , Complete Knowledge in C, Narosa
9. Varghese Paul, Computer Fundamentals, EPD.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

1109 ENVIRONMENTAL STUDIES AND TECHNICAL COMMUNICATION

PART - A ENVIRONMENTAL STUDIES (1 hour/ week)

Module I

Natural resources - issues related to the use and over exploitation of forest resources, water resources, mineral resources, food resources, energy resources and land resources- role of an individual in conservation of natural resources - equitable use of resources for sustainable life styles.

Concept of an ecosystem - structure and function - energy flow in the ecosystem - ecological succession - food chains, food webs and ecological pyramids - structure and functions of a forest ecosystem and an aquatic eco system.

Definition of biodiversity - genetic, species and ecosystem diversity - biogeographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Threats to biodiversity, Conservation of biodiversity.

Module II

Environmental Pollution - Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, marine pollution, thermal pollution and nuclear hazards - Causes, effects and control measures of urban and industrial solid wastes -Role of an individual in prevention of pollution - An overview of the various environmental legislations in India - Issues involved in enforcement of environmental legislation. Disaster Management: Floods, earth quake, cyclone and landslides. Role of public awareness in disaster management.

The concept of sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, water shed management - Resettlement and rehabilitation of people; its problems and concerns - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies - Population growth and problems of population explosion – Environment and human health – Human rights – Value education – Role of Information Technology in environment and human health - Environmental ethics: issues and possible solutions.

References:

1. Rajagopalan. R, Environmental Studies: From Crisis to Cure, Oxford University Press, 2005
2. Erach Bharucha, Textbook of Environmental Studies and Ethics, Universities Press (India), Hyderabad, 2005.
3. Jayashree A. Parikh, V.M. Balsaraf, P.B. Dwivedi, Environmental Studies, Ane Books Pvt. Ltd., 2010.
4. Anindita Basak, Environmental Studies, Pearson, 2009.
5. Gouri Suresh, Environmental Studies and Ethics, I.K. International Publishing House Pvt. Ltd., New Delhi, 2007.
6. S.P. Misra, Essential Environmental Studies, 3rd Edition, Ane Books Pvt. Ltd., 2011.
7. Benny Joseph, Environmental Science & Engineering, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
8. Meenambal T , Uma R M and K Murali, Principles of Environmental Science and Engineering, S. Chand & Company Ltd, 2005

PART - B TECHNICAL COMMUNICATION (1 hour/ week)

This is a practice oriented, need based, and functional – communicative course. It is intended to develop the student's skill of communication in listening, speaking, reading and writing. The student is advised to cultivate the habit of reading newspapers, magazines and books in a free, extensive manner to consolidate the skill already achieved. A more inter-active process of teaching/learning is called for in order to achieve effective communication.

Questions at the class tests and semester end examination will be largely problem solving and application oriented in nature.

Module I

Communicative Grammar: Time, tense and aspect; Verbs of state and event; Use of preposition; Expressing emotions and attitudes: Hope, anticipation of pleasure, disappointment, approval, disapproval, surprise.

The sounds of English: (it is not a course in phonetics. Technical terms will not be used except when absolutely necessary.)

Length of vowels-long and short vowels

/ | /, / 3 : /, /a :/, / : /, /U : / | / / 2 /, /,/ Λ /, / O /, / U / - Consonants : / f, v, o, o, s, z, 3/ - Stress pattern -

Intonation: failing and rising.

Oral Communication: starting and ending a conversation; telling and asking people to do things; expressing opinions and ideas, decisions and intentions, offers and invitations, feelings, right and wrong, numbers and money.

Purpose and audience; dealing with customers and clients; face-to-face discussions; interviews; group discussions; meetings and attending meetings; checking understanding; raising questions; giving and receiving feedback; using body language; leading and directing discussions; concluding discussions; using graphics in oral presentations

Reading Comprehension and reference skills: skimming and scanning; factual and inferential comprehension; prediction; guessing meaning of words from context; word reference; comprehending graphics in technical writing.

Reading strategies; reading speed; reading between the lines for hidden meaning; interpreting graphics; using a dictionary; using an index; using a contents list to find information; choosing the right reference source.

Module II

Written Communication: note making and note taking; summarizing; notes and memos; developing notes into text; organization of ideas: cohesion and coherence; Preparing notes – writing business letters and E-mail messages.

Organizing a meeting, preparing an agenda, chairing a meeting, drafting motions and resolutions, writing minutes.

Paragraph writing: Paragraph writing – Topic sentence, cohesion and coherence- sentence liners (so, but, however etc), ordering information in space and time; short essays: description and argument; comparison and contrast; illustration; using graphics in writing: tables and charts; diagrams and flow-charts; maps, plans and graphs.

Preparation of a business report-writing a business proposal - format, length,structure.

Spelling rules and tips; writing a rough draft; editing and proof reading; writing the final draft; styling text; filling in complex forms; standard letters; Writing a curriculum vitae (both chronological & functional) along with an application for a job; Public relation – Concept and relevance – PR in a business organization-handing the media; writing a report; writing leaflets and brochures; writing references; essay writing: expository writing; description of processes and products; classification; the instructional process; arguments and presentation of arguments; narrating events chronologically.

References:

1. John Seely, Oxford Guide to Writing and Speaking, Oxford University Press.
2. C. Muralikrishna and Sunita Mishra, Communication Skills for Engineers, 2nd Edition, Pearson, 2011.
3. Meenakshi Raman and Sangeetha Sharma, Technical Communication: Principles and Practice, Oxford University Press, 2004.
4. Krishna Mohan and Meenakshi Raman, Effective English Communication,Tata Mc-GrawHill,2000.
5. William Sanborn Pfeiffer, T.V.S. Padmaja, Technical Communication – A Practical Approach, Pearson, 2007.
6. R.C. Bhatia, Business Communication, 2nd Edition, Ane Books Pvt. Ltd., 2008.
7. Krishna Mohan and Meera Banerji, Developing Communication Skills, Mac Millan India Ltd, 2000.

University Examination Pattern

The question paper will have two parts. Part A and Part B will have a weightage of 50 marks each and they will have to be answered in separate answer books.

Question Paper Pattern for Part A (Environmental Studies)

Q I. – 6 short type questions of 3 marks each, with three questions from each module. (6 x 3 = 18 marks)

QII. – 2 questions A and B of 16 marks from Module I with choice to answer one. Both A and B should have a minimum of two sub – sections. (1 x 16 = 16 marks)

QIII. - 2 questions A and B of 16 marks from Module II with choice to answer one. Both A and B should have a minimum of two sub – sections. (1 x 16 = 16 marks)

Question Paper Pattern for Part B (Technical Communication)

Q I. – 10 short answer questions of 2 marks each, with five questions from each module. The questions shall be problem solving and application oriented in nature. (10 x 2 = 20 marks)

QII. – 2 questions A and B of 15 marks from Module I with choice to answer one. Both A and B should have a minimum of two sub – sections. The questions shall be problem solving and application oriented in nature. (1 x 15 = 15 marks)

QIII. - 2 questions A and B of 15 marks from Module II with choice to answer one. Both A and B should have a minimum of two sub – sections. The questions shall be problem solving and application oriented in nature. (1 x 15 = 15 marks)

11 L1 ELECTRICAL AND MECHANICAL WORKSHOP

ELECTRICAL WORKSHOP

1. One lamp controlled by one switch
2. Series and parallel connections of lamps.
3. Stair case wiring.
4. Hospital Wiring.
5. Godown wiring.
6. Fluroscent lamp.
7. Connection of plug socket.
8. Different kinds of joints.
9. Transformer winding.
10. Soldering practice.
11. Familiarisation of CRO.

MECHANICAL WORKSHOP

Preliminary exercises for beginners in all the following shops. Specific models may be designed by the teachers.

1. Fitting Shop.
2. Sheet Metal Shop
3. Foundry Shop
4. Welding Shop
5. Carpentry Shop

Note: 50% marks is earmarked for continuous evaluation, and 50% marks for end semester examination to be conducted by two examiners. A candidate shall secure a minimum of 50% marks in the aggregate and 50% minimum in the end semester examination for a pass.

11 L2 COMPUTER PROGRAMMING LABORATORY

Application packages

Word	1. To create an advertisement in Word. 2. To illustrate the concept of mail merging in word.
Spread Sheet	3. To create a spread sheet to analyze the marks of the students of a class and also to create appropriate charts.
Power Point	4. To create the presentation for the department using Power Point.

C Programming Basics

Operators & Expressions	5. To write a simple menu driven calculator program using switch statement
IO Formatting	6. To write a program to print Pascal's triangle.
Decision Making	7. To write a program for electricity bill preparation.
Looping	8. To write a program to print the *sine* and *cosine* series.
Arrays	9. To write a program to perform Matrix multiplication. 10. To write a program to prepare and print the sales report.
String	11. To write a program to perform string manipulation manipulations function like *string concatenations, comparison, find the length and string copy* without using library functions. 12. To write a program to arrange names in alphabetical order.
Functions	13. To write a C program to calculate the mean, variance and standard deviation using functions. 14. To write a C program to perform sequential and binary search using functions.
Recursion	15. To write a program to print the Fibonacci series and to calculate the factorial of the given number using functions.
Structures	16. To print the mark sheet of n students using structures.
Pointers	17. To write a program using pointers to access the elements of an array and count the number of occurrences of the given number in the array.

Note: 50% marks is earmarked for continuous evaluation, and 50% marks for end semester examination to be conducted by two examiners. A candidate shall secure a minimum of 50% marks in the aggregate and 50% minimum in the end semester examination for a pass.

11 L3 LANGUAGE LABORATORY

The **Language Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

Objectives:

1. To expose the students to a variety of self-instructional, learner-friendly modes of language learning.
2. To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required facility to face computer-based competitive exams.
3. To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.
4. To train them to use language effectively to face interviews, group discussions, public speaking.
5. To initiate them into greater use of the computer in resume preparation, report writing, format-making etc.

Syllabus:

The following course content is prescribed for the **English Language Laboratory** sessions:

1. Introduction to the Sounds of English- Vowels, Diphthongs & Consonants.
2. Introduction to Stress and Intonation.
3. Situational Dialogues / Role Play.
4. Oral Presentations- Prepared and Extempore.
5. 'Just A Minute' Sessions (JAM).
6. Describing Objects / Situations / People.
7. Information Transfer
8. Debate
9. Telephoning Skills.
10. Giving Directions.

Note: 50% marks is earmarked for continuous evaluation, and 50% marks for end semester examination to be conducted by two examiners. A candidate shall secure a minimum of 50% marks in the aggregate and 50% minimum in the end semester examination for a pass.

SEMESTER III

CE/CS/EB/EC/EE/EI/FT/IT/ME/SE 1301 ENGINEERING MATHEMATICS - II

Module I

Matrices and Vector spaces: Rank of matrix, Echelon and normal form, Solutions of linear systems of algebraic equations, Eigen values and Eigen vectors, Cayley Hamilton theorem (non proof).

Vector Spaces – Subspaces, - Linear Independence of vectors-Linear span-Dimension and Basis. Linear transformations.

Module II

Fourier series and Fourier integrals: Forier series of Periodic functions- Euler formulae for Fourier coefficients- functions having period 2π, arbitrary period-even and odd functions-half range expansions, Fourier integral, Fourier cosine and sine transformations, linearity property, transform of derivatives, convolution theorem (no proof)

Module III

Laplace transforms: Linearity property, transforms of elementary functions, Laplace transforms of derivatives and integrals, differentiation and integration of transforms, convolution theorem (no proof) use of Laplace transforms in the solution of initial value problems, unit step function, impulse function - transform of step functions, transforms of periodic functions.

Module IV

Vector calculus: Scalar and Vector point functions-Gradient and directional derivative of a scalar point function-Divergence and Curl of a vector point functions-their physical meanings.

Evaluation of line integral, surface integral and volume integrals, Gauss's divergence theorem, Stoke's theorem (No Proof of these theorem), conservative force fields, scalar potential.

References:

1. R.K.Jain, S.R.K.Iyengar, Advanced Engineering Mathematics: Narosa Publishers.
2. C.R.Wilie & L.C.Barrett, Advanced Engineering Mathematics, Mc-Graw Hill
3. Larry C Andrews, Ronald C Philips, Mathematical Techniques for Engineers & Scientists, PHI Publishers
4. 2. M.C.Potter, J.L.Goldberg, Advanced Engineering Mathemartics, Oxford Unversity Press.
5. B.S.Grewal, Higher Engineering Mathematics:, Khanna Publishers.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1302 ELECTRICAL MACHINES AND CIRCUITS

Module I

Generation, transmission & distribution of electrical energy: Different methods of power generation- thermal, hydro-electric and nuclear (general idea only). *Transformers:* Working principle and elementary theory of an ideal transformer, Constructional features of single phase transformer, emf equation, turns ratio, vector diagram, equivalent circuit, impedance transformation, transformer losses, flux leakage, efficiency, open circuit and short circuit test, load test. Auto transformer - working principle, basic idea of current transformer and potential transformer.

Module II

Basic principles of electrical machines: Concepts of motoring and generating action. *DC machines:* Main constructional features, principles of operation, types of generators, emf equation, characteristics, applications, armature reaction and commutation, types of motors, torque, speed, and power, characteristics, applications, starting, losses and efficiency, speed control, testing, load test of dc machines.

Module III

AC Machines: Alternator- rotating field, speed and frequency, effect of distribution of winding, coil span, emf equation, regulation (emf method only),applications, Synchronous motor- principle of operation, over excited and under excited, starting, applications. *Induction Motor:* Three phase induction motor - principles of operation, constructional features of squirrel cage and slip ring motors, torque-slip characteristics, starting, speed control, losses and efficiency. Single phase induction motor – Double field revolving theory, making single phase induction motor self starting-split phase and capacitor start induction run. *Special Motors:* Construction, principle of operation and applications of BLDC, Stepper Motor and PMSM.

Module IV

Network Analysis: Transients - DC and sinusoidal response of RL, RC and RLC circuits, Initial and final conditions, Rise and decay of current, Time constant; Application of Laplace Transforms in circuit analysis – circuit elements in S domain. *Two port networks* : Characterization of two port networks using Z, Y, Hybrid and Transmission parameters, T and π representations. *Passive filters* – Filter fundamentals, Classification of Filters, Characteristic impedance, Design of Constant K - Low Pass, High Pass & Band Pass - T and □.

References:

1. P. S. Bimbra, *Electrical Machines*, 7th ed., Khanna publications.
2. A. Sudhakar and Shyam Mohan. S. Pillai, *Circuits and Networks: Analysis and Synthesis* , Tata McGraw Hill, 2010
3. B.L. Theraja. *Textbook of electrical technology in S.I. system of units : volume 2: AC and DC machines* : S. Chand and Company Ltd., 1997.
4. H.Cotton, *Advanced Electrical Technology*, Wheeler publications. 1984.
5. Nagarath & Kothari *Electrical Machines*, Tata Mc Graw Hill.1999.
6. Smarajit Ghosh, Network Theory: *Analysis and Synthesis*, PHI, 2010.
7. D. Roy Choudhury, *Networks and systems*, New Age International, 2006.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1303 PRINCIPLES OF ANATOMY AND PHYSIOLOGY

Module I

Functional organization of human body - cells - cell structure and function, types, homeostasis – tissues, types - organs - systems. *Skin* – structure and functions. *Muscular system* – structure & mechanism of contraction of skeletal muscles, smooth muscles and cardiac muscles, principal groups of muscles in human body. *Skeletal system* – Bones – composition & structure, - classification of bones & joints in human body. *Teeth* – Functional parts.
General awareness of common diseases associated with the each system (detailed study not required).

Module II

Nervous system – Organization – Structure of neuron, nerve centres – cerebrum, cerebellum, thalamus, hypothalamus, brainstem and spinal cord, nerves - cranial and spinal. Autonomic nervous system. Central nervous system – receptors, ascending tracts and descending tracts, sensory perception with special reference to touch, heat, pain, muscle tone, regulation of posture and equilibrium. *Special senses* – organs of vision, hearing, taste & smell - mechanisms of each. *Endocrine system* – Functions of major endocrine glands and their hormones - Pituitary, thyroid and parathyroid, adrenocortical, insulin, glucagon, hormones of the male and female reproductive systems.
General awareness of common diseases associated with the each system (detailed study not required).

Module III

Digestive system – structure of digestive tract, organs and associated glands – saliva, gastric & intestinal digestion & motility of gastrointestinal tract - Enzymes – mode of action -Basic principles of metabolism – carbohydrate, fat and protein metabolism – Liver – Basal Metabolic Rate – Body Temperature - Regulation. *Urinary system* – Structure and function of organs– Kidneys - nephron – Renal function – process involved in urine formation, micturition, composition of urine, Body fluids - Water and electrolytes, acid - base balance & regulation. *Reproductive system* – Structure and function of reproductive organs in male and female, monthly ovarian cycle, spermatogenesis.
General awareness of common diseases associated with the each system (detailed study not required).

Module IV

Respiratory system – concepts of organs concerned with the respiration and their structure and organization – Mechanics of respiration, physical principles of gaseous exchange, transport of gases and control of respiration, lung volumes & capacities. *Cardiovascular system* – Heart – Structure of heart and major blood vessels, rhythmic excitation of heart – cardiac cycle - ECG , heart rate, heart sounds & phonocardiogram cardiac outputs. Circulatory system – systemic circulation and pulmonary circulation, blood pressure, arterial pulse, blood flow, measurement of blood flow & blood pressure. *Blood* – The composition of blood, functions, blood groups, lymphatic systems, reticuloendothelial system & defence mechanism of the body - Infection and immunity.
General awareness of common diseases associated with the each system (detailed study not required).

References:

1. Arthur C. Guyton, *Textbook of Medical Physiology, 11th ed*, Prism Books (Pvt) Ltd & W.B. Saunders Company. 2006.
2. Samson Wright, Cyril A. Keele (editor), Eric Neil (editor): *Applied Physiology*, Oxford University Press. 1990.
3. J.B.West.: *Best and Taylor's Physiological Basis of Medical Practice*, Williams and Wilkins, Baltimore. 1992
4. W.F.Ganong: *Review of Medical Physiology*, Prentice-Hall, Connecticut. 1990
5. Kathleen J.W. Wilson, Ross and Wilson, *Anatomy And Physiology In Health And Illness*, ELBS/Churchill Livingstone.1995.

Type of Questions for University Exam.
Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)
Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB/EC 1304 DIGITAL ELECTRONICS

Module I

Number system and codes: Binary, Octal, and Hexa-decimal number systems - Binary arithmetic. Binary coded Decimal, Excess - 3 code, Gray Code, Error detection and correction: Parity, CRC, 7 bit Hamming code.

Boolean algebra -Minimization of Boolean function using Karnaugh Map (upto 6 variables) and Quine - McClusky methods – Formation of switching functions from word statements , realization using basic gates and universal gates.

Module II

Combinational circuits: Half adder, Full adder , Subtractor, Binary parallel addition - Carry look ahead adder – BCD adder. Multiplexer demultiplexer, decoder & encoder circuits. Implementation of simple combinational circuits using ROM and PLA.

Module III

Sequential circuits : Flip-flops - RS, JK, T & D flip- flops , Shift registers - Counters - Asynchronous and synchronous counters , Up-Down counter, Ring counter, Johnson counter - Sequence generators - state tables and diagrams. Arithmetic circuits: Serial Adder, Difference between parallel adder and serial adder, Binary multiplication, Binary division circuits.

Module IV

Logic families: Standard logic levels - Current and voltage parameters - fan in and fan out - Propagation delay, noise consideration. Basic idea of DCTL, RTL and DTL families. TTL family NAND gate working principle, need for totem pole configuration, TTL inverter characteristics, Open collector gate and tri- state logic gate. CMOS: characteristics of basic CMOS inverter - interfacing of CMOS to TTL and interfacing of TTL to CMOS, Merits and demerits of TTL family and CMOS family. ECL family OR-NOR gate working principle.

References:

1. Taub & Schilling, Digital Integrated Electronics, Tata Mc Graw Hill,2008, ISBN-13: 978-0-07- 026508-0.
2. A. Anand Kumar, Fundamentals of Digital Circuits, PHI learning, 2/e, 2010, ISBN: 978-81-203-3679-7.
3. Thomas L Floyd, Digital Fundamentals, Pearson, 10/e, 2011.
4. R P Jain, Modern Digital Electronics, Tata Mc Graw Hill, 4/e,2009.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1305 MEDICAL PHYSICS

Module I

Radioactivity - Units - radio emission - law of radioactive decay, half life period - production of radio isotopes for medical use, Production of x rays – discharge tube and Coolidge tube method, x-ray spectra – continuous and line spectra, factors determining the x-ray emission, Efficiency of x ray production, distribution of x-rays in space. Radiation units - detection and measurements of x-rays.

Module II

Interaction of radiation with matter - exponential attenuation - half value thickness – Photon scattering – elastic and Compton scattering, Photon disappearance - photo electric, pair production process and photonuclear reactions and their significance in radiology. Transmission and absorption. Effects of x-rays. Radiation protection – units & Limits, Instrumentation, Radiation Protection in Diagnostic radiology, radiotherapy & nuclear medicine, radiation accidents.

Module III

Introduction to electrical simulation – 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 – micro and macro shocks – effects of electrical current on human body – ventricular fibrillation - leakage currents – types & measurements. Precautions and devices to protect against electric shock hazards – Patient isolation – methods. Equipment safety - regulations - Protection against shock, burn & explosion hazards.

Module IV

Basic principles of magnetic resonance – magnetic moment, FID, excitation and emission, Useful and harmful effects of magnetic fields. Basic physics of ultrasound – characteristic impedance, wavelength, frequency and velocity of propagation, Absorption, beam width, resolution, generation and detection. Applications in medicine. Radio waves, micro waves , ultra violet radiation and infrared radiation on human beings - Applications. Effect of hypothermia and hyperthermia. Production of ultra low and low temperature for medical use.

References:

1. W.J. Meredith & J.B. Massey, *Fundamental Physics of radiology*, Varghese Publishing House, Bombay, 1992.
2. Geddes & Baker, *Principles of Applied Biomedical Instrumentation*, John Wiley 3rd edition 1989.
3. Webb, S. (ed) *The Physics of Medical Imaging*, Institute of Physics Publishing, Bristol, 1992.
4. John G. Webster (ed.), *Medical Instrumentation - Application and Design*, Houghton Mifflin Co., Boston, 1992.
5. Khandpur R S, *Handbook of Medical Instrumentation*, Tata Mc Graw Hill, New Delhi, 2005.
6. B. H. Brown & R H Smallwood, *Medical Physics & Physiological Measurements*, Blackwell Scientific Publications, 1981.
7. John R Cameron, J.G. Skofronick, *Medical Physics*, John Wiley & sons 1997.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

CS/EB/EE 1306 ELECTRONIC DEVICES AND CIRCUITS

Module I

DC power supplies - power transformers - rectification - half wave , full wave, bridge - expression for ripple factor, efficiency, comparison, diode ratings. filters - capacitor - inductor LC filters- use of bleeder resistor - voltage multipliers - dual power supplies - zener and avalanche diodes - simple and series voltage regulator. *Special semiconductor devices:* Principles and operation of photodiodes, PIN diodes, phototransistors, LED, UJT. MOSFET - enhancement & depletion types - NMOS, PMOS & CMOS - basic principles & characteristics.

Module II

Small Signal amplifiers: Bipolar junction transistor – configurations, characteristics - current amplification factors - relations between alpha & beta – comparison. *BJT amplifiers*: Biasing techniques of BJT- stabilization of operating point - h-parameters - CE RC coupled amplifier - concept of load lines- frequency response of RC coupled amplifier - frequency analysis of R C coupled amplifier - lower cut-off frequency - upper cut-off frequency - 3 db bandwidth.
FET Amplifiers: Principle of operation, characteristics, Common source amplifier- design, frequency response- applications

Module III

Power amplifier - classification - class A, B, AB and C power amplifiers-tuned amplifier- push-pull and complementary symmetry power amplifier –Harmonic distortion – Heat sinks.
Feed-back amplifiers: concept of Negative and positive feedback – Bark Hausen criteria -low frequency sinusoidal oscillators
High frequency oscillators – types- LC, Crystal oscillators –circuit diagram-description-applications

Module IV

*Pulse Circuits***:-**Different types Pulse circuits - pulse characteristics - Pulse shaping using RC circuits - Differentiating and integrating circuits –applications. Clipping and clamping circuits using diodes - *Transistor as a switch*– simple sweep circuits-bootstrap sweep.
Multivibrators-astable, monostable and bistable ciruits using BJTs-applications

References:

1. Boylestead & Neshelsky, *Electronic Devices & Circuit Theory*, Prentice Hall of India.2003
2. Millman & Halkias, *Electronic Devices & Circuits*, Tata McGraw Hill, New Delhi.1996
3. Taub &Schilling, *Pulse,digital and Switching ciruits*,Tata Mc Graw Hill 2002
4. Bapat Y N, *Electronic Devices & Circuits*, Tata McGraw Hill, New Delhi.1995
5. Allan Mottorshed, *Electronic Devices & Circuits*, Prentice Hall of India, New Delhi.2003
6. Schilling & Belove, *Electronic Circuits, Discrete & Integrated*, TMH, New Delhi 1989
7. Theodore F.Bogart, *Electronic Devices & Circuits* Universal Book Stall, New Delhi 1992.

Type of Questions for University Exam.
Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)
Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 13 L1 ANALOG CIRCUITS LABORATORY-I

1. Study of - Multimeters, Signal generators & CRO and measurement of electrical quantities (Voltage, Current, Frequency & Phase)
2. Testing of Passive and Active components - Resistors, Capacitors, Inductors, Transformers, Diodes, Transistors, etc.
3. Characteristics of Active devices
   i) Characteristics of diodes – Si & Ge diodes, zener diode & LED.
   ii) Characteristics of transistors - CE & CB
4. Rectifying circuits

   i) HW rectifier ii) Centre tapped FW rectifier iii) FW Bridge rectifier
   iv) Filter circuits - Capacitor filter, inductor filter and Pi section filter
5. Biasing of BJT - Voltage, current and feedback biasing
6. Regulators – zener, series voltage regulator using transistors.
7. Design of power supplies.

Note: 50% marks is earmarked for continuous evaluation, and 50% marks for end semester examination to be conducted by two examiners. A candidate shall secure a minimum of 50% marks in the aggregate and 50% minimum in the end semester examination for a pass.

EB 13 L2 ELECTRICAL MACHINES LABORATORY

Compulsory experiments

1. (a) Preliminary study of AC and DC Power supplies in the laboratory.
   (b) Study of instruments and their mode of use
2. Open circuit characteristics of
   (a) Self excited generator
   (b) Separately excited generator.
3. Load characteristic of compound generator
4. Load characteristic of shunt generator
5. Study of face plate starter and starting of DC motors
6. Load characteristics of DC series motor.
7. Swinburn's test
8. Polarity and transformation ratio test on single phase transfer.
9. O.C & SC test on single phase transformer - equivalent circuit
10. Load test on single phase transformer.
11. Study of starting methods of squirrel cage and slip ring induction motor.
12. Load test on slip ring induction motor and study of characteristics.

Optional Experiments

1. Study of single-phase motors.
2. Load test of DC shunt motor.
3. Poly phase connection of single phase transformer.
4. Load test on squirrel cage induction motor
5. Study of alternators.

Note: 50% marks is earmarked for continuous evaluation, and 50% marks for end semester examination to be conducted by two examiners. A candidate shall secure a minimum of 50% marks in the aggregate and 50% minimum in the end semester examination for a pass.

SEMESTER IV

CE/CS/EB/EC/EE/EI/FT/IT/ME/SE 1401 ENGINEERING MATHEMATICS-III

Module I

Complex Analytic functions and conformal mapping: curves and regions in the complex plane, complex functions, limit, derivative, analytic function, Cauchy – Riemann equations, Elementary complex functions such as powers, exponential function, logarithmic, trigonometric and hyperbolic functions.

Conformal mapping: Linear factional transformations, mapping by elementary function like Z^2, e^z, sinz, cosz, sinhz, and coshz, $Z + 1/Z$

Module II

Complex integration: Line integral, Cauchy's integral theorem, Cauchy's integral formula, Taylor's series, Laurent's series, residue theorem, evaluation of real integrals using integration around unit circle, around the semi circle, integrating contours having poles, on the real axis.

Module III

Partial differential equations:

Formulation of partial differential equations.

Solutions of equations of the form F (p,q) = 0, F(x,p,q) = 0, F(y,p,q) = 0, F(z,p,q) = 0 F1(x,p) = F2 (y,q), Lagrange's form Pp+Qq = R

Linear homogeneous partial differential equations with constant co-efficient

Module IV

Vibrating string: one dimensional wave equation, D'Alembert's solution, solution by the method of separation of variables

One dimensional heat equation, solution of the equation by the method of separation of variables,

Solutions of Laplace's equation over a rectangular region and a circular region by the method of separation of variables.

References:

1. R.K.Jain, S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Publishers.
2. C.R.Wilie and L.C.Barrett Advanced Engineering Mathematics, Mc-Graw Hill.
3. Erwin Kreyszig, Advanced Engineering Mathematics, Wilsey Eastern.
4. Churchill R.V, Complex Variables & Applications, Mc-Graw Hill.
5. M.C.Potter, J.L.Goldberg. Advanced Engineering Mathematics, Oxford Unversity Press.
6. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

CS/EB 1402 MICROPROCESSORS

Module I

Introduction to 8 bit microprocessor: Microcomputers and microprocessors, 8/ 16/ 32/ 64-bit microprocessor families; Internal architecture of Intel 8085 microprocessor: Block diagram, Registers, Internal Bus Organization, Functional details of pins, Control signals, External Address / Data bus multiplexing, Demultiplexing, I/ O mapped I/ O, and memory mapped I/ O techniques. Interrupts, Serial communication and DMA features.

Module II

Assembly Language Programming: 8085 instruction set: Instructions, Classifications, Addressing modes, Stack and Subroutines, Delay routines, Counters etc. Programming examples.

Module III

Instruction Timing and Interrupts: Timing Diagrams (of various instructions): T- state, Machine cycle (Opcode fetch, Read / Write, Interrupt Acknowledge, Bus Idle, etc), Interrupts: -types (h/ w and s/ w), Maskable / Non maskable, their organization.

Module IV

Interfacing concepts and devices: Memory interface: Concept of memory chip/ chips interface to 8085 with appropriate examples Programmable interfacing devices: - Programmable peripheral interface (Intel 8255), Programmable timer interface (Intel 8253/ 54), Programmable display / Keyboard interface (Intel 8279), Programmable serial communication interface (Intel 8251)-(their architecture, register organization, initialization, hardware and software interface to 8085.

References:

1. Gaonkar , *Microprocesors, Architecture, Programming and Applications*, Wiley Eastern, 4th ed.
2. K. Udayakumar, B. S. Umasankar, " The 8085 microprocessor – Architecture, Programming & Interfacing,", 5ed.
3. A. Nagoor Kani, *Microprocessors,architecture and programming,*RBA Publications,2004.
4. Douglas V. Hall , *Microprocessors, Interfacing and Peripherals,* Tata McGraw Hill,2nd ed.
5. Ghosh and Sridhar, *0000 to 8085 Microprocessors for Engineers and Scientists*, PHI, 2nd ed.
6. S. P. Chowdhary, Sunetra chowdhary, Microprocessors & peripherals, SCITECH, 2004.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1403 INTEGRATED CIRCUITS AND SYSTEMS

Module I

Brief overview of microelectronic fabrication technology - Epitaxial Growth, Diffusion, Ion Implantation Processes - Description - Fabrication of BJT, MOSFETs. **Introduction to operational amplifiers** – Basic differential amplifier - dual input balanced output and unbalanced output - Internal block schematic of op amp - Power supply requirements - Op-amp parameters - ideal op amp open loop gain – input and output impedence – frequency response, frequency compensation. Slew rate, Input bias current – offset - drift - compensating networks CMRR, SVRR, finite gain bandwidth and its effect in op amp circuit performance. *Open loop and closed loop op amp configurations*: Feed back configurations - Voltage series feedback and voltage shunt feedback - concept of virtual ground - voltage follower - V/I & I/V converters and its applications.

Module II

Difference amplifiers with one op amp and 3 op amps - Use of offset minimizing resistor (R_{OM}) and its design. Instrumentation amplifier - IC and its application. Op amp applications - Summing - Difference – Log and Antilog amplifiers - Integrator and differentiator. Comparators: zero crossing – with reference voltage - regenerative (Schmitt trigger) comparators, window detector. Peak detector circuit. Precision rectifiers. Sample and hold circuit. ADC - successive approximation, flash, integrating types. DAC – weighted, R-2R types, ADC &DAC - performance specifications.

Module III

Active Filters : Transfer functions – LPF, HPF, BPF, BRF Approximation methods –Butter worth – Chebyshev -Active Filters - I order and II order filters, Quality factor –Design- Gyrator- Negative Impendence Converter-Universal Active Filters –All Pass filters. Switched Capacitive Filters.

Multivibrators- Astable and monostable - Design,working. *Wave generators*- Triangular and saw tooth - RC phase shift and Wien bridge oscillators.

Module IV

Specialized ICs and applications: IC regulators - 723 (block diagram, typical low voltage regulator circuit), 78XX, 79XX, 317 - applications. Timers - 555 – Functional block diagram- Astable and monostable multivibrators using 555 - applications. VCO – 566. PLL - Block diagram and derivation of capture range, lock range and pull in time capture and lock range - 565 – applications.

References:

1. Coughlin & Driscoll: *Op amps and Linear Integrated circuits* - Pearson Education Asia.2000
2. Sergio Franco, *Design with operational Amplifiers & Analog ICs*, Tata McGraw Hill.1998
3. Millman & Grabel: *Microelectronics*, McGraw Hill International, 2nd edition.1988.
4. Ramakant A. Gayakwad, *Op-Amp and Linear Integrated Circuits*", Pearson Education Asia. 4th ed.
5. K R Botkar: *Integrated circuits*, Khanna Publishers, Delhi. 1991
6. Gray: *Analog Integrated Circuits*, John Wiely.
7. Horstian: *Micro Electronics*, Prentice Hall of India.
8. Sedra & Smith: *Microelectronic circuits*, Oxford University Press. 5th ed.
9. D A Bel, *Opamps and Linear integrated Circuits*, Prentice Hall of India.
10. Clayton: *Operational Amplifiers*, Butterworth & Co. (Publishers) Ltd.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1404 BIOELECTRIC PHENOMENA

Module I

Cell membrane: Structure, Excitable cells, Nernst potential, Resting membrane potential, Polarised state, Goldman Hodgkin Katz equation, Action potential – Features, ionic basis, depolarization, re-polarization and hyper polarization- Propagation of nerve impulses – length constant, time constant, passive decay, Refractory period – absolute, relative, mono-phasic and bi-phasic recordings - Hodgkin Huxley model of squid gait axon membranes, Modes of transport of substances across the cell membranes.

Module II

*Electrical activity of the heart: C*ardiac muscle, Action potentials in cardiac muscle, SA node, Origin and propagation of rhythmical excitation & contraction, refractoriness, regular and ectopic pace makers, electrocardiogram – lead systems - waveforms and their significance – ECG in diagnosis – Arrhythmias, abnormal rhythms, heart blocks, premature contractions, flutter, fibrillation, vulnerable period.

Module III

Electrical activity of brain – Sleep stages, Brain waves, waveforms & measurements, 10-20 electrode system – montage - Evoked potentials – visual, auditory and somatosensory EPs, *Magnetoencephalogram*, *Electrogastrogram*, *Electroretinogram*, *Electroocculogram.*

Module IV

Electrical activity of muscles – neuromuscular junction, synaptic potentials, motor unit, motor unit action potentials, Electromyogram, *Electroneurogram* – nerve conduction studies.

Electrodes for measurement of biopotentials– Types, Recording and stimulating electrodes, electrode-tissue interfaces – electrode-electrolyte and electrolyte-skin interfaces, Polarizable and non polarizable electrodes - Silver-silver chloride electrodes, skin contact impedance.

References:

1. Arthur C. Guyton : *Textbook of Medical Physiology*, Prism Books (Pvt) Ltd & W.B. Saunders Company.1991
2. D.J. Aidley: *The Physiology of Excitable cells*, 3rd Ed., Cambridge University Press. 1998
3. John G. Webster: *Medical Instrumentation - Application and Design*; Houghton Mifflin Co., Boston.1992
4. Richard Aston: *Principles of Biomedical Instrumentation and Measurement*, Merril Publishing Co., Columbus 1990.
5. Khandpur R S*: Handbook of Medical Instrumentation*, Tata Mc Graw Hill, New Delhi.2005
6. B. Katz : *Nerve, Muscle, and Synapse*, Mc-Graw Hill, New York. 1990.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1405 COMMUNICATION TECHNIQUES

Module I

Introduction to communication systems – Definition of communication- Information – transmitter – receiver - Analog and digital communication systems – comparison. Channel – noise – white noise – narrow band noise – noise figure - calculation – equivalent noise resistance – pre emphasis & de emphasis filtering. *Modulation*: Need for modulation - different types - amplitude modulation, frequency modulation and phase modulation.

Module II

Amplitude modulation: Frequency spectrum – representation of AM – modulation index - power relations in AM wave - AM Generation – modulated transistor amplifier (one example). Evolution and description of SSB – Balanced modulator - suppression of unwanted sideband – extension of SSB - ISB, VSB – system evaluation and comparison - AM Transmitter and receiver (Block level).

Module III

Angle modulation: Frequency modulation - mathematical representation, waveforms, frequency deviation, bandwidth requirement, phasor representation, transmission bandwidth. Generation of FM – direct & indirect methods – FM transmitters. FM receivers - block diagram – demodulators – Tuned circuit frequency discriminators, slope detector, balanced slope detector (Block level). Phase modulation - FM &PM comparison.

Pulse modulation – Need for pulse modulation – different types – Pulse Width Modulation, Pulse Position Modulation and Pulse Code Modulation – principles of operation.

Module IV

Introduction to digital communication: Emergence of data communication systems – characteristics – digital codes – error detection and correction – constant ratio codes, redundant codes, parity check codes, rate transmission, forward error correcting codes. Data sets and interconnection requirements – Modems – classification, modes of operation, modem interconnection, modem data transmission speed – modem interfacing.

References:

1. George Kennedy & Davis: *Electronic communication Systems*, Tata Mc Graw Hill, 1999.
2. Dennis Roody and John Coolen: *Electronic Communication*, Prentice Hall of India, New Delhi.
3. Taub and Schilling: *Principles of Communication Systems*, Mc Graw Hill.1987
4. Sam shanmugham: *Digital and Analog Communication Systems*, John Wiley & Sons, 1985.
5. William Schweber: *Electronic Communication Systems – A complete course*" 4th edition, Prentice hall of India, 2002.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1406 POWER ELECTRONICS

Module I

Power transistors: Structure and characteristics, Parallel operation of transistors, Switching and amplification applications, *Power MOSFET:* Structure and characteristics.

Thyristors- Classification , *SCR*: Working principle, V – I, turn on, turn off and gate characteristics, ratings, Series and parallel operation of SCRs, Trigger circuits- half- wave and full-wave operation , Thyristor protection - over current, over voltage, di/dt, dv/dt, gate protection. *TRIAC* : characteristics, modes of operation.

Module II

Single phase controlled rectifiers - half-wave, full-wave, half-controlled and fully controlled - typical waveforms with R, RL, RL with diode and RL with voltage source - voltage and current equation for half-wave controlled rectifier. Three phase half-wave and full-wave controlled rectifier with R load, waveforms. DC motor speed control - various schemes - multiquardrant operation - simple circuits for speed control of series, PM and separately excited motors.

Module III

Commutation schemes - (different classes) waveforms - single-phase invertors - series, parallel and bridge -PWM invertor - square wave and sin wave input. Chopper circuits using SCR/transistor -step up, step down, step up/down (detailed analysis not required) - Jones Chopper. Induction Motor speed control - various schemes for electronic control.

Module IV

Static switches: dc & ac (1φ and 3φ) switches, Solid state relays., Switching regulators - Basic concepts, analysis and design of Buck, Boost and Buck-Boost converters . SMPS - Configuration – Application. UPS - Configuration – Application. Batteries - charging circuit.

Industrial applications: dielectric heating and induction heating.

References:

1. Muhammed H. Rashid, *Power Electronics – Circuits, Devices and Applications*, PHI Ltd, 3rd ed.
2. Ned Mohan, Tore M. Undeland, William P. Robbins , *Power electronics converter, applications and design*, John Wiley and Sons, Inc.
3. P S Bimbhra, Power Electronics, Khanna Publishers, 3rd ed.
4. B. K. Bose, *Modern Power Electronics And AC Drives*, Pearson Education/ Prentice-Hall India Ltd, 2003
5. Biswanath Paul, *Industrial Electronics and Control*, Prentice Hall of India, New Delhi, 2002
6. Singh & Khanchandani , *Power Electronics*, Tata Mc Graw Hill, 2nd ed.
7. Asghar M syed , *Power Electronics*, Prentice Hall of India, 2003.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

CS/EB 14 L1 DIGITAL ELECTRONICS LABORATORY

1. Study of standard logic gates and universal gates.
2. Arithmetic circuits
    i. Adders & subtractors using standard logic & universal gates.
    ii. Study of 7483 & binary addition & subtraction using 1's & 2's complement.
    iii. BCD adder using 7483.
3. Code converters with mode control, Parity generator/ checkers.
4. Study of MUX, DEMUX, decoder & encoder circuits & their ICs.
5. Flip flops: RS, JK, T, D, master-slave JK flip flops using universal gates.
6. Counters
    i. Asynchronous UP, DOWN, UP/DOWN counter using JK Flip flops
    ii. Design and realization of sequence generators.
    iii. Study of IC counters 7490, 7492, 7493 and 74193.
7. Study of shift registers and design of Johnson and Ring counter using it.
8. Study of seven segment display & decoder driver (7447)
9. Astable and monostable multi-vibrators using TTL gates
10. Transfer characteristics and specifications of TTL gates

Note: 50% marks is earmarked for continuous evaluation, and 50% marks for end semester examination to be conducted by two examiners. A candidate shall secure a minimum of 50% marks in the aggregate and 50% minimum in the end semester examination for a pass.

EB 14 L2 ANALOG CIRCUITS LABORATORY-II

1. Clipping and clamping circuits
2. Frequency responses of RC low pass & high pass filters
3. RC differentiating and integrating circuits.
4. RC coupled amplifiers using BJT with and without feedback - gain, frequency response & bandwidth.
5. Oscillators - RC phase shift, Wein Bridge & Crystal oscillators
6. Multivibrators - Astable , Bistable, Monostable.
7. Swithch & sweep circuits - Simple transistor sweep, bootstrap sweep.
8. Series & parallel RLC resonant circuits
9. Study of 741 op amp and implementation of basic circuits using 741 – Inverting, non inverting, voltage follower, summing, difference amplifiers, comparators, active high pass & low pass filters, integrator & differentiator.

Note: 50% marks is earmarked for continuous evaluation, and 50% marks for end semester examination to be conducted by two examiners. A candidate shall secure a minimum of 50% marks in the aggregate and 50% minimum in the end semester examination for a pass.

SEMESTER V

CE/CS/EB/EC/EE/EI/FT/IT/ME/SE 1501 ENGINEERING MATHEMATICS-IV

Module 1

Probability distributions: random variables (discrete & continuous), Probability density, mathematical expectation, mean and variance of a probability distribution, binomial distribution, Poisson approximation to the binomial distribution, uniform distribution, normal distribution.

Curve fitting: method of least squares, correlation and regression, lines of regression.

Module II

Sampling distributions: Population and samples, the sampling distribution of the mean unknown(σ known), the sampling distribution of the mean (σ)the sampling distribution of the variance, point estimation, interval estimation, tests of hypotheses, null hypotheses and significance tests, hypothesis concerning one mean, type I and type II errors, hypotheses concerning two means. The estimation of variances: Hypotheses concerning one variance – Hypotheses concerning two variances.

Module III

Finite difference Operators: $\blacktriangledown$, Δ E, δ, μ, $x^{(n)}$

Newton's Forward and Backward differences interpolation polynomials, central differences, Stirlings central differences interpolation polynomial. Lagrange interpolation polynomial, divided differences, Newton's divided differences interpolation polynomial.

Numerical differentiation: Trapezoidal and Simpson's rules, compounded rules, errors of interpolation and integration formulae. Gauss quadrature formulae (No derivation for 2 point and 3 point formulae)

Module IV

Numerical solutions of ordinary differential equations: Taylor series method, Euler's method, modified Euler's method, Runge-Kutta formulae 4^{th} order formula,

Numerical solution of boundary value problems: Methods of finite differences, finite difference methods for solving Laplace's equation in a rectangular region, finite differences methods for solving the wave equation and heat equation.

References:

1. Irvrin Miller & Freiend, Probability And Statistics For Engineers, Prentice Hall of India.
2. S.S.Sastry, Numerical Methods, PHI Publishers.
3. P.Kandaswamy.K.Thilagavathy, K.Gunavathy, Numerical Methods, S.Chand & Co.
4. Papoulis, Probability, Random Variables and Stochastic Processes, Mc-Graw Hill.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1502 BIOSENSORS AND TRANSDUCERS

Module I

Transducers and sensors: Transducers- sensors- active and passive. Study of biological sensors in human body and their basic mechanism of action - organization of nervous system- neuronal mechanism and circuit processing - Study of various corpuscles like Pacinian - Chemoreceptors, hot and cold receptors, barro receptors, sensors for smell, sound, vision, osmolality and taste.

Module II

Chemical Transducers: Transducers for the measurement of ions and dissolved gases. Reference electrodes - Hydrogen electrodes - silver-silver chloride electrodes- Calomel electrodes. Measurement of pH- Glass pH electrodes. Measurement of pO2, Measurement of pCO2 - catheter tip electrodes for the measurement of pO2 and pCO2. Blood gas analysers and autoanalysers.

Module III

Bio sensors - Ion exchange membrane electrodes- oxygen electrodes- CO2 electrodes enzyme electrode - construction - ISFET for glucose, urea etc. Electrolytic sensors - optical sensor - fiber optic sensors.

Module IV

Transducers: Temperature transducers - thermoresistive transducers, thermoelectric, p-n junction, chemical thermometry. Displacement transducers - potentiometric - resistive strain gauges - inductive displacement - capacitive displacement transducer. Pressure transducer - indirect method - measurement of blood pressure using sphygmomanometer -instrument based on Korotkof sound , strain gauge and LVDT transducers, capacitive and piezo electric type, catheter tip transducers - measurement of intracranial pressure -catheter tip - implantable type. Transducers for velocity and torque measurements

References:

1. Geddes & Becker: *Principles of Applied Biomedical Instrumentation*, John Wiley, 1989.
2. R S C Cobbold, *Transducers for Biomedcial Instruments*, John Wiley & Sons, 1974.
3. Brown & Gann: *Engineering Principles in Physiology Vol. I* Academic Press,1973
4. A V S De Reuck:, *Touch Heat & Pain*, J & A Churchill Ltd. London,1967.
5. Iberall & Guyton , *Regulation & Control in Physiological System*, Instruments Society USA
6. Harry Thomas , *Handbook of Bio medical Instrumentation* , Reston, Virginia 2000
7. R S Khandpur, *Handbook of Bio medical Instrumentation*, Tata McGraw Hill,2004
8. D L Wise , *Applied Bio Sensors*, Butterworth Publishers, London 1989
9. Keith Brindley, *Sensors & Transducers*, Heinemann Newnes, Great Britain, 1988.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1503 HOSPITAL ENGINEERING

Module I

Definition of Bio-Engineering, Biomedical Engineering, Clinical engineering & Hospital engineering - functions, responsibilities and training requirements of hospital engineers and clinical engineers. Modern Hospital Architecture – Space distribution in a hospital building. Equipment management system - preparation of estimates, specifications , inviting tenders. Ordering, testing, acceptance & maintenance protocols for medical equipments. Computerized preventive maintenance planning. Importance of ISO Certification.

Module II

Electrical power systems in hospitals - Design of sub stations, wiring in hospitals, protective systems – over voltage and over current protectors, circuit breakers , Surge protectors, EMI filters, Stabilised and uninterrupted power supply systems - Basics of air conditioning and refrigeration systems- De-odourisation and disinfections and dehumidification

Module III

Sterilization systems in hospitals: Principles and techniques of sterilization - Steam & EO sterilization, Autoclaves, Incinerators. Design of operation theatres – theatre lighting, OT tables, power supply systems - Cryogenic systems for hospitals.

Module IV

Hospital gas supply systems - Centralized supply of air, nitrous oxide, vacuum & oxygen – principle of production of liquid oxygen. Working of dry, oil free air compressor - small and big vacuum engines. Stretchers & wheel chairs.

References:

1. C A Caceres ,*Clinical Engineering*, Acadmic Press, New York,1977
2. C S Ward ,*Aneasthetic Equipments*, W. B. Saunders, London, 1985.
3. Kutz Myer, *Standard Handbook of Biomedical Engineering, & Design*, McGraw Hill,2002.
4. B. N. Feinberg, *CRC Handbook of Clinical Engineering*, CRC Press, 1980.
5. Richard L. Miller,Earl S. Swensson "Hospital and Healthcare Facility Design" W. W. Norton & Company; 2nd edition 2002
6. John Douglas McDonald "Electric Power Substations Engineering"– 2003 CRC Press
7. Alexander Kusko, *Emergency and Standby Power Systems* 1989 - McGraw-Hill
8. Anantha Narayanan , *Basic Refrigeration and Air Conditioning* , 2nd edition, TMH 1996.

For EB 1503 Hospital Engineering course, the assignment shall be an in-plant training (at least one week) in a hospital where the students get familiarized with the administration, functioning & management of the hospital with respect to the topics mentioned in the syllabus. The students shall fix up the hospital for training and prepare a document based on this training and present the details of the training attended during the course.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1504 BIOSIGNAL PROCESSING-I

Module I

Introduction to biomedical signals –nature- examples ECG, EMG, EEG, PCG, VAG, carotid pulse, speech signal, concurrent signals .Sampling theorem - Discrete time signals and systems - Properties of discrete systems - LTI system convolution correlation - difference equation representation of discrete systems - The Z transform - properties of Z transform - the inverse Z transform - Transfer function.

Module II

Frequency Domain Analysis of discrete time signals: Fourier Transform, Frequency response Function, Discrete Fourier series - Discrete Fourier Transform-properties- block convolution - Fast fourier Transform- FFT algorithms decimation in - time - decimation in - frequency - FFT algorithms for a composite number- Spectrum analysis of biosignals.- classical methods.

Module III

FIR Digital Filters Realizations - direct - cascade - lattice forms - FIR filter design using Fourier series - use of window functions like rectangular, raised Cosine, Kaiser, Triangular - frequency sampling design - Notch filter -Software implementation of filters.

Module IV

IIR Digital Filters Realizations - Direct - Cascade - Parallel forms - - Analog filter approximations - Butterworth and chebychev approximations - Frequency transformation techniques - The method of mapping of impulse transformation - transformation -Matched transform technique software implementation of digital filters. Finite word length effects in FIR & IIR filters

References:

1. Rangaraj M Rangayyan: *Biomedical Signal Analysis*, John Wiley, 2002.
2. John G Proakis & Dimitris G Manolakis: *Digital Signal Processing – Principles, Algorithms and Applications*, Prentice Hall of India, 2005.
3. Andreas Antonion: *Digital Filters Analysis & Design*, Prentice Hall of India, 2002.
4. P. Ramesh Babu: *Digital Signal Processing*, Scitech Publications,India 2004.
5. R Rabiner & B. Gold: *Theory & Application of Digital Signal processing*, Prentice Hall of India, 2000.
6. Alan V. Oppenheim & Ronald W Schafer: *Digital Signal Processing*, Prentice Hall of India, 2004.
7. Andreas Antoniou: *Digital Signal Processing*, Prentice Hall of India. 2nd ed.
8. John L.Semmlow: *Biosignal and Biomedical Image Processing – Matlab Based Applications*" Marcel Dekker Inc., New York.2004
9. Steven W. Smith, *Digital Signal Processsing – A Practical Guide for Engineers and Scientists*, Elsevier India Pvt Ltd., 2006
10. Avtar Singh & Srinivas, *Digital Signal Processing*, Thomson Learning, 2004
11. Sanjit K.Mithra ,*Digital Signal Processing*, Tata Mc Graw Hill, 3rd ed.
12. Charles S.Williams, *Designing digital filters*, Prentice-Hall India Ltd, 1986
13. Vinay K. Ingle, John G. Proakis, *Digital Signal Processing using MATLAB*, Thomson Learning, 2007.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1505 BIOINSTRUMENTATION-I

Module I

General measurement system: Static characteristics - accuracy, precision, linearity, hysteresis, threshold, dynamic range, calibration, standards. Errors – measurement of errors, error reduction. Dynamic characteristics -Transfer function - first and second order instruments - first and second order response, dynamic errors and dynamic compensation - Loading effect. **Basic principles of test and measuring instruments:** Multimeters - analog and digital, CROs- analog and digital storage oscilloscope. **Basic medical Instrumentation system**: Block diagram – design and performance requirements – constraints in design – types of biomedical equipments – analytical, diagnostic, therapeutic, surgical – manual, microprocessor and PC based equipments – regulation of medical devices and testing of biomedical equipments.

Module II

Medical Recording and display systems: General considerations, sources of noise, elimination methods, signal conditioning & preamplification – instrumentation amplifiers – patient isolation –and signal processing – main amplifier and driver stage , writing systems – direct writing recorders – inkjet recorders – potentiometric recorders – digital recorders – thermal array recorders – video printers – electrostatic recorders – instrumentation tape recorders, strip chart and x-y recorders. Medical display systems- – single and multicahnnel displays- nonfade displays.

Module III

Analytical equipments used in clinical environment: Beer-Lambert's Law - UV, visible and infra-red spectrophotometers- monochromators, detection systems and amplifiers - basic applications in biochemical analysis. Flame photometers, colorimeters, pH meter, Hb meter - principles and applications.

ModuleIV

Analytical aids: Electrophoresis – principles and applications, Densitometers – principle and applications, Chromatography - gas and liquid chromatographs - principle and applications, Flow cytometry. Fundamentals of NMR spectroscopy, X-ray spectrometers, Mass spectrometers, Raman & Moss Beer spectroscopy. Principles of simple, compound and phase contrast microscopes - scanning and transmission electron microscopy.

References:

1. Khandpur R S, *Handbook of Analytical Instruments*, Tata McGraw Hill,1989.
2. D. Patranabis, *Principles of Industrial Instrumentation*, Tata McGraw Hill.1999.
3. W.D. Cooper , Alber D Helfrick, *Modern Electronic Instrumentation and Measurement Techniques* PHI,1989.
4. Hobart H. Willard, Lynne H Merritt, *Instrumental Methods of Analysis*, Wadsworth Publishing Co., 1998.
5. Larry Jones, A. Foster Chin, *Electronic Instruments & measurements*, John Wiley & sons, 1983.
6. Joseph J Carr, *Elements of Electronic Instrumentation and measurement*, Pearson Edn.3rd edn.
7. John G. Webster: *Medical Instrumentation - Application and Design*; Houghton Mifflin Co., Boston.1992.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

CS/EB 1506 MICROPROCESSOR BASED SYSTEM DESIGN

Module 1

Architecture of 16 bit microprocessors: Architecture and Functional Block Diagram of Microprocessor 8086 — Instruction Sets and Programming - Assembly Language programming – Interrupts: 8086 Interrupts and Interrupts Responses. *Modular programming*-Assembler instruction format, assembler directives and operators, assembly process, linking and relocation, debugging, stacks, procedures, macros

Module 2

8086 hardware design: minimum mode and maximum mode configurations, Bus structure, bus buffering, latching, system bus timing with diagram. Peripherals and their interfacing: Dynamic RAM interfacing, interfacing I/O ports, interfacing with Programmable Interrupt Controller 8259, Programmable DMA interface 8237, DMA transfer and operations. *Multimicroprocessor Systems*:Interconnection topologies-interconnection of 8087 with the CPU- architecture of 8087 - Design of a PC based multimicroprocessor system

Module 3

Architecture of 32 bit Microprocessors: Intel 80386 Architecture, Block Diagram, Addressing modes, Data Types 80386, Real address mode of 80386 Protected mode of 80386, Segmentation, Paging and Virtual modes. *Advanced microprocessor Architectures* – Advanced features, Architecture, register organization & Flag register of Pentium Processor - An Overview of Pentium Pro, Pentium III and Pentium IV processor. *RISC Architecture* : RISC & CISC Convergence – Advantages - Basic features of RISC Processors

Module 4

Introduction to micro controllers - comparison with microprocessors, study of micro controller (MCS 51 family- 8051) - Architecture, instruction set, addressing modes and programming. Interfacing to ADC and DAC using microcontrollers

References:

1. Ajoy Kumar Ray, Kishor M. Bhurchandi, Advanced Microprocessors and Peripherals, TMH, ISBN : 0 – 07 – 060658 – 7, New Delhi, 2000.
2. Nilesh B.Bahadure, MICROPROCESSORS, The 8086/8088, 80186/80286, 80386/80486 and the Pentium Family, ISBN : 978 – 81 – 203 – 3942 – 2, PHI Learning.
3. Muhammad Ali Mazidi, Janice Gillispie Mazidi, "The 8051 Microcontrollers & Embedded Systems", ISBN : 81 – 7808 – 574 – 7, 5e-Pearson Education.
4. Douglas V Hall, "MICROPROCESSORS & INTERFACING – Programming and Hardware" 2 edition, ISBN : 0 - 07 – 463639 – 1, Tata Mc GrawHill.
5. Kenneth Ayala", The 8051 Microcontroller", West Publishing Company.
6. Avtar Singh , " The 8088 and 8086 Microprocessors_programming, Interfacing, Software, Hardware and Applications" PHI.
7. Barry B. Brey, "The INTEL Microprocessors - 8086/8088, 80186/80188, 80286, 80386, 80486 Pentium and Pentium pro processor, Pentium II, Pentium III and Pentium IV – Architecture, Programming and interfacing", PHI, 6 Ed, 2003.
8. YU-Cheng Liu & Glenn A Gibson," Microprocessor System , Architecture Programming & Design".
9. Kenneth Hintz & Daniel Tabak "Microcontroller architecture implementation and programming", Mc Graw Hill.
10. Intel Users manual for 8086, 80386 & 80486, Pentium & Pentium pro
11. "Microprocessor Systems", Learning Material Series, ISTE, NewDelhi, 1997.
12. John B. Peatman, "Design with microcontrollers" McGraw Hill, Singapore.
13. Kenneth Ayala The 8086 Microprocessor: programming and interfacing the PC Thomson Learning.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 15 L1 MICROPROCESSOR LABORATORY

PART I – Programming of 8085 microprocessor (6 Lab sessions)

1. Study of a typical microprocessor trainer kit and its operation.

2. Simple Programming examples using 8085 instruction set to understand the use of various instructions and addressing modes – at least 20 examples including code converters, counters (Up & Down Counters), real time clock.

PART II – Interfacing of peripheral devices to 8085 (5 Lab sessions)

1. Interfacing and programming of 8255.

2. Interfacing and programming of 8279.

3. Interfacing and programming of 8253.

4. A/D and D/A converter interface.

5. Stepper motor interface

PART III – 8086 programming (4 Lab sessions)

1. Introduction to DEBUG program commands

2. Typical examples of assembly language programming using 8086

3. Interfacing of peripheral devices to 8086

Note: 50% marks is earmarked for continuous evaluation, and 50% marks for end semester examination to be conducted by two examiners. A candidate shall secure a minimum of 50% marks in the aggregate and 50% minimum in the end semester examination for a pass.

EB 15 L2 MEDICAL ELECTRONICS LABORATORY-I

1. Bioamplifier, Phase detector, Notch filter
2. Study of IC 555 and its applications
3. Study of IC 4051 and its applications
4. Design of pacemaker circuits & Characterization
    i. Fixed type
    ii. Demand type
5. Digital to analog converter
6. Thermistor characteristics
7. Skin contact impedance
8. Study of LDR & its characteristics
9. ECG filters
10. Study of medical equipments
    i. ECG
    ii. Sphygmomanometer
    iii. Analytical equipments such as colorimeter, pH meter, HB meter

Note: 50% marks is earmarked for continuous evaluation, and 50% marks for end semester examination to be conducted by two examiners. A candidate shall secure a minimum of 50% marks in the aggregate and 50% minimum in the end semester examination for a pass.

SEMESTER VI

EB 1601 MEDICAL IMAGING TECHNIQUES

Module I

Ultra Sound In Medicine - principles of image formation, capture and display - principles of A-mode, B-mode and M-mode displays - Doppler Ultrasound and Colour flow mapping - Applications of diagnostic ultra sound. Introduction to 3D and 4D ultrasound and its applications.

Module II

X-Ray computed tomography - Principles of sectional imaging - scanner configuration - data acquisition system - image formation principles - conversion of x-ray data into scan image - Image reconstruction from projections CT reconstruction Radon transform-inverse radon transform back projection operator-convolution back projection- parallel beam geometry-Fan beam geometry. 2D image reconstruction techniques - Iteration and Fourier methods. Types of CT scanners – spiral CT, multi slice CT.

Module III

Magnetic Resonance Imaging - principles of image formation, pulse sequence- image acquisition and reconstruction techniques -MRI Fourier reconstruction. MRI instrumentation – magnets – gradient system – RF coils- receiver system – Functional MRI - Application of MRI.

Module IV

Radio isotope imaging - Rectilinear scanners, Linear scanners - SPECT - PET –Gamma Camera – Radio nuclides for imaging, Emission Computed Tomography. Infrared Imaging - Physics of thermography Imaging systems - Pyroelectric vidicon camera – clinical themography.

References:

1. S Webb, *The Physics of Medical Imaging*, IOP Publishing Ltd., 1988.
2. Peter Fish, *The Physics of Diagnostic Ultrasound*, John Wiley & sons, England, 1990.
3. A C Kak, *Principle of Computed Tomography* ,IEEE Press New York
4. Douglas A Christensen: *Ultrasonic Bioinstrumentation*, John Wiley, New York, 1988.
5. M N Rehani: *Physics of Medical Imaging*, Macmillian India Ltd., 1991.
6. D L Hykes, W R Hedrick & D E Starchman: *Ultrasound Physics & Instrumentation*, Churchill Livingstone, Melbourne, 1985.
7. Atam Dhavan, *Medical Image Analysi* ,Wiley IEEE Press, 2003.
8. HH Schild *MRI made easy* 2003 - Schering AG.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1602 BIOSIGNAL PROCESSING-II

Module I

Spectral analysis, Estimation of power density spectrum, Periodogram - Parametric model based spectral Linear prediction theory, estimation Auto regressive (AR), Moving average (MA) Autoregressive moving average (ARMA) models. Estimation of parameters- spectral error measure EEG analysis.

Module II

Optimal and adaptive filters: Weiner filters, Adaptive signal processing Steepest descent algorithm LMS adaptive algorithm, Adaptive noise canceller – cancellation of 50 Hz signal in ECG- cancellation of maternal ECG in fetal electrocardiography.

ECG data reduction Techniques: Direct ECG data compression- transformation compression – comparison.

Module III

Wavelets Introduction- Continuous wavelet transform, wavelet time-frequency characteristics, Discrete wavelet transform and orthogonal wavelet decomposition, orthonormal wavelets, filter banks-Applications- wavelet de-noising, discontinuity detection, feature detection : wavelet packets ,wavelet compression.

Module IV

Introduction to DSP processors: characteristic features of DSP processors ,special features for arithmetic ,I/O interfaces, memory architectures ,data formats, some basic DSP chip designs ,brief overview of some major DSP processors .The Architecture of TMS320C54xx Digital Signal Processors. Addressing Modes of the TMS320C54xx Processors. Memory Spaces of TMS320C54xx Processors. Program Control. TMS320C54xx Instructions and Programming. On-Chip Peripherals. Interrupts. Pipeline Operation of the TMS320C54xx Processors.

References:

1. D C Reddy: *Biomedical signal Processing*, Tata McGraw-Hill, New Delhi, 2005
2. John L.Semmlow: *Biosignal and Biomedical Image Processing – Matlab Based Applications*, Marcel Dekker Inc. New York, 2004.
3. Raghuveer M Rao et al: *Wavelet Transforms- Introduction To Theory And Applications,* Pearson Education Asia, 2003.
4. Rangaraj M Rangayyan: *Biomedical Signal Analysis*, John Wiley, 2002
5. Avtar Singh, S. Srinivasan *Digital Signal Processing Implementations : Using DSP Microprocessors (with examples from TMS320C54XX), Thomson-Engineering 1st Ed.2004*
6. Kuo,SenM.Gan, Woon-Seng S. *Digital Signal Processors: Architectures, Implementations, and Applications, Prentice Hall - PEARSON 1st Ed.2005*

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1603 BIOINSTRUMENTATION-II

Module I

ECG machine – Block diagram - Detection, amplification and recording of ECG, artifacts in ECG recording, types of ECG machines – Vectorcardiograph – Phonocardiograph – Patient monitoring systems – central station and bedside monitoring – cardioscope .Cardiotocograph – methods of monitoring fetal heart rate – arrhythmia monitors – arrhythmia detection methods , Holter monitoring and recording – data recording, replay and analysis , cardiac stress testing – bicycle and treadmill tests – protocols

Module II

Electroencephalograph – block diagram – amplifiers, filters – sensitivity control – applications of EEG. Evoked potential measurement system – types and stimulations – Recording - Amplifiers - Analysis and storage of VEP, AEP and Somatosensory EP – applications. Brain mappers - Magneto Encephalogram – principle of measurement and applications. Principles of electromyography – detection, signal processing, amplification and recording – applications, Myoelectric control system- use of myo electric signal for control

Module III

Impedance Techniques : Bipolar and tetrapolar circuits , detection of physiological activities using impedance techniques - cardiac output, respiratory activity, Impedance Plethysmography- resistance and capacitance type.. Pulmonary function measurements and analysers– respiratory volumes, capacities, compliance and related pressures , dynamic respiratory parameters – Spirometry – basic system – types and applications. Cardiac output measurement- different techniques

Module IV

Oximeters – types – Pulse oximeter- Audiometers – pure tone and speech audiometers. Blood cell counters- methods- Coulter Counters- automatic recognition and differential counting. Blood flowmeters - electromagnetic – types – ultrasonic – types – NMR and Laser Doppler blood flowmeters.

References:

1. Geddes & Baker , *Principles of Applied Biomedical Instrumentation*, Wiley
2. Khandpur R S, *Handbook of Bio-Medical Instrumentation*, Tata McGraw Hill, 2nd edn 2003
3. Richard Aston, *Principles of Biomedical Instrumentation and Measurements*, Merril Publishing Co., 1990.
4. Myer Kutz, *Standard Handbook of Bimedical Engineering and Design*, McGraw Hill, 1993.
5. Joseph D. Bronzino, *The Biomedical Engineering Handbook*, CRC Press, 1995.
6. John G. Webster, *Encyclopedia of Medical Devices and Instrumentation*, 2nd edn, Wiley Interscience, 2006
7. A M Halliday, *Evoked Potential in Clinical Testing* (2nd ed), Churchill Livingstone, London 1993.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1604 PRINCIPLES OF OBJECT ORIENTED PROGRAMMING

Module I

Introduction to Object Oriented Programming - Overview of Java - Data types, Variables and Arrays - Operators – Control Statements – Introducing Classes - Methods and Classes - Overloading - Understanding static, final – Nested and Inner Classes - String class - Command Line Arguments - Inheritance – I/O Basics - Packages and Interfaces - Exception Handling.

Module II

Multithreaded Programming, Java Thread Model, Creating Multiple Threads, Thread Priorities Synchronization, Event Handling Event classes, Event Listener Interfaces, Adapter Classes, Inner Classes.

Module III

AWT /SWING - Window Fundamentals, Working with Frames and Windows, Graphics, colors, and Fonts, Layout managers, Menus and Control.

Module IV

Internet Programming: HTML, Introduction to XML, DTD, XML Schema, XML Parsers, Introduction to JavaScript, Applet, Servlet, JDBC, Web Servers, Application Servers , Introduction to JSP.

References:

1. Herbert Schildt, "The Complete Reference Java 2", Fifth Edition, Tata McGraw Hill Edition, 2002.
2. Harvey M. Deitel, Paul J. Deitel, "Java: How to Program", 7th Edition, Deitel & Associates Inc., 2006.
3. Computing concepts with java 2 essentials by CAY HORSTMANN 2 Edn WILEY INDIA ISBN 81-265-0931-9.
4. Programming with JAVA Primer, E Balagurusamy 3rd Edition, Tata McGRAW –Hill, ISBN 0-07-061713-9.
5. Big java by CAY HORSTMANN, 2 Edition, WILEY INDIA ISBN 81-265-0879-5.
6. Chris Bates, Web Programming Building Internet Applications ,2 Ed. Wiley , Dreamtech.
7. Burdman, Collaborative Web Development, Addison Wesley.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

CS/EB 1605 MODERN CONTROL SYSTEMS

Module I

Basic idea of control systems and their classification - differential equations of systems - linear approximation - Laplace transform and transfer function of linear system - Model of physical system (Electrical, mechanical and electromechanical)- block diagram - signal flow graph - Mason's gain formula.

Module II

Time domain analysis - Representation of deterministic signals - First order system response - S-plane root location and transient response - impulse and step response of second order systems - performance - characteristics in the time domain - effects of derivative and integral control - steady state response - error constant - generalised definition of error coefficients - concepts of stability - Routh - Hurwitz criterion.

Module III

Frequency domain analysis - frequency response, frequency domain performance characteristics. Stability in frequency domain - Bode plot, Polar plot, closed loop frequency response - Nyquist Plot. Root locus method - basic theory and properties of root loci - procedure for the construction of root loci - Design and compensation of feed back control system – lead,lag and lag-lead compensation - simple design in S-plane.

Module IV

Basic elements of a discrete time control system - sampling - sample and hold - Examples of sampled data systems – pulse transfer function - Review of Z-transforms - system function - mapping between s plane and z plane - analysis of discrete time systems –- examples - stability - Jury's criterion. Introduction to the state variable concept - state space models - solution of state equations - homogenous case - properties of state transition matrix - state space representation of discrete time systems.

References:

1. Ogata K, *Modern Control Engineering*, 4th Ed., Prentice-Hall India Ltd /Pearson Education
2. Ogata, *Discrete Time Control Systems*, 2nd edn., Pearson Education/ Prentice-Hall India Ltd
3. Nagarath & Gopal, *Control System Engineering*, Wiley Eastern, 2nd ed.
4. Dorf , *Modern Control system*, Pearson Education, 8th ed.
5. Franklin, *Feed back Control Systems*, Pearson Education
6. Kuo B. C, *Automatic Control System*, Prentice-Hall India Ltd, 8th ed.
7. Nagoor Kani, *Control Systems*, RB Publishers,1998
8. Ogata, *Discrete Time Control Systems*, 2nd edn., Pearson Education/ Prentice-Hall India Ltd
9. Ramkalyan, *Control Engineering*, Vikas Publications, 2007
10. M N Bandyopadhyaya, *Control Engineering- Theory& Practice* , Prentice-Hall India Ltd, 2003.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1606 E1 ARTIFCIAL NEURAL NETWORKS

Module I

Introduction to neural networks. Artificial neural networks. Biological neural networks- Comparison , Basic building blocks of ANN. Activation functions. McCulloch-Pitts Neuron Model, Hebb net. Learning Rules-Hebbian Learning Rules, Perceptron, Delta, Competitive, Boltzmann. Perceptron networks- single layer, multilayer –algorithm.

Module II

Feedback Networks, Discrete Hopfield nets, Continuous Hopfield nets. Feed Forward Networks: Back Propagation Networks, Learning Rule, Architecture, training algorithm. Counter Propagation Network: Full CPN, Forward only CPN, architecture, training phases.

Module III

Adaptive Resonance Theory, architecture, learning in ART, Self Organizing feature maps: Kohonen SOM, Learning Vector Quantization, Max net, Mexican Hat, Hamming net. Associative memory networks Algorithms for pattern association Hetero associative networks, Auto associative memory networks Bidirectional associative memory networks Energy Function.

Module IV

Special networks: Probabilistic neural networks, Cognitron, Simulated Annealing, Boltzmann machine, Cauchy machine, Support Vector Machine Classifiers. Application of Neural networks In Image Processing and classification. Convolutional neural networks, Deep neural networks. Introduction to Fuzzy systems, Neuro fuzzy sytems.

References:

1. Dr. S N Sivanandam: *"Introduction to neural networks using "MATLAB 6.0"*, TataMcGrawHill New Delhi.,2012 ISBN 978-0-07-059112-7
2. Laurene Fausett: *"Fundamentals of neural networks"*, Prentice Hall, New Jersey, 2007. ISBN 81-317-0053-4.
3. James A. Freeman, David M. Skapure: Neural Networks Algorithms, Applications and Programming Techniques, Addison-Wesley, 2003 ISBN 81-7808-108-3.
4. Kevin Gruney: "An Introduction to neural networks", CRC Press,1997.
5. D. L.Hudson & M. E. Cohen: "*Neural Networks and Artificial Intelligence in Biomedical Engg."*, Prentice Hall Of India, New Delhi.,1999
6. James A. Anderson, "*An Introduction to Neural Networks", Prentice Hall of India,1995.*
7. Simon Haykin: "*Neural Networks"*, Pearson Education1 998.
8. Yegnanarayana: *Artificial Neural Networks*, Prentice Hall of India2004.
9. Jack M. Zureda, *Introduction to Artificial Neural Systems* West Publishing Company, *1992*

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1606 E2 COMPUTER COMMUNICATIONS

Module I

Introduction to computer networks – Types of Networks - Layered architecture- OSI reference model, TCP/IP reference model –Internet Protocol Stack – Network Entities in Layers- Connection oriented and Connection less services. Transmission media - description and characteristics - base band and broad band transmission - synchronous and asynchronous transmission - full duplex and half-duplex links. MODEMS serial communication standards - X-21 digital interface.X.25 Networks.

Module II

Need for data link layer - Error detection and correction Techniques- Elementary data link layer protocols-sliding window protocols - Multiple Access protocols -Random Access protocols: ALOHA-CSMA and CSMA/CD. Terminal handling - polling, multiplexing and concentration. Local area Network: LAN addresses- Address Resolution Protocol-Reverse Address Resolution Protocol. Ethernet: Ethernet Technologies-IEEE standards- Hubs-Bridges and Switches.

Module III

Network Layer: Virtual circuits and data grams -Datagram and Virtual circuit service- Routing - different types of congestion control – IP protocol – Subnets – Multicasting - Network layer in ATM.

Transport layer – Transport layer services - design issues – Elements of transport Layer – Internet Transport Protocols (TCP and UDP).

Module IV

Session layer - design issue - data exchange – dialogue management - synchronisation - remote procedure call - client server model. Application layer - network security and privacy - cryptography – Domain Name System (DNS)- SMTP – SNMP - virtual terminal and file transfer protocols - electronic mail - WWW and HTTP.

References:

1. Andrew S Tannenbaum, *Computer Networks*, Prentice hall of India Pvt. Ltd, 2003.
2. Uyless Balack, *Computer Networks, Protocols Standards & Interfaces*, Prentice hall of India Pvt. Ltd, 2000.
3. Zheng, S Akhtar, *Networks for computer scientists and Engineers*, Oxford Press, 2004
4. S. Keshav, *An Engineering Approach to Computer Networkin*g, Pearson education, 2002
5. Uyless Black, *Computer Networks - Protocols, Standards and Interface*s, PHI Ltd., 1994
6. Stalling , *Local and Metropolitan Area Networks* Prentice Hall; 6th edition (April 15, 2000)
7. Jean Walrand *Communication networks,* Richard D Irwin (May 1991) *2nd Edition.*

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1606 E3 DIGITAL SYSTEM DESIGN

Module I

Standard Combinational Modules: Binary Decoders – decoder networks, Binary Encoders, Priority Encoders, Multiplexers – multiplexer trees, Demultiplexers, Shifters – barrel shifter, Programmable Modules- PLA, PAL, ROM, Network of ROMs. Implementation of combinational systems with decoder, multiplexers, ROMs and PLAs.

Module II

Synchronous sequential systems- state description of finite state system – Mealy and Moore Machines, representation of the state transition and output functions, time behavior of finite sate machines, finite memory sequential systems, equivalent sequential systems and minimization of the number of states, Binary specification of sequential systems, Different types of sequential systems- modulo-p counter – pattern recognizer – block pattern recognizer – sequential decoders.

Module III

Sequential Networks: Canonical form of Sequential Networks, Timing characteristics of sequential networks – setup time – hold time – propagation delay – maximum clock frequency, analysis of canonical sequential networks, Design of canonical sequential networks, Flipflop modules, Analysis of network with flipflops, Design of networks with flipflops

Module IV

Standard Sequential Modules: Registers, Shift registers, Counters, Multimodule implementation of sequential systems – array of registers – Networks of shift registers - cascade counters – parallel counters, Design of sequential systems with standard sequential modules. Multimodule systems.

References:

1. Milos Ercegovac, Tomas Lang, Jaime H. Moreno, *Introduction to Digital Systems*, John Wiley & Sons, Inc.
2. John F Wakerly, *Digital Design Principles & Practices*, Pearson Education.
3. John M.Yarbough, *Digital Logic Applications and Design*, Thomson Learning.
4. Charles Roth, *Fundamentals of logic design*, Thomson Publishers, 5th Edition.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1606 E4 BIOMEMS AND NANOTECHNOLOGY

Module I

Introduction to Microsystems,MEMS and BioMEMS-Evolution of Microfabrication-Introduction to Nanotechnology-Comparison of these systems. *Silicon microfabrication techniques*-photolithography(high resolution),Ion Implantation, oxidation, diffusion, sputtering, epitaxial growth, etching- Design of flow processes in bulk manufacturing-surface micro machining- the LIGA process –EFAB fabrication- Micro system packaging.

Module II

*MEMS materials:*Polymer materials -common Bio MEMS polymers- micro fluids-micro arrays Polymerase Chain Reaction (PCR)-elements of PCR-specification of PCR. Microsystem approach to PCR-Batch system-PCR flow system;Lab-on-a-chip and micrototal analytical system. Nanostructure synthesis-functional polymersand Dendrimers-Microelectronic Array Devices DNA Diagnostics and nanofabrication applications- Nanotechnology Manufacturing.

Module III:

MEMS Devices:Pressure sensors, accelerometers, micromotors, micropumps, microvalves, thermal sensors and actuators, prosthetics made of MEMS.

Module IV

Nanosensors and nanodevices for clinical diagnostics – nanostructures for drug delivery, nano arrays, use of nano analytical devices and systems – potential use of DNA and other biomolecules for computing and ultra high density data storage.Application of Nanotechnology to Medical Therapy.

References:

1. Ferrari , Mauro *BioMEMS and Biomedical Nanotechnology* Springer 2006
2. Steven S. Saliterman,*Fundamentals of BioMEMS and Medical Microdevices*,SPIE PressMonograph,2006
3. Tai-Ran Hsu *MEMS&Microsystems*,TMH ,New Delhi
4. S.Senturia, *Microsystem Design* ,Kluwer Academic Press,2000
5. G.Kovacs, *Micromachined Transducers Source book*, McGraw Hill,NY,1998
6. S.A.Camphell, *The Science and Engineering of Microelectronic Fabrication*,*Oxford University Press*,1996
7. Mark A Ratner, Daniel Ratner *Nanotechnology: A Gentle Introduction to the Next Big Idea* PHI
8. Sergery E. Lyshevski, *MEMS and NEMS: Systems, Devices and Strucures*, CRC Press,2002.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 16 L1 MEDICAL ELECTRONICS LABORATORY-II

1. First order and second order high pass and low pass filters.
2. Precision rectifiers (Half wave and Full wave).
3. UJT relaxation oscillator
4. Band pass filter
5. High voltage and low voltage regulators
6. DC power control using SCR.
7. ECG simulator.
8. Basic principle of biotelemetry using IC 4046.(Transmitting ECG signals)
9. Patient isolation circuits
10. Study of PLL IC 565.
11. Sample and hold circuit
12. Study of AD 590
13. Voltage to frequency converter
14. Systolic and diastolic pressure measurement.
15. Front end of ECG machine
16. Front end of plethysmograph
17. Study of medical equipments
    i. Fetal monitor
    ii. EEG
    iii. EMG
    iv. Spirometer
    v. Plethysmograph
    vi. Defibrillator

Note: 50 % marks is earmarked for continuous evaluation, and 50% marks for end semester examination to be conducted by two examiners. A candidate shall secure a minimum of 50% marks in the aggregate and 50 % minimum in the end semester examination for a pass.

EB 16 L2 MINI PROJECT

Each batch comprising of 3 to5 students shall design, develop and realize an engineering product which is having application in Biomedical field. Basic elements of product design must be considered. Fully software/simulation projects are not allowed. Each student shall submit a project report at the end of the semester. The project report should contain the design and engineering documentation including the bill of Materials and test results. Product has to be demonstrated for its full design specifications. Innovative design concepts, reliability considerations and aesthetics / ergonomic aspects taken care of in the project shall be given due weightage.

Guidelines for evaluation:

i) Attendance and Regularity	10
ii) Work knowledge and Involvement	30
iii) End-Semester presentation & Oral examination	20
iv) Level of completion and demonstration of functionality/specifications	25
v) Project Report	15
Total	**100 marks**

***Note**: External projects and R&D projects need not be encouraged at this level. Points (i) & (ii) to be evaluated by the project guide & co-ordinator and the rest by the final evaluation team comprising of 3 teachers including the project guide.*

SEMESTER VII

CS/EB/EC/EE/EI/IT 1701 INDUSTRIAL ORGANIZATION AND MANAGEMENT

Module I

Organisation: Introduction, definition of organization, system approach applied to organization, necessity of organization, elements of organization, process of organization, principles of organization, formal and informal organization, organization structure, types of organization structure.

Forms of business organization: Concept of ownership organization, types of ownership. Individual ownership, partnership, joint stock Company, private and public limited company, co-operative organizations, state ownership, public corporation.

Module II

Basic concept of management: Introduction, definitions of management, characteristics of management, levels of management, management skills

Management theory: Scientific management, contribution of Gilbreth. Gantt, Neo-classical theory, modern management theories

Functions of management: Planning, forecasting, organizing, staffing, directing, motivating, controlling, co-coordinating, communicating, decision making.

Module III

Personnel management: Introduction, definition, objectives, characteristics, functions, principles and organization of personnel management

Markets and marketing: Introduction, the market, marketing information, market segmentation, consumer and indusial markets, pricing, sales, physical distribution, consumer behaviour and advertisement.

Financial management: the basics , financial accounts, inflation, profitability, budgets and controls, cost accounting, valuation of stock, allocation of overheads, standard costing ,marginal costing.

Module IV

Productivity and production: Measurement of productivity, productivity index productivity improvement procedure

Materials management and purchasing: Objectives, functions, importance of materials management. Stores and storekeeping

Inventory control: Classification, functions, inventory models, inventory costs, EOQ, Materials requirement planning

References:

1. Fraidoon Mazda, Engineering Management-, Addison -Wesley
2. Koontz and O'Donnell, Essentials of Management, Mc Graw Hill
3. Kotlar P, Marketing Management, Prentice Hall India
4. Prasanna Chandra , Finance Management,TMH.5th ed.,
5. Monks J.G Operations Management ,MGH

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1702 BIOMECHANICS

Module I

Bone: structure & composition mechanical properties of bone 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, Structure and functions of cartilages, tendons, ligaments.

Module II

Cardiovascular biomechanics – Models of peripheral circulation – Concept of vascular resistance – capacitance – Lumped parameter model of peripheral circulation – Wind Kessel simplifications. Heart as a pump – sliding filament theory – p-v curve for ventricles – contractility – Electrical model of ventricles – cardiac cycle in p-v plane.

Module III

Artificial heart valves- biological mechanical valves - Heterografts, Homografts – testing of valves. Total Hip Prosthesis - requirements – different types of components- Stress analysis & instrumentation, Knee Prosthesis. Human locomotion – gait analysis - Foot Pressure measurements - Pedobarograph - Force platform.

Module IV

Muscle mechanics - Biomechanics of spine - Scoliosis - Measurement – biomechanical treatment- instrumentation. Monitoring Devices: Catheter Mathematical Model, response to a sinusoidal input. Tonometry- different types.

References:

1. D N Ghista , *Biomechanics of Medical Devices* , Macel Dekker , 1982
2. J B Park , *Biomaterials - Science and Engineering*, Plenum Press , 1984
3. Alexander R Mc Neill , *Biomechanics*, Chapman and Hall, London, 1975
4. A Z Tohen and C T Thomas , *Manual of Mechanical Orthopaedics*" ,1973
5. D N Ghista and Roaf , *Orthopaedic Mechanics*, Academic Press,1978
6. VC Mow and W C Hayes *Basic Orthopedic Biomechanics*, Lippincott – Raven publishers,1997.
7. C. G. Caro, T. J. Pedley, R. C. Schroter, W. A. Seed, 2011, The mechanics of the circulation, Oxford University Press, 2nd Edition.
8. Fung Y. C., 1984, Biodynamics: Circulation, Springer Verlag

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1703 MEDICAL IMAGE PROCESSING

Module I

Image perception -MTF of the visual system - monochrome vision models - color vision model Image sampling and quantization - Two dimensional sampling theory - Practical limits in sampling reconstruction. Image quantization - visual quatization. Image transforms - Two dimensional orthogonal and unitary transforms - properties of unitary transforms - onedimensional DFT-2D DFT - cosine,sine Hadamard ,Haar transforms, KLT ,slant transforms.

Module II

Image enhancement - Point operations - contrast stretching - clipping and thresholding - digital negative intensity level slicing - bit extraction. Histogram modelling - histogram eqalization - modification. Spatial operations - smoothing techniques. Magnification and interpolation. Transform operations.Applications in medical imaging.

Module III

Image filtering and restoration.Inverse and weiner filters –filtering using image transforms. Splines and interpolation. Maximum entropy restoration. Bayesian methods Image analysis- spatial feature extraction - transform features. Edge detection – boundary extraction, shape features image segmentation.

Module IV

Applications of Medical Image processing: Fusion of PET and MRI for Hybrid Imaging: Hybrid PET Fusion System, PET/CT Systems, PET/MRI Systems, High-Resolution Fusion. Quantitative Medical Image Analysis: Examples: Assessment of Osteoarthritis, Carotid Atherosclerosis & Cancer.

References:

1. Jain Anil K: *Fundamentals of Digital Image Processing- ,* Prentice Hall of India. 1989
2. Rosenfield Azriel, Kak Avinash C: *Digital Picture Processing,* Academic Press Inc.1991
3. Thomas M. Deserno *Biomedical Image Processing* Springer-Verlag Berlin Heidelberg 2011
4. Gonzalez Rafel C, Wintz Paul: *Digital Image Processing,* Addison Wesley.1993
5. Pratt William K: *Digital Image Processing,* John Wiley and Sons. 2001.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1704 THERAPEUTIC EQUIPMENTS

Module I

Cardiac Pacemakers & Defibrillators: Effects of electric field on cardiac muscles and laws of stimulation. External and internal pacemakers - programmable pacemakers - power sources - defibrillators - basic principle and comparison of output wave forms of different DC defibrillators - energy requirements - synchronous operation - implantable defibrillators - defibrillator analyzers - RF ablation treatment for arrhythmia.

Module II

Ventilators: Basic principles - Different generators, Inspiratory phase, Different cycling mechanism - Expiratory phase - Different ventillatory adjuncts - study of typical ventilator - Anesthetic machines.

Module III

Surgical diathermy – principles, burn and shock hazards - electro surgical analyzers - Principles of short wave and microwave diathermy. Lithotripsy – principles of percutaneous, ultrasonic & extracorporeal shock wave lithotripters.

Module IV

Principle of endoscopy-Types of endoscopes , cystoscopes , laproscopes - Fiber optic endoscopes and endoscopes with integral TV cameras - Infusion pumps, peristaltic pumps – Dialysis equipments - Heart lung machines.

References:

1. Mushin, *Automatic Ventilation of Lung*, Black Well,1980
2. R S Khandpur, *Handbook of Bio medical Instrumentation*, Tata McGraw Hill,2004
3. Massey & Meredith , *Fundamental Physics of Radiology*, Wright, Bristol,1992
4. Geddes & Baker , *Principles of Applied Biomedical Instrumentation* Wiley,1989.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B.(4 x 15 = 60 marks)

EB 1705 E1 MODELING OF PHYSIOLOGICAL SYSTEMS

Module I

Physiological complexity and the need for models: Complexity , Feedback and Control in Physiological Systems Models and the modeling process: Model Formulation , Identification Validation and Simulation Different approaches of modeling physiological systems Linear Modeling Distributed Modeling Nonlinear Modeling Time-varying Modeling Mathematical approach, electrical analogues, etc. Introduction to various process controls like cardiac rate, blood pressure, respiratory rate. Blood - Glucose regulation. Pharmacokinetic modeling-compartmental models, blood-tissue models.

Module II

Modeling of human thermal regulatory system: Parameters involved, control system model etc. Biochemistry of digestion, Loss of heat to the environment, Heat transfer within the body, Models describing heat transfer between core and skin, heat distribution in extremities.

Module III

Modeling of Respiratory system : Human Lungs: Anatomy and physiology of the respiratory system, mass balance in lungs, oxygen and carbon dioxide transport in blood Modeling oxygen uptake by RBC and pulmonary capillaries .

Modeling of Ultra filtration system : Anatomy and physiology of kidneys. Transport through cells and tubules, passive diffusion, facilitated diffusion and active transports. Methods of waste removal, counter current method of urine formation in nephron, model of Henle's loop.

Module IV

Neuron Models: Electrical properties of Neurons, Single compartment models, voltage dependent conductances, Hodgkin Huxley model, Integrate fire neuron model, conductance based models, Cable equation, multi compartment models. Fitzhugh Nagumo models.

References:

1. David Cooney, *Advanced in Bio medical Engineering*, Marcel Decker Publications, 1980
2. David Cooney, *Biomedical Engineering Principles*, Marcel Decker Publications, 1976.
3. Arthur C Guyton, *Text Book of Medical physiology*, PRISM Books India, 2000
4. Peter Dayan, *Theoretical Neuroscience: Computational and Mathematical modeling of Neural systems* MIT Press
5. Vasilis Z Marmarelis, *Nonlinear Dynamic Modeling of Physiological systems* IEEE Press series in Biomedical Engineering,
6. Rushmer, *Medical Engineering*, Academic Press
7. Yukihito Nose: *The Artificial Kidney*, The C V Mosby Co., 1969.
8. Kennedy & Blackie, *Electromedcial Engineering*
9. Webstar, *Electronic Devices for Rehabilitation*
10. Myers, *Engineering in Heart and Blood Vessels*, Wiley International
11. Ibrall & Guytion , *Regulations and Control in Physiological Systems* , Instruments Society USA
12. Brown & Gann, *Engineering in Physiology Vol 1 & Vol 2*
13. Michael C.K. Khoo, *Physiological Control System,* PHI, New Delhi, 2001.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1705 E2 BIOSTATISTICS AND DESIGN OF EXPERIMENTS

Module I

Basic concepts: Measures of central tendency – measure of dispersion – properties. Random variables – discrete and continuous – probability density function – binomial, Poisson and normal distributions – Joint probability density function – marginal and conditional distributions.

Module II

Statistical inference: Interval estimation – mean and variance – testing of hypothesis – single population mean – difference between two population means. Hypothesis testing for categorical data – Fisher exact test – chi square distribution – Goodness of fit. Non parametric tests – sign test – Wilcoxon sign rank test – Wilcoxon rank sum test.

Module III

Multisample inference –Introduction to analysis of variance – one way analysis of variance (fixed effects model) – hypothesis testing in one way anova (fixed effects model) – comparison of specific groups in one way anova. Regression and correlation: Fitting of regression line (least squares method) – linear regression – statistical inference on parameters from regression line – correlation coefficient – statistical inference on correlation coefficient – multiple regression – partial and multiple correlation – rank correlation coefficient.

Module IV

Scope of statistics in biomedical data analysis - Statistical design of experiments for clinical and laboratory data – Study design - Measure of effect for categorical data – confounding and standardization – methods of inference for stratified categorical data – power and sample size estimation for categorical data – multiple logistic regression – meta analysis – equivalence studies - Crossover designs – clustered binary data – measurement-error method – missing data.

References:

1. Wayne Daniel: *Biostatistics: Foundation for Analysis in the Health Sciences, 5th ed*., John Wiley & Sons, New York.
2. Bernard Rosener: *Foundations of Biostatistics, 6th edition*,Thomas Brooks, USA.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B.(4 x 15 = 60 marks)

EB 1705 E3 EMBEDDED SYSTEMS AND APPLICATIONS

Module I

Overview of Embedded System: Embedded System-Features-Categories-Requirements- Challenges and Issues Applications of Embedded Systems in Consumer Electronics, Control System, Biomedical Systems, Handheld computers, Communication devices.

Module II

Embedded Hardware & Software Development Environment :- Hardware Architecture, Communication Interface Standards-SPI,I^2C,USB,Firewire,Bluetooth,Zigbee,IrDA, Embedded System Development Process, Embedded Operating systems, Types of Embedded Operating systems.

Module III

Real Time & Database Applications :- Real-Time Embedded Software Development, Sending a Message over a Serial Link, Simulation of a Process Control System, Controlling an Appliance from the RT Linux System, Embedded Database Applications using examples like Salary Survey, Energy Meter Readings.

Module IV

Microchip PIC16 family – PIC16F873 processor – features – architecture – memory organization – register file map – I/O ports – PORTA - PORTB – PORTC – Data EEPROM and flash program memory – Asynchronous serial port – SPI mode – I2C mode.

Introduction to ARM family of microcontrollers- General features of ARM7,ARM9,ARM Cortex (Basic features only).

References:

1. Dreamtech Software Team , *Programming for Embedded Systems-*, Wiley Dreamtech 2002.
2. Rajkamal, *Microcontrollers- Architecture, programming, Interfacing and system Design*, Pearson Education, 2005.
3. John B Peatman *Design with PIC micro-controllers*:, Pearson Education.
4. Daniel W Lewis *Fundamentals of Embedded Software where C and Assembly Meet* PHI Ltd, 2003.
5. DS101374: *National Semiconductor reference manual*.
6. SoftwareTeam, Wiley Dreamtech, *Embedded / RealTime systems: Concepts, Design and programming, Dreamtech* 1993.
7. *1187D: Atmel semiconductor reference manual.*
8. *Atmel semiconductor web site* – www.atmel.com.
9. *Microchip semiconductor web site* – www.microchip.com**.**

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB/EC 1705 E4 MECHATRONICS

Module I

Introduction to Mechatronics - Elements of Mechatronic Systems. Mechatronics in manufacturing - Mechatronics in products - Scope of Mechatronics. **Mathematical modeling of Engineering Systems:** System Building blocks for Mechanical, Electrical, Fluid and Thermal systems. **General Engineering System Modeling:** Rotational - Translational, Electromechanical, Hydraulic_ Mechanical systems - System Transfer Function - Dynamic response of systems for standard test signals (Detailed mathematical analysis not required).

Module II

Actuation Systems: Pneumatic & Hydraulic Systems: Process Control Valves, Directional and Pressure Control valves, Linear and Rotary actuators. **Mechanical Actuation Systems:** Translational and Rotational motions, Kinematic Chains, Cams, Gear Trains, Ratchet and Pawl, Belt and Chain drives, Bearings. **Electrical Actuation Systems:** Mechanical and Solid State Relays, Solenoids, DC & AC motors, Servo & Stepper motors- feedback devices - encoders - pulse digitizers - resolvers - inductosyn – tachometers.

Module III

Fundamentals of numerical control - advantages of NC systems - classification of NC systems - point to point and contouring systems - NC and CNC - incremental and absolute systems - open loop and closed loop systems - features of NC machine tools - fundamentals of machining - design consideration of NC machine tools - methods of improving machine accuracy and productivity. **Industrial robotics** - basic concepts - robot anatomy - robotics and automation - specification of robots - resolution - repeatability and accuracy of manipulator - classification of robots.

Module IV

MEMS: Internal Structure, advantages, manufacturing, applications - Fibre Optic Devices in Mechatronics. **Mechatronic System Controllers:** ON/OFF, P, I, D, PI and PID Controllers, Digital controllers, Intelligent Controllers in Mechatronics. **Programmable Logic Controllers:** Structure, I/O processing, Programming, applications – Selection Criteria.

References:

1. Bolton. N, *Mechatronics - Electronic Control systems in Mechanical and Electrical Engineering*, Pearson Education,4/e, 2008
2. M.D. Singh, J.G. Joshi, *Mechatronics*, Prentice Hall India, New Delhi, 2006
3. Dradly. D.A, Dawson.D, Burd N.C and Loader A.J, *Mechatronics – Electronics in Products & Processes*, Chapmen & Hail, 1993.
4. HMT Limited, *Mechatronics*, Tata McGraw Hill,1998.
5. James Harter, *Electromechanics- Principles concept and Devices*, Prentice Hall, 1995.
6. Michel P. Groover, *Industrial Robots-Technology, Programming and Applications*, McGraw Hill,1986
7. Yoram Koren & Ben Yuri, *Numerical Control of Machine Tools*, Khanna Publishers,1984
8. A.Smaili, F.Mrad, *Mechatronics-Integrated Technologis for Intelligent Machines*,Oxford,2009
9. Appukuttan .K. K, *Introduction To Mechatronics*,Oxford University,Press,1/e, 2007
10. David G Alciatore, Micheal, *Introduction to Mechatronics and Measurement Systems*,TMH,3/e,2007
11. Nitaigour P Premchand, *Mechatronics-Principles,Concepts and Applications*,TMH,11/e,2011.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 17 L1 BIOSIGNAL PROCESSING LABORATORY

1. MATLAB familiarization
2. Acquisition of biosignals to the system
3. Implementation of filters.
4. Processing of ECG signals for acquiring parameters like heart rate, QRS complex, P wave etc
5. Arrhythmia analysis.
6. Analysis of plethysmographic signal.
7. Automated detection of systolic and diastolic pressure from cuff pressure and peripheral pulse.
8. Signal Classification using neural networks.
9. 50 Hz interference rejection in ECG signals.
10. Event detection in EEG signals
11. Spectral analysis of EEG, EMG signals.

Note: 50% marks is earmarked for continuous evaluation, and 50% marks for end semester examination to be conducted by two examiners. A candidate shall secure a minimum of 50% marks in the aggregate and 50 % minimum in the end semester examination for a pass.

EB 17 L2 BIOENGINEERING LABORATORY

1. Flash ADC
2. Automatic gain compensator
3. Power amplifier of stylus movement
4. X-ray timer circuit
5. ESU waveform generator
6. Chart drive circuit.
7. QRS detector circuit.
8. Study of IC 7107
9. ECG monitor circuit.
10. Study of
    i. ECG monitor and recorder
    ii. Defibrillator
    iii. ESU
    iv. X-Ray Machine
    v. Tread Mill
    vi. Holter Recorder

Note: 50% marks is earmarked for continuous evaluation, and 50% marks for end semester examination to be conducted by two examiners. A candidate shall secure a minimum of 50% marks in the aggregate and 50% minimum in the end semester examination for a pass.

EB 17 L3 PROJECT DESIGN

Each batch comprising of 3 to 5 students shall identify a project related to the curriculum of study. At the end of the semester, each student shall submit a project synopsis comprising of the following.

- Application and feasibility of the project
- Complete and detailed design specifications.
- Block level design documentation
- Detailed design documentation including circuit diagrams and algorithms/ circuits
- Project implementation action plan using standard presentation tools

Guidelines for evaluation:

i) Attendance and Regularity	10
ii) Quality and adequacy of design documentation	10
iii) Concepts and completeness of design	10
iv) Theoretical knowledge and individual involvement	10
v) Quality and contents of project synopsis	10
Total	**50 Marks**

Note: *Points (i) - (iii) to be evaluated by the respective project guides and project coordinator based on continuous evaluation. Points (iv) - (v) to be evaluated by the final evaluation team.*

The first phase of the main project including the literature survey, schematic block or algorithms, design of the project and implementation of the initial phase of the project shall be completed. A report on the work done in this phase shall be submitted by each student by the end of the VIII semester. There will be an internal examination of the project that includes oral presentation regarding the overall project and demonstration, if any, of the completed work. The evaluation panel shall consist of at least three faculty members including the project coordinator, guide and one senior faculty member of the department.

EB 17 L4 SEMINAR

Students shall individually prepare and submit a seminar report on a topic of current relevance related to the field of Electronics & Biomedical Engineering. The reference shall include standard journals, conference proceedings, reputed magazines and textbooks, technical reports and URLs. The references shall be incorporated in the report following IEEE standards reflecting the state-of-the-art in the topic selected. Each student shall present a seminar for about 30 minutes duration on the selected topic. The report and presentation shall be evaluated by a team of internal experts comprising of 3 faculty members based on style of presentation, technical content, adequacy of references, depth of knowledge and overall quality of the seminar report.

SEMESTER VIII

EB 1801 PRINCIPLES OF RADIO DIAGNOSIS AND RADIOTHERAPY

Module I

Various components of radiographic systems – Electrical circuit for X-ray unit – Filament circuit and mA control- HT circuit & KV control – Safety devices - X-ray tubes for various medical applications – fixed anode, rotating anode, x-ray tubes for specialised applications - Rating charts of X-ray tubes.

Module II

Exposure switching and control of exposure time – Types of timer circuits - Automatic exposure control – Photo electric and ionisation timers –-limitations - performance - Guard timers. Scattered radiation – effects & control in radiography – collimators – grids – types and characteristics, bucky grids – Absorbed dose and Rad - Basics of tables & arms.

Module III

X-ray films and its processing, properties of X-ray films, intensifying & fluorescent screens -properties. Fluoroscopy systems – Direct and indirect fluoroscopy, Image intensifier & TV chain for fluoroscopy, Automatic brightness control – Camera tubes for x-ray TV chains. Serial film chargers – types - radiographic considerations - film exposure time - Basics of digital radiography & digital subtraction angiography.

Module IV

Physical principles of radiotherapy. Dosage data for clinical applications – kV & MV radiations – output and percentage depth dose values. Measurement of output and use of ISODOSE charts - Radiation therapy planning. Collimators and beam direction devices. Teletherapy sources - Principles of linear accelerators for radiation therapy.

References:

1. Sybil M Stockley, *A Manual of Radiographic Equipments*, Churchill Livingstone, New York.,1986
2. Meredith & Massey, *Fundamental Physics of Radiology*, Varghese Publishing House, Bombay.1972
3. Thomas T. Thompson, *A Practical Approach to Modern Imaging Equipment* Little Brown & Co., 2nd edition,1978
4. T S Curry, J E Dowdey & R C Murrey: *Christensen's Introduction to Physics of Diagnostic Radiology*, Lea & Febiger, Philadelphia,1984
5. D N & M O Chesney, *Radiographic Imaging*, CBS Publishers,1990.
6. D N & M O Chesney, *X-ray equipment for student Radiographers*, CBS Publishers,1975.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1802 BIOMATERIALS

Module I

Definition and classification of biomaterials: Applications of polymers, metals, ceramics and composite as biomaterials for implantation. Surface properties of materials, mechanical properties. Metallic implant materials: Stainless steel, Co-based alloys, Ti and Ti-based alloys .Ceramic implant materials: Aluminium oxides, Glass ceramics, Carbons, Bioactivity, bioactive glasses and applications.

Module II

Polymeric implant materials: Polyolefins, polyamides, acrylic polymers, fluorocarbon polymers. Rubbers, Thermoplastics . Physiochemical characteristics of biopolymers. Biodegradable polymers for medical purposes. Synthetic polymeric membranes and their biological applications. Biopolymers in controlled release systems. Artificial skin. Dialysis membrane.

Module III

Hard tissue replacement implant: Orthopedic implants, Dental implants. Soft tissue replacement implants: Percutaneous and skin implants, Vascular implants, Heart valve implants- Strength and strengthening mechanisms of metals, ceramics and polymers. Tailor made composites, Bio-composites and nano bio-composites.

Module IV

Biocompatibility: Definition, Wound healing process-bone healing, tendon healing. Material response: Function and Degradation of materials in vivo. Host response: Tissue response to biomaterials, Effects of wear particles. Testing of implants: Methods of test for biological performance- In vitro implant tests, In vivo implant test methods.

References:

1. J B. Park, Roderic S. Lakes: *Biomaterials: an Introduction*, Plenum Press, New York, 1992
2. Jonathan Black, *Biological Performance of materials*, Marcel Decker, 1981
3. Piskin and A S Hoffmann, *Polymeric Biomaterials(Eds)*, Martinus Nijhoff Publishers, Dordrecht, 1986.
4. Eugene D. Goldbera & Akio Nakajima: *Biomedical Ploymers*, Academic Press, 1980
5. A . Rembaum & M. Shen, *Biomedical Polymers* , Mercel Dekker Inc., New York, 1971.
6. L. Stark & G. Agarwal, *Biomaterials*, Plenum Press, New York, 1969.
7. Donald L. Wise...[et al.] eds. :*Encyclopedic handbook of biomaterials and bioengineering* (4 vols.), Marcel Dekker, New York,1995
8. Fredrick H.Silver: *Biomaterials, Medical Devices & Tissue Engineering: An integrated approach.* Chapman & Hall, 1994.
9. Julien F V Vincent: *Structural Biomaterials*, Macmillan Press, 1982.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1803 BIOPHOTONICS

Module I

Principles of operation and characteristics & properties of common continuous and pulsed lasers used in medicine – He-Ne, Nd-YAG, Argon, CO_2, free electron and semiconductor lasers.

Module II

Optical properties of tissues: Introduction – fundamental optical properties – refraction, scattering, absorption – light transport in tissue – preliminaries to radiation transport – time resolved propagation of light pulses – tissue properties – refractive indices, scattering and absorption properties. Light tissue interactions – light interactions with a strongly scattering tissue – continuous wave light, polarized light, short light pulses, diffused photon density waves. Optothermal interaction – temperature rise and tissue damage – optothermal and optoacoustic effects.

Module III

Biophotonic diagnostics: Near IR spectroscopy for biological glucose analysis, flow cytometry – basic operation, optical response,– applications - optical biosensors – principles, biorecognition, optical transduction – Bioimaging – cellular, tissue imaging and in vivo imaging. Introduction to Optical Coherence tomography.

Module IV

Biophotonic Therapy: Photodynamic therapy- basic principle, photosensitizers, mechanism of photodynamic action, applications – Laser tissue welding, lasers in dermatology, neurosurgery, ophthalmology, urology.

References:

1. William T Silfwast: *Laser fundamentals*, Cambridge University Press, 1998.
2. Tuan Vo-Dinh: *Biomedical Photonics Handbook*, CRC Press, 2003.
3. Paras N Prasad: *Introduction to Biomedical Photonics*, John Wiley.2003
4. Leon Goldman, *The Biomedical laser Technology and Clinical Applications* Springer-Verlag.
5. Leon Goldman, *Lasers in Medicine*, Springer-Verlag.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1804 E1 TELEMEDICINE

Module 1

Definitions of telemedicine telehealth and telecare**.** History of telemedicine: Main phases of telemedicine Pre electronic telemedicine Electronic telemedicine Technical Requirements , Type of information and standards, audio, data, Fax, Video Types of communications and networking- networking architecture, POTS, ISDN, ATM Other Fixed networks, Air/aireless communications.- RF,Microwaves, Satellite, GSM, CDPD (Cellular Digital Packet Data) Acquisition/ displays: Acquisition systems Cameras, Scanners, Other medical specialized acquisition system

Display systems: Analogue devices, LCD, Laser displays, Holographic representations, Virtual screen devices Computation / storage systems: Magnetic, Mixed, Optical (laser) devices (only brief description required)

Module 1I

Telemedicine applications: Teleradiology: Basic parts of a teleradiography system, Image acquisition and management, display, communication, interpretation Telepathology: Applications, requirements, security and confidentiality tools, telequantitation at distance. Telecytology: Applications, Telecardiology: requirements, portable solutions Telehome-Care Home based applications, Teleoncology : Applications, Telesurgery, telepsychiatry, Teledermatology : Techniques.

Module III

Internet in telemedicine 1) The internet 2) Basic concepts 3) Security – secure socket layer – Firewalls – proxies. Personal Communication , Medical data sharing needs for telemedicine- -Internet problems Distant training, teleworking and telecasting.

Module IV

Ethical and legal aspects of telemedicine-confidentiality, patient rights and consent-ehtical and legal aspects of internet-telemedical malpractice. Constraints for the wide spread use of telemedicine-constraints linked to economy, social acceptance Strategic planning for telemedicine implementation. Analysis of the present situation and the demand Objectives and strategies - Plan of implementation Forces affecting technology transfer scenarios for telemedicine.

References:

1. Olga (EDT), Ferrer – Roca, M. Sosa (EDT), Marcelo C, *Handbook of telemedicine*, IOS Press 1998.
2. A. C. Norris *Essentials of Telemedicine and Telecare*, John Wiley & Sons 2002.
3. Ling Guan, *Multimedia image and video processing*, CRC Press 2000
4. Thorsten M Buzug, Heinz Handels, Dietrich Holz, *Telemedicine: Medicine and Communication*", Springer Verlag 2001
5. Douglas V.Goldstein, " *E Healthcare: Harness the power of Internet, e-commerce and e-care"*, Jones and Barlett Publishers

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1804 E2 BIOINFORMATICS

Module I

Basic Concepts of Molecular Biology: Cells - Chromosomes, DNA, RNA, Proteins, Central dogma of molecular biology, Genomes and Genes - Genetic code, Transcription, Translation and Protein synthesis. Web based genomic and proteomic data bases: NCBI, Gen Bank

Module II

Sequence alignments – Dot plot-Pair-wise sequence alignments - local and global -Sequence similarity and distance measures - Smith-Waterman algorithm, Needleman-Wunch algorithm, Multiple sequence alignment –Sum-of-Pairs measure - Star and tree alignments – PAM and BLOSUM, Phylogenetic analysis

Module III

Informational view of Genomic data, Genomic Signal Processing, DNA Spectrograms, Identification of protein coding regions, Gene expression, Microarrays, Microarray image analysis

Module IV

Gene structure in Prokaryotes and Eukaryotes: Molecular Structure Prediction: Basic concepts and terminologies related to molecular structures, Basic molecular Visualization, RNA secondary structure prediction, Protein folding problem, Protein Threading, Protein Visualization, Introduction to Drug Discovery.

Case Study

Software Tools: Use of Tools for basic and specialized sequence processing such as: BLAST, FASTA, RasMol, Phylip, ClustalW

References:

1. Setubal & Meidanis, *Introduction to Computational Molecular Biology*, Thomson: Brooks/Cole, International Student Edition, 2003
2. Claverie & Notredame, *Bioinformatics - A Beginners Guide*, Wiley- Dreamtech India Pvt Ltd, 2003.
3. Lesk, *Introduction to Bioinformatics*, Oxford University Press, Indian Edition, 2003
4. Higgins and Taylor, *Bioinformatics: Sequence, structure and databanks*, Oxford University Press, Indian Edition, 2003
5. Bergeron, *Bioinformatics Computing*, Prentice hall of India, 2003
6. Jiang, Xu and Zhang, *Current topics in Computational Molecular Biology*, Ane Books, New Delhi, 2004
7. S.C Rastogi & Namitha Mendiratta, *Bioinformatics method and application Genomics,Protinomics & drug discovery*
8. Dov Stekel, *Microarray Bioinformatics*, Cambridge University Press

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1804 E3 COMPUTER GRAPHICS AND VOLUME VISUALIZATION

Module I

Overview of graphics systems. Video display devices – raster scan systems – random scan systems – input devices. Hardcopy devices – graphic software. Output primitives – points and lines. Line drawing algorithms – circle generating algorithms – polygon filling algorithms.

Module II

Two dimensional transformations, basic transformations – translation – rotation – scaling, matrix representation and homogeneous co-ordinates – composite transformations. Transformation between co-ordinate systems – affine transformations. Two dimensional viewing – viewing pipeline – windows to viewport transformations – clipping operations – point clipping – line clipping – polygon clipping.

Module III

Three dimensional object representations, polygon surfaces – three dimensional transformations, Three dimensional viewing. Visible surface detection. Depth buffer. Scan line algorithms – BSP trees – octrees – Ray casting.

Module IV

Volume visualization – visualization pipeline – reconstruction - 3D voxel image – enhancement – classification – mapping – Viewing and shading. Volumetric shading techniques. Introduction to shading. Illumination models – light sources – basic illumination models. Surface shading. Image space shading.
Volume representation. Viewing algorithms, Marching cube algorithm.

References:

1. Allan Watt, Mark Watt, *Introduction to animation and Rendering* Addison Wesley Publishing Co, 1994.
2. Arie Kauffman, *Volume Visualisation* IEEE Computer Society Press Tutorial, Washington, 1990.
3. Donald Hearn, M.Pauline Baker, *Computer Graphics*, Prentice Hall of India Pvt. Ltd.,1993.
4. James D. Foley et.al., *Introduction to computer Graphics*, Addison Wesley Publishing Co., 1994.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)
Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 1804 E4 VLSI DESIGN

Module I

VLSI process integration: The MOS device - (n - channel & p- channel) - capacitance of MOS structure - accumulation, depletion and inversion, threshold voltage, current equations - characteristics, channel pinch-off. Second order MOS device effects: short-channel effect, narrow width effect, sub-threshold current, device saturation characteristics. Fundamental considerations in IC processing - NMOS and PMOS IC technology - CMOS IC technology - BiCMOS IC technology. -Introduction to GaAs technology. Design technology-design flow-Y chart.

Module II

Switch logic- pass transistors and transmission gates, Gate logic-The basic inverter using NMOS-circuit - current equations - pull up to pull down ratio- transfer characteristics- Alternate forms of pull up. Basic NAND, NOR circuits. The CMOS inverter, characteristics – NAND, NOR and compound circuits using CMOS. Other forms of CMOS logic : pseudo CMOS, CMOS domino logic, n-p logic. Layout design rules for MOS circuits – Lamda based rules-general principles & steps of lay-out design - use of stick diagrams - design rules - Layout examples of Inverter, NAND and NOR.

Module III

Basic circuit concepts: sheet resistance, area capacitance, delay unit, inverter delays – driving large capacitive loads, cascaded inverters, super buffers, BiCMOS drivers. Combinational circuits -parity generator-bus arbitration logic-multiplexers-gray to binary code converter- clocked sequential circuit - drivers for bus lines. Scaling of MOS circuits: scaling models and scaling factors for device parameters.

Module IV

Timing issues in VLSI system design: timing classification- synchronous timing basics – skew and jitter- latch based clocking- self timed circuit design - self timed logic, completion signal generation, self timed signaling–synchronizers and arbiters.

References:

1. Douglas A Pucknell, Kamran Eshraghian , *Basic VLSI Design*, PHI
2. Jan M. Rabaey, A. Chandrakasan, B. Nikolic *Digital Integrated Circuits- A Design perspective* 2/e, Pearson education.
3. Thomas E. Dillinger , *VLSI Engineering* , PH International editions.
4. S M Sze, *VLSI Technology,PHI.*
5. Weste and Eshraghian, *Principles of CMOS VLSI Design, A Systems Perspective*,2/e, Pearson Education.
6. Mead & Conway, *Introduction to VLSI System Design*-Addison Wesley.
7. Fabricius, *Introduction to VLSI Design*,Pearson.
8. Charles H Roth Jr – *Fundamentals of Logic Design 4 Ed*, Jaico Publishers.
9. Wayne Wolf: Modern *VLSI Design Systems on Chip*-Pearson Education, 2nd ed.

Type of Questions for University Exam.

Q 1. Eight short answer questions of 5 marks each with two questions from each of the four modules. (8 x5 = 40 marks)

Q 2. to Q 5. Two questions A & B of 15 marks from each module with option to answer either A or B. (4 x 15 = 60 marks)

EB 18 L1 MAIN PROJECT

Each batch of students shall develop the project designed during the VII semester. The implementation phase shall proceed as follows:

- For hardware projects, practical verification of the design, PCB design, fabrication, design analysis and testing shall be done.
- For software projects, a proper front end (GUI) if applicable, shall be designed. A detailed algorithm level implementation, test data selection, validation, analysis of outputs and necessary trial run shall be done.
- Integration of hardware and software, if applicable, shall be carried out.
- A detailed project report in the prescribed format shall be submitted at the end of the semester. All test results and relevant design and engineering documentation shall be included in the report.
- The work shall be reviewed and evaluated periodically

A committee consisting of the Project Coordinator (appointed by the Head of the Department/ Division), project guide and at least one senior faculty member will carry out the assessment based on at least one interim review and a final review just before the submission of the project report. The final evaluation of the project shall include the following.

- Presentation of the work
- Oral examination
- Demonstration of the project against design specifications
- Quality and content of the project report

***Guidelines for evaluation*:**

Regularity and progress of work	60
Work knowledge and Involvement	60
End semester presentation and oral examination	60
Level of completion and demonstration of functionality/specifications	60
Project Report – Presentation style and content	60
Total	**300 marks**

Note: *Points (i) and (ii) to be evaluated by the respective project guide and the project coordinator based on continuous evaluation. (iii) - (v) to be evaluated by the final evaluation team.*

EB 18 L2 VIVA VOCE

Each student is required to appear for a viva-voce examination at the end of the complete course work. The student shall produce the seminar report and project reports duly attested by the institutional authorities, before the examiners. The examination panel shall comprise of Head of the Department/ Division or his/her nominee and one senior faculty of the Department/ Division and an external expert. The examiners except the Head of the Department/ Division or his/her nominee shall be, both appointed by the University. The examiners shall evaluate the student in terms of their conceptual grasp of the course of study and practical/analysis skills in the field.