COCHIN UNIVERSITY OF SCIENCE & TECHNOLOGY

B.TECH DEGREE COURSE IN

ELECTRONICS & COMMUNICATION ENGINEERING

Scheme of Examinations and Syllabus
(2012 Admission onwards)

B.TECH DEGREE COURSE IN ELECTRONICS & COMMUNICATION ENGINEERING

Scheme of Examinations (2012 Admission onwards)

SEMESTER I&II (Common to all branches)

Code No.	Subject	L Hrs/wk	T Hrs/wk	P Hrs/wk	C	Int	Univ	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 Engineering and Electronics	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*	*Credit*	*Internal*	*University*	*Total*
CE/CS/EB/EC /EE/EI/FT/IT/ ME/SE 1301	Engineering Mathematics –II	3	1	0	3	50	100	150
EC 1302	Probability and Random Process	3	1	0	3	50	100	150
EC/EI 1303	Network Theory	3	1	0	3	50	100	150
EB/EC1304	Digital Electronics	3	1	0	3	50	100	150
EC/EI 1305	Solid State Electronics	3	1	0	3	50	100	150
EC/EI 1306	Electronic Circuits I	3	1	0	3	50	100	150
EC/EI 13L1	Basic Electronics Laboratory	0	0	3	2	100	-	100
EC/EI 13L2	Digital Electronics 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*	*Credit*	*Internal*	*University*	*Total*
CE/CS/EB/EC /EE/EI/FT/IT/ ME/SE 1401	Engineering Mathematics -III	3	1	0	3	50	100	150
EC1402	Microprocessors :Architecture And Programming	3	1	0	3	50	100	150
EC/EI 1403	Electronic Circuits II	3	1	0	3	50	100	150
EC/EI 1404	Signals and Systems	3	1	0	3	50	100	150
EC1405	Communication Engineering I	3	1	0	3	50	100	150
EC1406	Digital System Design	3	1	0	3	50	100	150
EC14L1	Microprocessor Laboratory	0	0	3	2	100	-	100
EC14L2	Electronic Circuits Laboratory I	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*	*Credit*	*Internal*	*University*	*Total*
CE/CS/EB/EC /EE/EI/FT/IT/ ME/SE 1501	Engineering Mathematics –IV	3	1	0	3	50	100	150
EC1502	Electromagnetic Theory	3	1	0	3	50	100	150
EC1503	Embedded Systems	3	1	0	3	50	100	150
EC1504	Communication Engineering II	3	1	0	3	50	100	150
EC/EI 1505	Analog & Integrated Circuits	3	1	0	3	50	100	150
EC/EI 1506	Digital Signal Processing	3	1	0	3	50	100	150
EC15L1	Mini Project	0	0	3	2	100	-	100
EC15L2	Electronic Circuits Laboratory II	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*	*Credit*	*Internal*	*University*	*Total*
EC1601	Electronic Measurements And Instrumentation	3	1	0	3	50	100	150
EC1602	Microwave Techniques and Devices	3	1	0	3	50	100	150
EC1603	VLSI Design	3	1	0	3	50	100	150
EC1604	Communication Engineering III	3	1	0	3	50	100	150
EC1605	Control Systems Engineering	3	1	0	3	50	100	150
EC1606E	Elective I	3	1	0	3	50	100	150
EC16L1	DSP Laboratory	0	0	3	2	100	-	100
EC16L2	Communication Laboratory I	0	0	3	2	100	-	100
TOTAL		**18**	**6**	**6**	**22**			

EC1606E - Elective I

EC1606 E1 **Optical Fiber Communication**
EC/EI 1606 E2 **Digital Image Processing**
EC1606 E3 **Hardware Modelling**
EC/EI 1606E4 **Nano Electronics**

SEMESTER VII

Course Code	*Subject*	*L Hrs/ Wk*	*T Hrs/ Wk*	*P Hrs/ Wk*	*Credit*	*Internal*	*University*	*Total*
CS/EB/EC/ EE/EI/IT 1701	Industrial Organisation and Management	3	1	0	3	50	100	150
EC1702	Antennas and Wave Propagation	3	1	0	3	50	100	150
EC1703	Electronic Product Design	3	1	0	3	50	100	150
EC1704	Power Electronics	3	1	0	3	50	100	150
EC1705E	Elective II	3	1	0	3	50	100	150
EC17L1	Embedded Systems Laboratory	0	0	3	2	100	-	100
EC17L2	Communication Laboratory II	0	0	3	2	100	-	100
EC17L3	Project Design	0	0	2	1	50	-	**50**
EC17L4	Seminar	0	0	2	2	50	-	50
TOTAL		**15**	**5**	**10**	**22**			

EC 1705E - Elective II

EC 1705 E1	**EMI/EMC**
EC 1705 E2	**Adaptive Signal Processing**
EC 1705 E3	**Digital Integrated Circuit Design**
EB/EC 1705 E4	**Mechatronics**

SEMESTER VIII

Course Code	*Subject*	*L Hrs/ Wk*	*T Hrs/ Wk*	*P Hrs/ Wk*	*Credit*	*Internal*	*University*	*Total*
EC1801	Multimedia Communication Systems	3	1	0	3	50	100	150
EC1802	Wireless Communication	3	1	0	3	50	100	150
EC1803	Computer Communication & Networking	3	1	0	3	50	100	150
EC1804E	Elective III	3	1	0	3	50	100	150
EC18L1	Project	0	0	14	8	300	-	300
EC18L2	Viva voce	-	**-**	**-**	**2**	**-**	**100**	**100**
	TOTAL	**12**	**4**	**14**	**22**			

EC 1804E - Elective III

EC 1804 E1	**Computational Electromagnetics**
EC/EI 1804 E2	**Radar & Navigation**
EC1804 E3	**ASIC Design**
EC/EI 1804 E4	**Neuro-Fuzzy Systems**

COCHIN UNIVERSITY OF SCIENCE & TECHNOLOGY

B.TECH DEGREE COURSE IN

ELECTRONICS & COMMUNICATION ENGINEERING

Syllabus 1 – VIII Semesters
(2012 Admission onwards)

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, series 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 with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5: Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 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 step index 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 Josephson's 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 interpretation 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-Sabine's 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 with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5: Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 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, Kirchhoff'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 with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5: Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 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 with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5: Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 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 modules. (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 modules. (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

PART- 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 – Kirchhoff'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.

PART- B: ELECTRONICS ENGINEERING

Module III

The Diode - Biasing the Diode, Voltage - Current Characteristic of a Diode, Diode Models, **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. **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 Education Inc. 5th edition.

Type of Questions for University Exam.

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

Q 2. to Q.5: Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 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 fetch(), frets), 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 with two questions from each of the four modules. (8x5 = 40 marks)

Q 2. to Q.5: Two questions A & B of 15 marks from each modules with option to answer either A or B. (4x15 = 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-GraHill, 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 x3 = 18)

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.

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.

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. (10x2 = 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.

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.

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. Fluorescent lamp.
7. Connection of plug socket.
8. Different kinds of joints.
9. Transformer winding.
10. Soldering practice.
11. Familiarisation of CRO.

MECHANICAL WORK SHOP

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 analyse 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 1I

Module 1

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: Fourier 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. M.C.Potter, J.L.Goldberg, Advanced Engineering Mathematics, Oxford University Press.
5. B.S.Grewal, Higher Engineering Mathematics: Khanna Publishers.

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 1302 PROBABILITY AND RANDOM PROCESS

Module I

Random Variables - Discrete and continuous random variables - Probability density functions and distribution functions - Mathematical Expectations - Properties - Mean and Variance -Joint moments, Moment-generating and characteristic functions and their applications, conditional expectation; covariance and correlation; independent, uncorrelated and orthogonal random variables, covariance matrix and properties- Central limit theorem. Some special distributions: Uniform, Gaussian and Rayleigh distributions; Binomial, and Poisson distributions; Multivariate Gaussian distribution. Vector-space representation of random variables, linear independence, inner product, Schwarz Inequality

Module II

Random processes - Classification of random processes and examples - Continuous random process - Discrete random process - Continuous random sequence - Discrete random sequence - Stationary process and evolutionary process - Strict sense stationary process - Wide sense stationary process - Auto correlation, auto covariance and cross correlation - Their relation, properties and problems - Poisson process - Mean, variance, autocorrelation of the Poisson process - Properties

Module III

Markov process - Classification of Markov process - Markov chain - Transition probability matrix. Ergodic process - Time average of random process - Power spectral density and its properties - Spectral representation of real WSS process - Wiener-Khinchin Theorem - Calculation of spectral density given the autocorrelation function

Module IV

Linear time invariant systems - WSS process as input, stationarity of the output, auto-correlation and power-spectral density of the output; examples with white-noise as input to the analog communication coherent & non coherent receiver (AM, FM & PM)

References:

1. Papoulis and S.U. Pillai , *Probability, random variable and stochastic processes* , Tata McGraw Hill, 4/e, 2002, ISBN-: 978-0071226615
2. Stark and Woods, *Probability and Random processes with Application to Signal Processing*, Pearson Education, 3/e,2002, ISBN 978-81-7758-356-4
3. Sam Shanmugam, *Random signals: Detection ,Estimation and Data analysis,* John Wiley,1/e, 1988, ISBN: 978-0-471-81555-6
4. F M Dekking , C K Kraaikamp, L E Meester , *A Modern Introduction to Probability and Statics Understanding Why and How,* Springer , 1/e ,2005 ,ISBN 978-1-85233-896-1
5. Leon Garcia, *Probability and Random process for Electrical Engineers*, Pearson Education ,2/e, 1994
6. Dougherty, *Random Process for Image and Signal Processing* , Prentice hall of India , ISBN: 81-203-2334-3
7. Wim C van Etten, *Introduction to random Signal and noise*, Wiley India, 1/e, 2005 ISBN 978-81-265-265-2163-0
8. Richard A. Johnson, Miller &Freud's, *Probability And Statistics For Engineers*, PHI Publications ,7/e , 2008, ISBN 978-01-3143-745-6
9. Peebles, *Probability Random Variables and Random signal principles*,TataMcGrawHill ,4/e, 200l

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC/EI 1303 NETWORK THEORY

Module I

Circuit concepts–Circuit elements and networks, classifications; Energy sources- Dependent, independent, ideal and practical sources; Standard signals and Waveforms – periodic and non periodic signals, alternating currents and voltages, Step function, Ramp function, Impulse function; complex impedance; Methods of Analysing Circuits – Node analysis, Mesh analysis; Source Transformations; Circuit Theorems- Superposition, Thevenin's, Norton's, Reciprocity, Maximum Power Transfer; Resonance – Series, Parallel, Q, Bandwidth.

Module II

Transients - DC and sinusoidal response of RL, RC and RLC circuits, Initial and final conditions, Rise and decay of current, Time constant; Laplace Transforms – Laplace transform of important Network functions; Application of Laplace Transforms in circuit analysis – circuit elements in S domain, Transient analysis of RL, RC, and RLC networks with impulse, step, exponential, pulse and sinusoidal inputs, Transfer function and Impulse function in circuit analysis; S domain analysis - complex frequency, transform impedance, Significance of poles and zeros, Restriction of poles and zeros in driving point and transfer functions, Ruth-Hurwitz criteria for stability of Network functions.

Module III

Characterization of two port networks using different parameters – Z, Y, Hybrid and Transmission parameters; Interconnections of two port Networks – Cascade, Series and Parallel, T and π representation of two port Networks; Passive filters – Filter fundamentals, Classification of Filters, Characteristic impedance, Transfer function, frequency response; Design of Constant K - Low Pass, High Pass, Band Pass & Band Reject Filters - T and π; Design of m derived Low Pass and High Pass filters - T and π ; Attenuators – T and π; Equalizers – Series and shunt.

Module IV

Realizability and Synthesis of passive networks – causality, stability, Hurwitz polynomial, Positive real functions, driving point immitance; Basic Philosophy of synthesis- removal of a pole at infinity, removal of a pole at origin, removal of conjugate poles, removal of a constant, Impedance and admittance functions, Foster's method, Cauer method.

References:

1. A. Sudhakar and Shyam Mohan. S. Palli, *Circuits and Networks: Analysis and Synthesis*, Tata McGraw Hill, 4/e,2010
2. W H Hayt, J E Kemmerly & S M Durbin, *Engineering Circuit Analysis*, Tata McGraw-Hill, 7/e, 2010.
3. D. Roy Choudhury, *Networks and systems*, New Age International,2/e, 2006
4. Smarajit Ghosh, *Network Theory: Analysis and Synthesis*, PHI publications, 6/e, 2010
5. Ravish.R.Singh, *Electrical Networks*, Tata McGraw Hill, 6/e, 2010
6. K Channa Venkatesh and D. Ganesh Rao, *Network Theory*, Pearson Education, 2/e, 2010.
7. VanValken Berg, *Network Analysis*, PHI publications, 3/e, 2010.
8. John.D.Ryder, *Networks, Lines and Fields*, PHI Publications,2/e,2010
9. DeCarlo / Lin, *Linear Circuit Analysis*, Oxford University Press, 2/e,2005
10. Franklin F.Kuo, *Network Analysis and Synthesis* ,Wiley India, 2/e, 2011

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

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 (up to 6 variables) and Quine - McClusky methods. Formation of switching functions from word statements, realisation using basic gates and universal gates.

Module II

Combinational circuits: Half adder, Full adder, Subtractor, Binary Parallel adder, Carry look ahead adder, BCD adder, multiplexer, demultiplexer, decoder and 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 table 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 Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC/EI 1305 SOLID STATE ELECTRONICS

Module I

Introduction to quantum mechanics, potential well problem, energy momentum relation for electrons in solids, effective mass and tunneling. Energy bands in solids, intrinsic and extrinsic semiconductors. Elemental and compound semiconductors.Fermi-diracdistribution.Equilibrium and steady state conditions, Equilibrium concentration of electrons and holes. Temperature dependence of carrier concentration.

Carrier transport in semiconductors – drift, conductivity and mobility, variation of mobility with temperature and doping, High Field Effects, Hall effect.

Excess carriers in semiconductors – Generation and recombination mechanisms of excess carriers, quasi Fermi levels, diffusion, Einstein relations. Continuity equations, Diffusion length - Gradient of quasi Fermi level.

Module II

PN junctions - Contact potential, Electrical Field, Potential and Charge Density at the junction, Energy band diagram, Minority Carrier Distribution, Ideal diode equation, Electron and hole component of current in forward biased p-n junction, piecewise linear model of a diode effect of Temperature on I-V characteristics. Diode capacitances, switching transients. - Zener and avalanche break down, Metal Semiconductor contacts, Ohmic and Rectifying Contacts, Hetero Junctions – Energy band diagram, Applications.

Module III

Field Effect Transistors: JFET - principle of operation, current equation, static I-V characteristics. MOS Capacitor – Ideal MOS Capacitor-MOS Electrostatics -accumulation, depletion & inversion- Energy Band Diagram, C-V characteristics, frequency effect- threshold voltage (derivation needed).

MOSFET- Basic structure and principle of operation, I-V characteristics, Derivation of Drain Current and device parameters.

Module IV

Bipolar junction transistor - current components, Minority Carrier Distributions basic parameters, relations between alpha & beta - comparison Ebbers - Moll model, Switching, Base width modulation, Avalanche multiplication in collector-base junction, Punch Through, Base resistance, Static I-V characteristics of CB and CE configurations-frequency limitation of transistor - transit time effect

References:

1. Ben G. Streetman: *Solid State Electronic Devices*, 5/e, Pearson Education. ISBN 9788120318403
2. Robert F. Pierret: *Semiconductor Device Fundamentals*, 4/e, Pearson Education. ISBN 0201543931
3. M.S.Tyagi: *Introduction to Semiconductor Materials and Devices*, John Wiley &Sons,2000 ,ISBN: 978-0-471-60560-7
4. Warner and Grung: *Semiconductor Device Electronics*, Holt Rinhalt& Winston, 1991, ISBN 9780030532382
5. S.M.Sze: *Physics of Semiconductor Devices*, Wiley India, **3/e**, ISBN: 978-0-471-14323-9
6. Y.P.Tsividis: *Operation and Modeling of the MOS Transistor*, McGraw Hill, 1986.
7. Jasprit Sing *Semiconductor Devices*, Wiley India, 1/e, 2001, ISBN 81-265-1102-8
8. Donald Neamen, *Semiconductor Physics And Devices* , Tata McGraw hill ,3/e ISBN: 9780072321074

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC/EI 1306 ELECTRONIC CIRCUITS I

Module I

Pulse characteristics - Pulse shaping using RC circuits, RC low pass- high pass-circuits, integrator and differentiator using RC, Diode circuits clipping & clamping circuits. Rectifiers - half wave, full wave, bridge - expression for ripple factor, efficiency, comparison, diode ratings. Filters - capacitor - inductor LC filters- use of bleeder resistor - voltage multipliers, DC power supply - simple voltage regulator using zener diode.

Module II

BJT Amplifiers: Units of gain, CE amplifier- Biasing techniques - stabilization of operating point -Temperature compensation techniques- low frequency equivalent circuits - r-parameters, h-parameters Methods of coupling - D.C coupled amplifier - CE RC coupled amplifier - loading effect at the input and output - emitter follower as Buffer stage- Darlington emitter follower - Boot strapping - frequency response of RC coupled amplifier - frequency analysis of R C coupled amplifier - lower cut-off frequency - upper cut-off frequency - 3 db bandwidth.

Module III

FET Amplifier: FET biasing- Low frequency equivalent circuit- RC coupled common source amplifier - expression for gain - frequency response - MOSFET V-I characteristics, load lines, small signal parameters, small signal equivalent circuits - Body effect - Biasing of MOSFETs amplifiers. Analysis of Single stage discrete MOSFET amplifiers – small signal voltage and current gain, input and output impedance of Basic Common Source amplifier, Common Source amplifier with and without source bypass capacitor, Source follower amplifier.

Module IV.

High frequency equivalent circuits of BJTs, MOSFETs, Miller effect, short circuit current gain, s-domain analysis, amplifier transfer function. Analysis of high frequency response of Amplifiers. Pulse response of amplifiers

Power amplifiers: Class A, B, AB and C circuits - efficiency and distortion. Biasing of class AB circuits. Transformer less power amplifiers.

References:

1. David A. Bell, *Electronic Devices and circuits*, Oxford University Press, 2008,5/e, ISBN 9780195693409
2. Sedra&Smith, *Microelectronic circuits*, Oxford University Press, 5/e, 2008, ISBN 0195116631
3. Milman&Halkias, *Integrated Electronics*, Tata McGraw Hill , 2/e, 2009, ISBN 9780070151420
4. Schilling &Belove, *Electronic Circuits, Discrete & Integrated*, Tata McGraw Hill, 3/e, 2002, ISBN9780070528987.
5. Allen Mottorshed, *Electronic Devices & Circuits*, Prentice Hall of India, 2003 ISBN: 978-81-203-0124-5
6. Boylsted&Nashelsky, *Electronic Devices and circuits*, Pearson Education/ PHI Ltd, 10/e,2009,ISBN 9788131727003
7. *2000 Solved problems in Electronics: Shaum series*, McGraw Hill, 1990
8. Milman&Taub, *Pulse Digital & Switching waveforms*, Tata McGraw Hill, 3/e, 2011 ISBN 97800710727247.
9. Paynter , *Introductory Electronics Devices and Circuits* , Pearson Education ,7/e, 2008,ISBN 9788131722817
10. Neamen Electronic Circuits 3/e, 2006, Tata McGraw hill, ISBN 9780070634336

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC/EI 13L1 BASIC ELECTRONICS LABORATORY

1. Characteristics of Diodes & Zener diodes
2. Characteristics of Transistors (CE & CB)
3. Characteristics of JFET
4. Frequency responses of RC Low pass and high pass filters. RC Integrating and Differentiating Circuits
5. Rectifying circuits
   i) HW rectifier ii) FW rectifier iii) FW Bridge rectifier
   iv) Filter circuits - Capacitor filter, inductor filter and Pi section filter
6. Zener Regulator with & without emitter follower.
7. Biasing of Active devices
   i) Voltage biasing, current biasing and Feedback biasing of BJT
   ii) Biasing of JFET
8. Clipping and clamping circuits

Note : 50 % marks is earmarked for continuous evaluation, and 50 % marks for end semester examination to be assessed 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.

EC/EI 13L2 DIGITAL ELECTRONICS LABORATORY

1. Half adder and full adder using standard logic gates / NAND gates.
2. Code converters - Binary to Gray and gray to Binary with mode control
3. Binary addition and subtraction (a) 1's complement (b) 2's complement(using 7483)
4. BCD adder using 7483.
5. Study of MUX, DeMUX &Decoder Circuits and ICs
6. Set up R-S JK & JK Master slave flip flops using NAND/NOR Gates
7. Asynchronous UP / DOWN counter using JK Flip flops
8. Design and realization of sequence generators.
9. Study of shift registers and Implementation of Johnson and Ring counter using it.
10. Study of IC counters 7490, 7492, 7493, 74163 and 74192 or the CMOS equivalent.
11. Study of seven segment display and decoder driver (7447).
12. Astable and monostable multi- vibrators using TTL gates
13. Transfer characteristics and specifications of TTL gates
14. Block level system design in Simulink® / LabVIEW environment
15. Simple experiments using VHDL tools.

References:

1. Herbert Taub, Donald Schilling , *Digital Integrated Electronics*, Tata Mc Graw Hill, 1/e, 2008, ISBN: 9780070265080
2. Soumitra Kumar Mandal, *Digital Electronics, Principles and applications*, Tata Mc Graw Hill, 2/e, 2011, ISBN 0070153825

Note : 50 % marks is earmarked for continuous evaluation, and 50 % marks for end semester examination to be assessed 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 1

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, sin z, cosz, sin hz, and Cos hz, 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, Wiley Eastern.
4. Churchill R.V, Complex Variables & Applications, Mc-Graw Hill.
5. M.C.Potter, J.L.Goldberg. Advanced Engineering Mathematics, Oxford University Press.
6. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers.

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 1402 MICROPROCESSORS: ARCHITECTURE AND PROGRAMMING

Module I

Introduction to microprocessors: Microcomputers and microprocessors, 8/ 16/ 32/ 64-bit microprocessor families. Internal architecture of Intel 8086 microprocessor: Block diagram, Registers, Internal Bus Organization, Functional details of pins, Control signals, External Address / Data bus multiplexing, De-multiplexing, Memory Address space and data organisation, Memory segmentation and segment registers, IO Address space.
Basic 8086/8088 configuration, Minimum mode and maximum mode. Comparison of 8086 and 8088.

Module II

Instruction set and Assembly language Programming of 8086: Instruction set, Instruction Classifications, addressing modes, Assembler Directives, Strings, Procedures and Macros
Assembly language Program development tools: editor, assembler, linker, locator, debugger and emulator.

Module III

Interfacing concepts and devices: Memory interface: Concept of memory chip/ chips interface to 8086 with examples Direct Memory Access (DMA) data transfer Programmable interfacing devices: - Programmable peripheral interface (Intel 8255), Programmable timer interface (Intel 8253/ 54) -Block diagram and modes of operation .Hardware and Software aspects of Interfacing these peripherals to 8086. 8087 Numeric coprocessor interface.

Module IV

Multiuser /Multitasking operating system concepts and the need for protection.
Introduction to 80386: Architecture of 80386, Real and protected modes of operation, Virtual memory, Address translation with Segmentation and Paging, Virtual 8086mode.
RISC architecture, Instruction Level Parallelism- concept and limitations-Pipelining and Superscalar architecture, Branch Prediction, Intel MMX architecture, VLIW architecture, NetBurst microarchitecture, Multicore Processing, Hyper threading technology, Trusted Execution Technology(TXT) - concepts

References:

1. Lyla B.Das, *The x86 Microprocessors:Architecture,programming and Interfacing (8086 to Pentium*), Pearson Education,2010, ISBN:9788131732465
2. Douglas V.Hall, *Microprocessors and interfacing, Programming and Hardware,* Tata Mc Graw Hill,2/e,2006, ISBN: 9780070601673
3. Barry B Brey, *The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, and Core2 with 64-bit Extensions*, Pearson/ Prentice Hall, 8/e, 2009, ISBN 0135026458/ 9780135026458.
4. John L Hennessy , David A Patterson, *Computer Architecture , A Quantitative approach,* Elsevier Inc 5/e,2012, **ISBN 9780123838728**
5. A K Ray and K M Bhurchandi, *Advanced Microprocessors and peripherals,* Tata Mc Graw Hill, 2/e, 2009, ISBN 9780070140622
6. Krishna Kant, *Microprocessors and Microcontrollers, Architecture, Programming and System Design 8085,8086,8051,8096*, Prentice Hall India,1 /e, 2008, ISBN: 9788120331914
7. Sunil Mathur, *Microprocessor 8086:Architecture, Programming and Interfacing,* Prentice Hall India ISBN - 9788120340879

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC/EI 1403 ELECTRONIC CIRCUITS II

Module I

Differential Amplifiers - BJT differential pair, large signal and small signal analysis of differential amplifiers, Input resistance, voltage gain, CMRR, non-ideal characteristics of differential amplifier. Frequency response of differential amplifiers, MOS differential amplifiers.

Current sources, Active load, cascode load, current mirror circuits, Wilson current mirror circuits. Small signal equivalent circuits, multistage differential amplifiers.

Module II

Feedback amplifiers - Properties of negative feedback. The four basic feedback topologies-Series-shunt, series-series, shunt-shunt, shunt-series. Analysis and design of discrete circuits in each feedback topologies - Voltage, Current, Tran conductance and Tran resistance amplifiers, its loop gain, input and output impedance., Stability of feedback circuits. Effect of feedback on amplifier poles, frequency compensation-Dominant pole and Pole-zero.

Module III

Low frequency Oscillators: Barkhausen criterion, RC phase shift and Wien bridge oscillators - analysis. High frequency oscillators- Hartley, Colpitts, Crystal oscillators and UJT Oscillators.

Astable, Monostable and Bistable multivibrators, Schmitt trigger - analysis. Sweep circuits- Bootstrap, Miller sweep and current sweep circuits - analysis.

Module IV

Internal block schematic of analog IC (op amp) -Biasing used in IC- Constant current source- Current mirror Circuits- Active Load – Level Shifters- Power amplifier stages. Open loop gain input- output impedance & bandwidth calculation using small signal equivalents. Frequency compensation and slew rate.

References:

1. Sedra&Smith, *Microelectronic circuits*, Oxford University Press, 5/e, 2008, ISBN 0195116631
2. Millman&Halkias, *Electronic Devices & Circuits*, Tata McGraw Hill,3/e, 2010, ISBN 9780070700215
3. Gaykwad , *Op-amps and Linear integrated Circuits*, Pearson Education/ Prentice-Hall India Ltd, 4/e,2010,ISBN: 978-81-203-2058-1
4. Schilling &Belove, *Electronic Circuits, Discrete & Integrated* , 3/e, 2002, Tata McGraw Hill, ISBN9780070528987.
5. Jacob Milman&Taub, *Pulse Digital & Switching waveforms*, 3/e, 20011, Tata McGraw Hill ISBN 97800710727247.
6. Jacob Millman & Arvin, *Micro Electronics*, 2/e, 1999, McGraw Hill ISBN 9780074637364
7. Gray, *Analysis and Design of Analog Integrated Circuit*, John Wiley, 4/e, ISBN 9788126515691.
8. Paynter , *Introductory Electronics Devices and Circuits* 7/e,2008,Pearson Education ISBN 9788131722817
9. Horenstein, *Microelectronics Circuits & devices*, Prentice-Hall India, 2/e,2009,ISBN: 978-81-203-1135-0

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC/EI 1404 SIGNALS AND SYSTEMS

Module I

Continuous time (CT) and Discrete time (DT) Signals -Transformations of the independent variable- exponential and sinusoidal - unit step and impulse functions / sequences – Classification of signals - CT and DT Systems - Properties of systems - Linear time-invariant (LTI) systems – The representation of signals in terms of impulses - convolution - Properties of LTI systems - Singularity functions – LTI Systems described by differential and difference equations and calculation of impulse responses.

Module II

Sampling – Introduction - Representation of a continuous-time signal by its samples - the sampling theorem -The effect of under sampling: aliasing - Sampling with a zero-order hold - Reconstruction of a signal from its samples using interpolation - Sampling of discrete-time signals - Discrete-time decimation and interpolation – Laplace transform - The region of convergence for Laplace transforms - The inverse Laplace transform - Properties of the Laplace transform - Analysis and characterization of First-order and second-order LTI systems using the Laplace transform.

Module III

Fourier Series and Transforms - The response of continuous-time LTI systems to complex exponentials - Fourier series representation of Continuous time periodic signals - Convergence of Fourier series – Properties - Continuous-time Fourier transform representation of Aperiodic signals – Fourier transform of periodic signals - Properties - Fourier transform and Fourier series pairs - the discrete-time Fourier series - Properties - Discrete-time Fourier transform - Properties of Discrete-time Fourier transform - Properties .

Module IV

The z-transform- The region of convergence – Pole zero plot - Properties of the z-transform - Inverse z-transform (partial fraction method) - Analysis and characterization of LTI systems using z-transforms - System function – Introduction to Linear feedback systems - Some applications and consequences of feedback - Root - locus analysis of linear feedback systems.

References:

1. Alan V Oppenheim, Alan S Willsky, *Signals and Systems*. Prentice Hall India ,2/e,2010
2. S.S. Soliman, M.D. Srinath, *Continuous and Discrete signals and systems*, Prentice Hall India, 2/e, 2004.
3. C.L. Phillips, J.M. Parr, E.A. Riskin, *Signals Systems and Transforms*. Pearson Education, 4/e, 2008.

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC1405 COMMUNICATION ENGINEERING I

Module I

Introduction to continuous wave modulation - needs of modulation - Amplitude modulation - modulators, spectrum, Demodulation. DSBSC signals - spectrum, modulators, demodulators. SSB signals-spectrum, modulators demodulators - VSB – AM receivers – TRF receivers, Super heterodyne receiver, Double Super heterodyne receiver – SSB receiver.

Module II

Angle modulation-FM &PM - mathematical analysis, principles, waveforms, frequency deviation, frequency analysis, bandwidth requirement, phasor representation, Transmission bandwidth. Generation of FM. FM receivers-block diagram– demodulators – Tuned circuit frequency discriminators, slope detector, balanced slope detector

Module III

Noise: White noise, Narrow band noise, effective noise temperature and noise figure representation Sine wave contaminated with narrow band noise. Effect of noise in Systems; eg: Linear and angle modulation systems, threshold effect and threshold extension, pre-emphasis and de-emphasis filtering.

Module IV

Sampling Process: Sampling theorem, Interpolation Formula, Quadrature sampling of band pass signals, Reconstruction of a message process from its samples, signal distortion in sampling, practical aspects. PAM, PPM, PWM, Multiplexing- TDM, FDM. Frequency domain analysis

Waveform Coding Techniques: PCM, Quantization Noise & Signal to noise ratio, effect of sampling on quantization noise, uniform and nonuniform quantization companding- A Law and μ Law characteristics DPCM, Delta Modulation.

References:

1. B. P. Lathi, *Modern Digital and Analog Communication Systems*, Oxford University Press, 3/e,2009
2. Bruce Carlson &Crilly, *Communication Systems*. Tata McGraw Hill ,5/e, 2011
3. Simon Haykin, *Communication Systems*, Wiley India, 4/e, 2010
4. George Kennedy, *Electronic communication systems*, McGraw Hill ,5/e,2011
5. Robert J Schoenbeck, *Electronic Communications Modulation & Transmission*, PHI Ltd, 2/e,2009,
6. Wayne Tomasi, *Electronic Communications Systems (Fundamentals through Advanced)*, Pearson Education ,5/e,2008
7. Taub & Schilling, *Principles of Communication Systems*, Tata McGraw Hill, 3/e,2007
8. Roddy&Coolen, *Electronic Communications*, Pearson Education/ Prentice-Hall India Ltd 4/e, 2008
9. Ziemer ,*Principles of Communication : System modulation and noise* 5/e, Wiley India
10. P Ramakrishna Rao ,*Analog Communication*, Tata McGraw Hill,1/e, 2011

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 1406 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, Flip flop modules, Analysis of network with flip flops, Design of networks with flip flops

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, 1998
2. John F Wakerly, *Digital Design: Principles & Practices*, Pearson Education, 4/e, 2008
3. John M.Yarbough, *Digital Logic Applications and Design*, Thomson Learning, 1/e, 1991

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC14L1 MICROPROCESSOR LABORATORY

1. Introduction to DEBUG program commands
   - Examining and modifying the contents of the memory
   - Assembling 8086 instructions with the ASSEMBLER commands
   - Executing 8086 instructions and programs with the Trace and GO Command.
   - Debugging a program
2. Assembly language program development using IBM/PC Macro assembler
   - Creating an Assembler source file
   - Assembling source program with MASM
   - The link program - creating a RUN module
   - Typical programming examples (at least 15 no's)
3. Familiarization of a typical 8086 microprocessor trainer kit and its operation
4. Stepper motor/DAC/ADC/Display interface to 8086

References:

1. Peter Abel, Niyaz Nizamuddin, *IBM ®PC Assembly language and Programming*, Prentice Hall India ,5/e , 2001, ISBN: 9788120320949
2. Lyla B.Das, *The x86 Microprocessors:Architecture,programming and Interfacing (8086 to Pentium*), Pearson Education,2010, ISBN 978-81-317-3246-5

Note : 50 % marks is earmarked for continuous evaluation, and 50 % marks for end semester examination to be assessed 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.

EC 14L2 ELECTRONIC CIRCUITS LABORATORY I

1. Amplifying circuits
   (i) Simple common emitter amplifier configuration - gain and bandwidth.
   (ii)Common source amplifier
   Functions of each component, gain measurement, frequency responses
2. Feedback amplifier circuits - Current series and voltage shunt - gain and bandwidth
3. Oscillators - RC phase shift. WeinBridge, crystal oscillator
4. Multivibrators - Astable, Bistable, Monostable
5. Switch& Sweep circuits - Simple transistor sweep, bootstrap sweep
6. Power amplifiers.
7. SPICE: Simulation of experiments listed above using SPICE
   (*It is desirable to carry out the implementation followed by simulation*)

Note : 50 % marks is earmarked for continuous evaluation, and 50 % marks for end semester examination to be assessed 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. A. Papoulis, Probability, Random Variables and Stochastic Processes, Mc-Graw Hill.

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 1502 ELECTROMAGNETIC THEORY

Module I

Vector Analysis : Vector Algebra, Coordinate Systems and Transformation – Cartesian, Cylindrical and spherical coordinates, Vector Calculus – Differential length, area and volume, Line, surface and volume integrals, Del operator, Gradient of a scalar, Divergence of a vector, Divergence Theorem, Curl of a vector, Stoke's Theorem, Laplacian of a scalar.

Module II

Electrostatics: Electrostatic Fields – Coulomb's Law and field intensity, Electric fields due to continuous charge distributions, Electric flux density, Gauss's Law, Applications of Gauss's Law, Electric Potential, Relationship between E and V, Electric dipole, Energy density in Electrostatic fields.

Electric fields in material space – Properties of materials, Convection and conduction currents, Conductors, Polarization in Dielectrics, Dielectric constant and strength, Continuity equation, relaxation time, Boundary conditions; Electrostatic Boundary value problems–Poisson's and Laplace's Equations, Uniqueness Theorem, Resistance and capacitance [Parallel-plate, coaxial, spherical capacitors].

Module III

Magnetostatics and Maxwell's equations: Magnetostatic fields – Biot-Savart's Law, Ampere's circuital law, Applications of Ampere's circuital law, Magnetic flux density, Magnetic scalar and vector potentials. Magnetic forces, Materials and devices – Forces due to magnetic fields, Magnetic torque and moment, Magnetic dipole, Magnetization in materials, Classification of Magnetic Materials, Magnetic boundary conditions, Inductors and inductances, Magnetic energy, Magnetic circuits. Faraday's Law, Displacement current, Time-harmonic fields, Maxwell's equations for static fields and time varying fields.

Module IV

Electromagnetic wave propagation : Electromagnetic waves-Wave propagation in lossy dielectrics- Wave equations, propagation constant, intrinsic impedance of the medium, complex permittivity, loss tangent, Plane waves in lossless dielectrics, Plane waves in free space – uniform plane wave, Plane waves in good conductors – skin effect, Poynting vector, Poynting's Theorem, Reflection of a plane wave at normal incidence – standing waves, Reflection of a plane wave at oblique incidence – parallel and perpendicular polarization, Brewster angle.

References:

1. Matthew N. O. Sadiku, *Principles of Electromagnetics*, 4/e, International version, Oxford University press.2009.
2. W.H.Hayt, and J.A.Buck, *Engineering Electromagnetics*, Tata McGraw Hill, 7/e, 2011.
3. Jordan and Balmain, *Electromagnetic waves and radiating systems*, PHI Ltd, 2/e,2010
4. Kraus and Fleisch, Electromagnetics with applications, Tata McGraw Hill, 5/e, 2010.
5. Joseph A. Edminister, *Electromagnetics*, Schaum series - Tata McGraw Hill, 2/e, 2011.
6. W.H.Hayt, and J.A.Buck, *Problems and solutions in Electromagnetics*, Tata McGraw Hill, 7/e, 2011.
7. Lonngren, Fundamentals of Electromagnetics with Matlab, PHI Ltd, 2/e, 2007.
8. Umran.S.Inan and Aziz.S.Inan, *Engineering Electromagnetics*, Pearson Education, 2010.
9. Bhag Guru & Huseyin Hiziroglu *Electromagnetic Field Theory Fundamentals*, Cambridge,2/e 2010

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC1503 EMBEDDED SYSTEMS

Module 1

Overview of Embedded System: - Embedded System, Categories of Embedded System, Requirements of Embedded Systems, Challenges and Issues in Embedded Software Development, major application areas of embedded system. Typical embedded system- Core of the embedded system, memory, sensors and actuators, Communication Interface, reset circuit, Brown-out protection circuit, oscillator circuit, Watchdog timer .Overview of the 8051 family. 8051 architecture- memory organization, registers and I/O ports. Addressing modes, instruction sets, and assembly language programming. Programming timer/counter. Interrupts- handling and programming. Introduction to C programming in 8051.

Module II

8051 interfacing - keyboard, stepper motor, ADC, DAC, and LCD module interface. Applications - frequency counter and temperature measurement. Bus architectures & protocol of I2C, SPI, CAN, RS232.

Module III

Memory-Technology & devices -Flash memory-NAND Flash -NOR Flash-DRAM-SDRAM/ DDR/ DDR2. Introduction to embedded CPUs: Basic architecture of ARM core family-features of ARM 926EJS core. Basic architecture of MSP430-features of MSP430.

Module: IV

Introduction to embedded firmware & operating systems: Boot loader -Realtime kernel-Embedded OS- Tasks, Processes and Threads, Multiprocessing and Multitasking, Task scheduling, Task communication and synchronisation, Device Drivers.

References:

1. Shibu K.V, Introduction to Embedded Systems, Tata McGraw Hill, 2009
2. Dr. K Uma Rao, Dr.Andhe Pallavi ,*The 8051 and MSP430 Microcontroller Architecture Programming and Applications,*Pearson,2010
3. Rajkamal, *Microcontrollers - Architecture, programming, Interfacing and system Design,* Pearson Education, 2005
4. Daniel W. Lewis, *Fundamentals of Embedded Software where C and Assembly Meet,* PHI Ltd, 2003
5. Steve Heath, *Embedded system design second edition ,* Elsevier,2/e,2002
6. Kantha Rao, *Embedded systems,* PHI, ISBN: 978-81-203-4081-7
7. Subrata Ghoshal, *8051 Microcontroller internals,instructions, programming and Interface,* Pearson, ISBN: 9788131731437
8. Steve Furber, *ARM System on Chip Architecture,* Pearson ,2/e,2009
9. Andrew Sloss, Dominic Symes , Chris Wright -*ARM Developers Guide, Designing & Optimizing system software*
10. Tammy Noergaard, *Embedded System Architecture , A comprehensive guide for Engineers and Programmers,* Elsevier ,2005, ISBN-10: 0750677929, ISBN-13**:** 978-0750677929

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC1504 COMMUNICATION ENGINEERING II

Module I

Introduction: Digital communication system, Complex baseband representation of signals, Gram-Schmidt orthogonalisation procedure. M-ary orthogonal signals. Modulation: Carrier modulation (M-ary ASK, PSK, FSK, DPSK), Continuous phase modulation (QPSK and variants, MSK, GMSK). Band width required – Generation.

Module II

Receiver: Coherent and non-coherent demodulation: Matched filter, Correlator demodulator, square-law, and envelope detection Detector, Optimum rule for ML and MAP detection Performance: Bit-error-rate, symbol error rate for coherent and non coherent schemes. Probability of error of binary DPSK – Performance of M-ary signaling schemes in AWGN channels.

Module III

Base band data transmission Line codes-NRZ, RZ, Phase encoded, Multilevel binary. Band-limited channels: Pulse shape design for channels with ISI: Nyquist pulse, Partial response signaling, Channel with distortion: Zero forcing Equalizer- Decision Feedback Equalizer-Preset and Adaptive Equalizer- Scrambling and descrambling. Different synchronization techniques -Early-Late Gate, MMSE, ML and spectral line methods, Carrier, symbol timing.

Module IV

Fundamental concepts of spread spectrum systems-pseudo noise sequence-performance of direct sequence spread spectrum systems-analysis of direct Sequence spread spectrum systems- the prosing gain and anti jamming margin-frequency hopped spread spectrum systems –time hopped spread spectrum systems-time synchronization.

References:

1. Bernard Sklar, *Digital Communication Fundamentals and applications* ,Pearson education , 2/e,2009
2. John P Proakis & Salehi, *Digital Communication*, 5/e, 2008, McGraw-Hill. ISBN 97800-70591172
3. B. P. Lathi, *Modern Digital and analog Communication Systems*, Oxford University Press, 4/e
4. Krzysztof Wesolowski, *Introduction to digital Communication* Systems ,Wiley India 2009
5. Hwei Hsu, Schaum's Outline, *Analog and Digital Communications*, McGraw Hill, 1/e, 2009.
6. M Rice, *Digital Communication*, , Pearson education,3/e, 2009
7. J B Andreson, *Digital Transmission Engineering* ,2/e, 2005,Wiely India

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC/EI 1505 ANALOG AND INTEGRATED CIRCUITS

Module I

Introduction to operational amplifiers Op-amp parameters - ideal op amp Frequency response, frequency compensation. Slew rate and its effect; Input bias current –offset - drift - compensating networks CMRR, SVRR, finite gain bandwidth and its effect in opamp circuits' performance.

Open loop configurations Op amp in closed loop configuration: Different feed back configurations- Voltage series feedback and voltage shunt feedback - concept of virtual ground- linear circuits: Summer- Subtractor, Integrator and differentiator voltage follower - V/I converters, I/V converters and its applications - Differential 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

Module II

Op amp applications- Log amplifier- Antilog amplifier- Comparators: zero crossing- using voltage reference- regenerative (Schmitt trigger) comparators, window detector application – OPAMP as comparators - Astable and monostable multivibrators- Triangular and saw tooth wave generators- - RC phase shift and Wien bridge oscillators- Sample and hold circuit- Peak detector circuit. Precision rectifiers.

Module III

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 - Filter using Simulated Inductance - Universal Active Filters - All Pass filters. Switched Capacitive Filters. ADC and DAC - performance specification - weighted, R-2R, successive approximation, flash, integrating.

Module IV

Specialized ICs and applications: Voltage regulator IC 723, current limiting, short circuit protection, Thermal protection -555 timers – Functional block diagram- AstableMultivibrator, MonostableMultivibrator and its applications.- 566 VCO chip- Phase locked loop (PLL) - block diagram, Mathematical Derivation of capture range, lock range and pull in time capture and lock range- 565 PLL - PLL applications: Frequency multiplication and division- AM demodulation - FM detection - FSK demodulation Analog multiplier circuits and applications.

References:

1. Gray, *Analysis and Design of Analog Integrated Circuit,* John Wiley, 4/e, ISBN 9788126515691.
2. D A Bell, *Opamps and Linear integrated Circuits,* Prentice-Hall India ,2/e
3. Sedra&Smith, *Microelectronic circuits,* Oxford University Press, 5/e, 2009, ISBN :0195116631
4. Jacob Millman & Arvin , *Micro Electronics* , McGraw Hill 1999,ISBN: 9780074637364
5. K R Botkar, *Integrated circuits,* Khanna Publishers, 9/e
6. R F Coughlin ,*Op amps and Linear Integrated circuits* , Pearson Education/ PHI Ltd, 6/e,2010
7. SargioFranko, *Design with operational Amplifiers Analog IC*s, Tata McGraw Hill, 3/e, 2003, ISBN :9780070530447
8. Gaykwad, *Op-amps and Linear integrated Circuits,* Pearson Education/ Prentice-Hall India Ltd, 4/e,2010
9. Razavi ,*Fundamentals of Microelectronics,* Wiley India, ISBN: 9788126523078

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC/EI 1506 DIGITAL SIGNAL PROCESSING

Module I

Discrete Time Fourier Transform (DTFT) – Properties - Discrete Fourier Transform (DFT) – Properties – circular convolution – Linear convolution – Efficient computation of DFT : Fast Fourier Transform (FFT) – Decimation in Time (DIT) – Decimation in Frequency (DIF) – practical considerations - Discrete Hilbert transforms - Introduction to Discrete Hilbert Transforms, DCT, STFT, Wavelet Transform.

Module II

Finite Impulse Response (FIR) Filters – Basic structures – direct, cascade, linear phase, frequency sampling and lattice - Design of FIR filters – Fourier series truncation – Windowing: Rectangular, Bartlett - Blackman – Hanning - Hamming – Frequency Sampling – Finite register length effects - Application of FIR filters.

Module III

Infinite Impulse Response (IIR) Filters – Basic structures : Direct form I & II , cascade and Parallel – Design of IIR Filters – Butterworth – Chebyshev - Impulse Invariance – Bilinear Transformation – Frequency transformations – Finite register Length effects – Applications of IIR Filters – Dual Tone multi frequency generation and detection.

Module IV

General and Special purpose Digital Signal Processors –Harvard architecture – Pipelining – Hardware Multiplier Accumulator -Special Instructions - Fixed and Floating Point Processors – TMS320C54X –Architecture – Instruction set - Addressing modes –- TMS320C67X – Architecture - Instruction set Addressing modes .

References:

1. Oppenheim, Alan V, and Ronald W. Schaffer., *Discrete Time Signal Processing*, Prentice Hall / Pearson Education 2/e,1989
2. Sen M.Kuo, Woon-Seng Gan, *Digital Signal Processors: Architectures, Implementations, And Applications*, Pearson Education, 2005
3. Emmanuel C. Ifeachor & Barni W.Jerris, *Digital Signal Processing ,a practical approach*, Pearson education,2/e,2002
4. John G Proakis & Dimitris G Manolakis , *Digital Signal Processing*, Pearson education,4/e,2007
5. Andreas Antoniou , *Digital Filters Analysis & Design*, Prentice Hall India , 2/e,2000

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 15L1 MINI PROJECT

Each batch comprising of 3 to5 students shall design, develop and realize an electronic product. 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 weight.

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.*

EC 15L2 ELECTRONIC CIRCUITS LABORATORY II

1. Linear circuits
   Circuits using OP- Amps - Inverting & non inverting amplifiers , Summing Amplifier, Differential Amplifier, Instrumentation Amplifier, Integrators & Differentiators , Measurements of offset voltage and its compensation. Precision rectifiers

2. Circuits using op-amps for waveform generation
   i) Astable, monostable multivibrators.
   ii) Wein bridge oscillator
   iii) Triangular, Saw tooth waveform generators

3. Second order Active RC filters: High pass, Low pass

4. Astable and monostable multi-vibrator circuit using 555

5. Voltage regulator using 723

6. Filters using simulated inductance

7. SPICE: Simulation of experiments listed above using SPICE

   (*It is desirable to carry out the implementation followed by simulation*)

Note : 50 % marks is earmarked for continuous evaluation, and 50 % marks for end semester examination to be assessed 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

EC 1601 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Module I.

Introduction- Measurements- Monitoring, Control, Analysis. Instruments- Transducer, Signal Conditioner and Transmitter, Display/Recording Devices. Static characteristics of Instruments. Estimation of Static errors and reliability-errors, types of errors, probability of errors, limiting errors, Reliability Principles. Dynamic characteristics of Instruments- Transfer function-Zero, first and second order instruments-Dynamic response of first and second order Instruments.

Module II.

Transducers and Sensors: Transducers- active and passive, Magnetic effect based Transducers. - Selection Criteria-Smart Sensors and IEEE 1451 Standard. Temperature measurements-RTD, Thermocouples. Displacement Measurement- Strain Measurement-Pressure Measurement- Measurement of acceleration, force, and Torque. LVDT. Piezo-electric transducers. Bridge measurements:-dc bridges for low, medium and high resistance-ac bridges for capacitance and inductance. Sources of error in bridge circuits- Precautions. Vector impedance meter. Multimeters: - Principles of analog and digital multimeter.

Module III.

Signal generators: - Sine-wave Generators-AF and RF Signal Generators- Non-sinusoidal Generators, Function generator- Sweep frequency generator- Frequency synthesizers. Digital Signal Generators- Arbitrary Wave form Generator, Arbitrary Function generator, Data Generator. Signal analyzers-Wave Analyzer –Harmonic Distortion Analyzer, Spectrum Analyzer. FFT Analyzer, Vector Analyzer, Logic Analyzer. Digital storage oscilloscope (DSO).Recording instruments- Strip chart recorders, x-y- recorders.

Module IV.

Industrial Instrumentation: Basis of Pressure measurements, Flow measurements and Level Measurement. Data Acquisition System- Telemetry- characteristics and different types. Industrial Communication Techniques-OSI Net Work Model, Network Topologies, Interface Standards- RS 232, RS 422, RS 423, RS 485, IEEE 488 (GPIB), HART, Ethernet or CSMA/CD. Virtual instrumentation Systems- What It is, Problem to Tackle. Instrumentation in Hazardous Areas.

References:

1. Arun K Ghosh, Introduction *to Measurements and Instrumentation,* PHI Learning Pvt.Ltd, 3/e, 2010.
2. M.M.S Anand, *Electronic Instruments and Instrumentation technology*, PHI Learning Pvt.Ltd, India, 2010.
3. Oliver-Cage, *Electronic Measurements and Instrumentation*, Tata McGraw Hill,2008
4. Albert D.Helfrick and W.D.Cooper, *Modern Electronic Instrumentation and Measurement Techniques,* PHI Learning Pvt.Ltd, 2011.
5. H S. KALSI, *Electronic Instrumentation*, Tata McGraw Hill,3/e
6. D. Patranabis ,*Principles of Industrial Instrumentation,* Tata McGraw Hill,3/e,2010
7. K. Padmanabhan, S. Ananthi, *A Treatise on Instrumentation Engineering*, Ik International, Pvt. Ltd.
8. C.S. Rangan, G.R. Sharma ,*VSV Mani, Instrumentation Devices and Systems* , Tata McGraw Hill, 2/e,2001
9. D. Patranabis, Principles *of Industrial Instrumentation*, PHI Learning Pvt.Ltd, 1/e, 2011.
10. BC. Nakara, KK Chaudhary, *Instrumentation Measurements and Analysis.* Tata McGraw Hill.
11. Ernest O Doebelin,Dhanesh N Manik,*Doeblins's Measurements System*,6/e,2011,McGrawHill

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 1602 MICROWAVE TECHNIQUES AND DEVICES

Module I

Introduction to microwaves - frequency range, significance, applications; Guided waves: TE, TM, TEM waves, Velocities of propagation; Transmission line theory: Lumped element circuit model, Transmission line parameters, Transmission Line equations, Characteristic impedance, Input impedance of a Lossless Line, short circuited and open circuited lines, Standing Waves, Reflection Coefficient, VSWR, Impedance matching devices – Quarter wave transformer, Stub matching, Smith Chart and its applications; Waveguides - Rectangular Waveguide: TE waves, TM waves, dominant and degenerate modes, Impossibility of TEM waves in wave guides; Excitation of modes in Rectangular Waveguides; Planar Transmission lines: Strip lines, Microstrip lines, Slot lines and Coplanar lines.

Module II

Scattering matrix - Concept of N port scattering matrix representation - Properties of S matrix- S matrix formulation of two-port junction; Microwave Passive devices - Tee junctions – E plane Tee, H plane Tee, Magic Tee, Rat race, Two hole directional coupler, Isolator, Circulator, Phase shifter, Attenuator, Power divider; S matrix of E plane Tee, H plane Tee, Magic Tee, Directional coupler, Circulator only; Microwave Resonators: Transmission line resonators – $\lambda/2$ and $\lambda/4$ resonators, Rectangular and Circular Cavity resonators - Resonant frequency and Q factor, Cavity excitation and tuning, Coupled cavities; Microstrip resonators – Disc and ring resonators

Module III

Microwave filters – Filter implementation at Microwave frequencies, Low Pass Butterworth and Chebyshev Filter design by Insertion loss method and implementation using discrete components, Design of Stepped impedance Butterworth and Chebyshev Low Pass filters.

Microwave measurements and applications**:** Measurement of Power, VSWR, frequency, wavelength, insertion loss, impedance and attenuation; Basic concepts of Network Analyzer and Anechoic chamber; Applications of Microwaves - ISM applications, Microwave radiation hazards.

Module IV

Solid state microwave devices:- Diodes – Principle of operation and applications of Crystal diode, PIN diode, Varactor diode, Tunnel diode, Gunn diode and Avalanche Transit time devices; Basic principle of operation of parametric amplifiers, Manley-Rowe power relations, Negative resistance amplifiers; Microwave tubes - High frequency limitations – Structure and Principle of operation of Two Cavity Klystron, Reflex Klystron, Traveling Wave Tube Amplifier, Magnetron Oscillator (detailed mathematical analysis not needed), Characteristics of Microwave Transistors – FET and BJT.

References:

1. David.M. Pozar, *Microwave Engineering*, John Wiley, 2/e, 2003.
2. Samuel Y Liao, *Microwave Devices & Circuits*, Pearson Education, 3/e, 2003.
3. Jordan and Balmain, *Electromagnetic waves and Radiating systems*, PHI Ltd, 2/e, 2010.
4. Peter A. Rizzi, *Microwave Engineering – Passive circuits*, PHI Ltd, 1/e, 2010.
5. Robert E. Collin, *Foundations for Microwave Engineering*, Wiley India, 2/e, 2009.
6. Annapurna Das and Sisir K Das, *Microwave Engineering*, Tata McGraw Hill, 2/e, 2009.
7. Herbert J.Reich, *Microwave Principles*, Affiliated East-West Press Limited.

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 1603 VLSI DESIGN

Module I

VLSI process integration: fundamental considerations in IC processing - NMOS IC technology - CMOS IC technology- n-well process, p-well process, twin-tub process, silicon on insulator - Ion implantation in IC fabrication.

Second order MOS device effects: short-channel effect, narrow width effect, sub-threshold current, field dependent carrier mobility, device saturation characteristics, drain punch through, hot electron effect.

Module II

Switch logic- pass transistors and transmission gates, Gate logic - The basic inverter using NMOS - pull up to pull down ratio- transfer characteristics- Alternate forms of pull up. CMOS logic – inverter, NAND, NOR, 0 compound gates - CMOS inverter DC characteristics. Design rules and Layout of static MOS circuits: general principles & steps of lay-out design - use of stick diagrams – NMOS and CMOS design rules - Layout examples of inverter, NAND and NOR - Interlayer contacts, butting and buried contacts - use of layout tools like MICROWIND for integrated circuits.

Module III

Circuit characterization and performance estimation: resistance estimation - sheet resistance, capacitance estimation - Switching characteristics of CMOS inverter- rise time, fall time, delay time, delay unit, inverter delays - driving large capacitive loads - cascaded inverters, super buffers, BiCMOS drivers. Scaling of MOS circuits: scaling models and scaling factors for device parameters, limitations of scaling.

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. Weste and Eshraghian, Principles of CMOS VLSI Design-A Systems Perspective, Pearson Education ,2/e,2002
2. Jan M. Rabaey, A. Chandrakasan, B. Nikolic, *Digital Integrated Circuits- A Design perspective*, Pearson education, 2/e,2003
3. Douglas A Pucknell, Kamran Eshraghian , *Basic VLSI Design*, Prentice Hall India, 3/e,2010
4. S M Sze, VLSI Technology, Mc Graw Hill, 2/e,2003
5. Wolf, Modern VLSI Design-System- on -Chip Design, Pearson Education, 3/e,2002
6. Mead & Conway , Introduction to VLSI System Design , Addison-Wesley Publishing Co., 1980
7. Fabricius, Introduction to VLSI Design, McGraw-Hill, 1990
8. Thomas E. Dillinger , VLSI Engineering , PHI,
9. Charles H Roth Jr ,Fundamentals of Logic Design , Jaico Publishers,5/e
10. A. Albert Raj and T. Latha, VLSI Design, PHI Learning private limited, 2008,ISBN-976-61-203-3431-1

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 1604 COMMUNICATION ENGINEERING III

Module I

Entropy and Loss-less Source Coding: Entropy, Entropy of discrete random variables- Joint, conditional and relative entropy- Chain rule for entropy, Mutual information and conditional mutual information, Relative entropy and mutual Information

Lossless source coding- Discrete Memory-less sources, Uniquely decodable codes- Instantaneous codes- Kraft's inequality – Average codeword length, Optimal codes- Huffman coding, Arithmetic Coding, Lemplel-Ziv Coding, Shannon's Source Coding Theorem.

Module II

Channel Capacity and Coding Theorem: Channel Capacity- Discrete memory-less channels (DMC) and channel transition probabilities, Capacity computation for simple channels- Shannon's Channel Coding Theorem, Converse of Channel Coding Theorem

Continuous Sources and Channels: Differential Entropy- Mutual information- Waveform channels- Gaussian channels- Shannon-Harley Theorem, Shannon limit, efficiency of digital modulation schemes-power limited and bandwidth limited systems.

Module III

Introduction to linear algebra- vector spaces-matrices. Coding – linear block codes-generator matrices-parity check matrices-encoder-syndrome and error correction-minimum distance-error correction and error detection capabilities-BCH codes-description-coding & decoding –Reed Solomon codes-coding & decoding cyclic codes-coding and decoding.

Module IV

Convolutional codes-encoder -state diagram-distance properties-maximum likelihood decoding-viterbi decoding-sequential decoding interleaved convolutional codes-Turbo coding- coding & decoding -Trellis coding- coding & decoding- Low-Density Parity check (LDPC) codes.

References:

1. John P Proakis&Salehi Digital Communication, McGrawHill,5/e, 2008, ISBN 9780070591172
2. Thomas M. Cover and Joy A. Thomas, *Elements of Information Theory*, Wiley India, ISBN 9788126508143
3. Shu Lin and Daniel. J. Costello Jr, *Error Control Coding: Fundamentals and applications*, Pearson India, 2/e.
4. Richard B Wells, *Applied Coding and Information Theory* , Pearson Education ,2009
5. J C Moreira Essentials of Error Control Coding Wiley India ,2006 ,ISBN 9788126528691
6. Bernard Sklar, *Digital Communication Fundamentals and applications* ,Pearson education , 2006
7. B. P. Lathi, *Modern Digital and analog Communication Systems*, Oxford University Press, 3/e
8. Ranjan Bose, *Information Theory ,Coding and Cryptography* ,Tata McGraw-Hill ,2/e, 2008

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC1605 CONTROL SYSTEMS ENGINEERING

Module 1

General schematic diagram of control systems - open loop and closed loop systems – concept of feedback - modeling of continuous time systems – Review of Laplace transform - transfer function - block diagrams – signal flow graph - mason's gain formula - block diagram reduction using direct techniques and signal flow graphs - examples - derivation of transfer function of simple systems from physical relations - low pass RC filter - RLC series network - spring mass damper.

Module II

Analysis of continuous time systems - time domain solution of first order systems – time constant - time domain solution of second order systems - determination of response for standard inputs using transfer functions - steady state error - concept of stability - Routh- Hurwitz techniques - construction of bode diagrams - phase margin - gain margin - construction of root locus - polar plots and theory of Nyquist criterion - theory of lag, lead and lag-lead compensators.

Module III

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 - bilinear transformation – stability analysis after bilinear transformation - Routh-Hurwitz techniques - construction of bode diagrams - phase margin - gain margin - digital redesign of continuous time systems.

Module IV

Introduction to the state variable concept - state space models - phase variable and diagonal forms from time domain - diagonalization - solution of state equations - homogenous and non homogenous cases - properties of state transition matrix - state space representation of discrete time systems - solution techniques - relation between transfer function and state space models for continuous and discrete cases - relation between poles and Eigen values – Controllability and observability.

References:

1. Dorf R.C. & Bishop R.H., Modern Control Systems, Addison Wesley,9/e,2001
2. K. Ogata, Modern Control Engineering Prentice Hall of India , 5/e, 2010
3. Norman S. Nise, Control Systems Engineering John Wiley and Sons Inc,4/e, ISBN 9788126510979
4. Kuo B.C., *Digital Control Systems*, Second Edition, Oxford University Press, 2/e,2007
5. Ogata K., *Discrete Time Control Systems*, Pearson Education, 2001
6. Nagarath I.J. &Gopal M., *Control System Engineering*, Wiley Eastern Ltd,1995
7. ZiemerR.E.,Tranter W.H&FaninD.R ,*Signals and Systems*, Pearson Education Asia
8. J Wilkie, M Johnson, R katebi, *Control Engineering an Introductory Course*, Palgrave 2002
9. G. Frankline, J David Powell, A E Naeini, Feedback *Control of Dynamic System*s, Pearson Education 5/e, 2011.
10. Kuo B C &Golnaraghi ,*Automatic Control Systems* 8/e, 2003, Wiley India, ISBN 9788126513710
11. Gopal, *Control System principles and design* McGrawhill,3/e

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 1606E - ELECTIVE I
EC 1606 E1 OPTICAL FIBRE COMMUNICATION

Module I

Overview of optical communication systems, History of optical communications, Wave theory of light, Reflection and refraction of plane waves; Optical waveguides Planar waveguides, Characteristics of optical fibers , numerical aperture, Wave propagation in multimode and single-mode optical fibers, Coupling into and out of fibers, attenuation, group-velocity dispersion, optical nonlinearities, polarization-mode dispersion.dispersionshifted and polarization maintaining fiber

Module II

Optical sources and transmitters: Optical sources, Physics of light emission and amplification in semiconductors, - direct and indirect band gap materials-LED structures- quantum efficiency- modulation. Laser diodes- rate equations- diode structure- single mode laser-modulation- temperature effects- quantum cascade lasers-vertical cavity surface emitting lasers- modal noise- partition noise- reflection noise. Light coupling-source to fiber coupling.Photo detectors-PIN, APD, Photo detector noise - response time- structure of detectors- receiver units.

Module III

Components of fiber optic networks: – couplers - splitters- semiconductor optical amplifiers- Erbium doped fiber amplifiers- wavelength division multiplexers/ demultiplexers. Filters- isolators-circulators-optical switches- Wavelength converters- Fiber gratings tunable sources-tunable filters.

Module IV

Dispersion in optical communication systems, Dispersion in single-mode and multimode fibers, Dispersion-induced pulse broadening in single-mode fiber, coherent & non coherent detection, channel capacity, various limits of transmission rate- Optical link design, Power and noise budget, Jitter and rise time budgets.

References:

1. Gerd Kaiser , *Optical fiber communication*, McGraw Hill ,4/e, 2007, ISBN 9780070648104
2. John M. Senior, *Optical fiber Communication*, Pearson Education India, 3/e
3. John Gowar, *Optical communication systems*, Prentice Hall Inc, 1984
4. Mynbaev and Scheiner, *Fiber optic communications technology*, Pearson Education, 2001
5. Ray Tricker, *Optoelectronics and Fiber Optic Technology*, Elsevier India Pvt. Ltd, 2006
6. Joachim Piprek, *Semiconductor Optoelectronic Devices*, Elsevier India Pvt. Ltd, 2005
7. Govind P. Agrawal, *Fiber-Optic Communication Systems*, Wiley India, 3/e
8. Max Ming-Kang Liu, *Principles and applications of optical communications*, McGraw hill,1/e,2010
9. Kasap, *Optoelectronics and Photonics: Principles and Practices* ,Pearson Education ,2009 ,ISBN 978131726482

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC/EI 1606E2 DIGITAL IMAGE PROCESSING

Module I

Digital Image Fundamentals: Representation of digital image -Elements of visual perception – Image sampling and quantization- Basic relationship between pixels.

Review of Matrix Theory: Row and column ordering-Toeplitz, Circulant and Block Matrices

Image Transforms: 2D DFT, Hadamard, Haar, DCT, Wavelet Transforms.

Module II

Image Enhancement: Spatial domain methods: Basic Gray Level Transformations-Histogram Processing: Equalization and specification- Fundamentals of Spatial Filtering: Smoothing, Sharpening spatial filters. Frequency domain methods: low pass filtering, high pass filtering, homomorphic filtering.

Module III

Image segmentation: Detection of discontinuities: Point Line and Edge Detection - Edge linking and boundary detection - Hough transform – Thresholding - Region based segmentation: Region growing-Region splitting and merging - Use of motion in segmentation.

Representation and Description: Representation, Boundary Descriptors: Shape numbers, Fourier descriptors, statistical moments - Regional Descriptors: Topological descriptors, texture.

Module IV

Image Restoration: Degradation Model- Restoration in the presence of Noise only-Spatial Filtering - Periodic Noise reduction by frequency domain filtering- Linear position Invariant degradations-Estimating the degradation function- Inverse filtering - Wiener filter - Constrained Least squares filtering.

Fundamentals of Colour image processing: Colour models - RGB, CMY, YIQ, HIS - Pseudo colour image processing - intensity slicing, gray level to color transformation.

References:

1. Gonzalez and Woods, *Digital Image Processing*, Pearson Education,3/e, 2008
2. Anil K. Jain, *Fundamentals of Digital Image Processing*, Prentice Hall India, 2010
3. William K Pratt, *Digital Image Processing*, John Wiley and Sons, 4/e, 2007

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 1606E3 HARDWARE MODELLING

Module I

Introduction: Hardware Abstraction- Basic Terminology- Entity Declaration- Architecture Body- Basic Language Elements –Identifiers- Data Objects- Data Types- Operators. Example designs: Basic Combinational Circuits.
Behavioural Modelling: Process Statement- Variable Assignment Statement- Signal Assignment Statement- Wait Statement- If Statement - Case Statement- Null Statement- Loop Statement- Exit Statement- Next Statement- Assertion Statement- Report Statement- Other Sequential Statements- Multiple Processes

Module II

Dataflow Modelling: Concurrent Signal Assignment Statement- Concurrent versus Sequential Signal Assignment- Multiple Drivers- Conditional Signal Assignment Statement- Modelling of Basic Binary Arithmetic Circuits, Sequential Circuits, Registers.
Structural Modelling: Component Declaration- Component Instantiation- Resolving Signal Values - Generics- Configurations

Module III

Subprograms- Subprogram Overloading- Operator Overloading- Signatures- Packages and Libraries. Models of RAM.
Advanced Features: Generate Statements- Aliases- Attributes.
Model Simulation: Simulation- Writing a Test Bench- Reading Vectors from a Text File.
Modelling Delays- State Machine Modelling.

Module IV

CPLDs and FPGA: FPGA types- FPGA versus custom VLSI- FPGA based system design
FPGA programming technologies: antifuse-static RAM-EPROM-EEPROM.
FPGA families: Actel- Actel1 logic module, Xilinx- xilinx LCAXC3000CLB, Altera-Altera FLEX logic element. Logic expander.

References:

1. S S Limaye,VHDL – A Design Oriented Approach,TMH,2008,ISBN: 13: 978-0-07-064825-8, ISBN: 10: 0-07-064825-5
2. Micheal John Sebastian Smith, Application Specific Integrated Circuits,Pearson,2001,ISBN: 978-81-7758-408-0
3. Gaganpreet Kaur, *VHDL basics to programming*, Pearson,2011
4. Stephen Brown,Zvonko Vranesic ,*Fundamentals of Digital Logic Design with VHDL*,TMH,2/e,2007
5. Cyril, *Fundamentals of HDL Design*,*Pearson*,2009,ISBN: 978-81-317-3247-2
6. Mark Zwolonski,*Digital System Design with VHDL*,Pearson,2/e,2004
7. Zainalabedin Navabi, *VHDL Modular Design and Synthesis of Cores and Systems*, TMH,3/e,2008
8. Douglas L. Perry, *VHDL Programming by Example*,TMH,4/e,2002
9. John F Wakerly, Digital Design Principles and Practices,Pearson,4/e,2008

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC/EI 1606E4 NANO ELECTRONICS

Module I

Introduction to nano Electronics, Top down and bottom-up approach- classical particles- waves quantum particles- Quantum mechanics of Electron – Time dependentshordinger equation - Probability density- Free and confined Electron- finite potential well- Electron in a periodic potential well- kronig and penny model- Band theory

Module II

The physics of low dimensional structures - basic properties of two dimensional semiconductor nanostructures, square quantum wells of finite depth, parabolic and triangular quantum wells - -Tunneling Junction- resonant tunneling - coulomb blockade

Module III

Review of density of states-Semiconductor hector junction - Quantum well – Nano wires and quantum wires - Quantum dots and nanoparticles, Fabrication Techniques. Carrier transport in nano devices-Ballistic transport. Transport of spin- spintronic devices.

Module IV

Nanoelectonic devices and systems - MODFETS, heterojunction bipolar transistors, resonant tunnel effect, RTD, RTT, hot electron transistors, Carbon nanotube transistor, heterostructure semiconductor laser, quantum well laser, quantum dot LED, quantum dot laser, quantum well optical modulator, quantum well sub band photo detectors, nanoswitches

References:

1. G W Hanson ,*Fundamental of nano electronics* Pearson education ,2009, ISBN 9788131726792
2. M Duart, R J Martin, F Agullo Rueda *Nano Technology for Micro electronics and optoElectronics*, Elsevier ,2006
3. J.M. Martinez-Duart, R.J. Martin Palma, F. Agulle Rueda *Nanotechnology for Microelectronics and optoelectronics*, Elsevier, 2006.
4. W.R. Fahrner, *Nanotechnology and Nan electronics*, Springer, 2005
5. SupriyoDutta, *Quantum Transport- Atom to transisto*r, Cambridge University Press, 2005.
6. K goser, P Glosekotter, J. Dienstuhl ,*Nano Electronics and Nano Systems*,Springer ,2005
7. J JRamsden, *Nano-Technology An introduction* ,Elsevier ,2011
8. T Pradeep, *Nano : the essentials* McGraw Hill Education ,2007

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 16L1 DSP LABORATORY

1. Familiarization of Signal processing tool box-MATLAB
2. Familiarization of DSP trainer kit (Sampling & reconstruction of signals)

Experiments

1. Generation of basic input signals (*both discrete & continuous*)
2. DFT and spectral analysis - computation of DFT, properties of DFT
3. Convolution
4. Correlation
5. Digital filter design- FIR & IIR Filters
6. FFT
7. Spectral estimation

The above experiments should be done using MATLAB and DSP Trainer Kit. The student should be able to apply the above tools in a small application.

References:

1.Vinay.K.Ingle, John G. Proakis, *Digital Signal Processing using MATLAB*, Thomson, 1/e, 2003
2. Dr.Shailendra Jain, Modelling and Simulation using MATLAB – Simulink, 1/e, 2011

Note : 50 % marks is earmarked for continuous evaluation, and 50 % marks for end semester examination to be assessed 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.

EC 16L2 COMMUNICATION LABORATORY I

1. Active Filters - Band Pass, Band reject (II order Butterworth)-Magnitude and phase characteristics, Q-factor.
2. Amplitude modulation - frequency modulation
3. Balanced modulator
4. PLL characteristics and demodulation using PLL
5. AM generation and demodulation using OP-AMPs and IC multipliers
6. PAM .modulator and demodulator
7. PWM modulator and Demodulator
8. PPM modulator and Demodulator.

SPICE: Simulation of experiments listed above using CAD tools
(*It is desirable to carry out the implementation followed by simulation*)

Note : 50 % marks is earmarked for continuous evaluation, and 50 % marks for end semester examination to be assessed 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 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. Prsanna Chandra , Finance Management,TMH.5th ed.,
5. Monks J.G Operations Management ,MGH

Type of questions for University Examination

Question 1 - 8 short answer questions of 5 marks each. 2 questions from each module

Question 2-5 – There will be two choices from each module .Answer one question from each module of 15 marks

EC 1702 ANTENNAS AND WAVE PROPAGATION

Module I

Antenna parameters: Isotropic Radiator, The short dipole, Radiation mechanism, radiation zones, radiation resistance, radiation efficiency, effective aperture area, radiation pattern, half power beam width, bandwidth, reflection coefficient, directivity, gain.(simple problems)

Potentials: Retarded potentials, Lienard- Wiechert potentials for a moving charge

Magnetic dipole radiation

Module II

Radiation from an Oscillating current element (derivation included), total power radiated and radiation resistance of short dipole antenna.

Antenna arrays: Need for arrays, Radiation pattern of two element and N-element point sources, Principle of pattern multiplication, Broad side - end fire arrays (concept and comparison only)

Antenna Measurements: VSWR - Radiation pattern- Gain.

Module III

Types of antennas : Yagi-Uda antenna, Helical antennas ,Aperture antennas, Slot antennas and Babinet's principle, Horn antenna and Fermat's principle, Corner and Parabolic Reflector Antennas, Fractal antennas (qualitative study only - construction, basic principle, pattern, gain). Microstrip patch antennas (structure, Radiation mechanism, pattern).

Antennas for mobile radio base stations- network requirements, Antennas for space and polarisation diversity, Antennas for handsets and small wireless devices- multi-band antennas SAR– concepts only. Smart Antennas- Principle, types, antenna beamforming, Printed arrays and Phased arrays.UWB antennas, Wearable antennas.

Module IV

Fundamentals of Wave propagation: Ground waves, Space waves and Sky wave. Free space propagation**,** Frii's Transmission Equation, Path loss, Plane earth loss, Spherical earth effects, Multipath Effects, Tropospheric refraction, Path profiles - Line of sight versus non-line of sight.

Refraction and Reflection of sky waves by ionosphere – ray paths – skip distance – virtual height-critical frequency-maximum usable frequency -vertical and oblique incidence.

References:

1. J.D. Kraus, R. J Marhefka , Ahmed S Khan, *Antennas and wave propagation* , Tata McGraw Hill, Special Indian Edition,4/e,2010
2. C. A Balanis, *Antenna Theory, Analysis and design*, John Wiley student edition, 3/e, 2009, ISBN:978-81-265-2422-8
3. Jordan and Balmain, *Electromagnetic waves and Radiating systems*, Pearson Education / PHI Ltd, 2/e, ISBN:978-81-203-0054-5
4. D Ganesh Rao, B Somanathan Nair & Deepa Raghunath, *Antennas and Radio Wave propagation*, Sanguine Technical Publishers, 2006
5. G.S.N Raju, *Antennas and Wave Propagation*, Pearson education,2008, ISBN: 978-81-317-0184-3
6. A.R.Harish and M.Sachidananda, *Antennas and Wave Propagation*, Oxford Higher Education, 2007

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 1703 ELECTRONIC PRODUCT DESIGN

Module 1

From Requirement to Product: Engineering design as real life problem solving- Requirement analysis of Electronic products- Formulation of product requirement specifications and target specifications. The design process: Product conceptualization- Product architecture- Product synthesis- Portable Electronic Design Factors- Computer Aided Design. Product Life Cycle. Various dimensions of Electronic Product Design- Industrial design and Engineering design- Aesthetics and Ergonomics- Inputs, control and display interface.

Module II

Electronic interconnection and Packaging of components, Integrated circuits, Printed circuits and Functional products- Cables and connectors- Design Documentation, Engineering Documentation and Test Documentation – Component Specification/ Bill of materials. Enclosure sizing, requirement of enclosure and standards of enclosures. Noise and thermal management: Noise- Types of noise-Noise coupling mechanisms in Electronic Circuits-EMI/ EMC, EMI standards and regulations, Grounding, cabling, Shielding, Guarding.

Module III

Thermal Considerations in Electronic Product Design: Heat generation and modes of heat transfer in Electronic products- Selection/Design of Heat Sinks- Factors affecting the design of heat sinks and its cooling effectiveness- Assembly of components on heat sinks- Electrical analogue of thermal circuits- Enclosure design of Electronic Equipments and thermal considerations- Design guidelines for Ventilations- Forced cooling- Heat pipes for electronic cooling applications.

Module IV

PCB design: requirements in PCB Design- PCB Design elements- PCB design process- advantages of PCBs- Design rules for analog, digital, high-frequency, power-electronic and MW PCBs-PCB design guidelines for EM compatibility. Introduction to SPICE simulation of circuits- Circuit description- Modeling of active and passive circuit elements - DC, AC, Transient and Parametric circuit analysis.

Module V (*Tutorial Only-No questions from this module for University Examination*)

Electronic Design Automation Tools: Introduction to PC based Electronic Design Automation Tools: Schematic Capture, Circuit Simulation, Layout Design etc. features like EMI analysis, Thermal analysis, 3d visualization etc. of such packages with reference to EDA tools such as Orcad, EDWIN XP etc. (*As assignment, each student shall design and simulate an electronic product following the above syllabus using EDA tools*.)

References:

1. R.G.Kaduskar, V.B Baru, Electronic Product Design, Wiley India, 2/e.
2. Karl T. Ulrich & Steven D. Eppinger, *Product Design and Development*, Tata McGraw Hill, 2004
3. *Thermal Design of Electronic Equipment*- Monogram by CEDT, IISc., Bangalore.
4. Henry W. Ott, *Noise Reduction Techniques in electronic systems*, John Wiley, NY, 1988
5. Mohammed H. Rasheed, *Spice for circuits & Electronics using Pspice*, Prentice Hall India,3/e
6. V. Prasad Kodali, *Engineering Electromagnetic Compatibility-Principles, Measurements, and Technologies*, S. Chand & Company Ltd,2000
7. Walter C. Bosshart, *Printed Circuit Boards- Design and Technology*, Tata McGraw Hill, 1988
8. Kim. R. Fowler, *Electronic Instrument Design*, OXFORD University Press, 2006
9. Kevin Otto, Kristin Wood, *Product Design- Techniques in Reverse Engineering and New Product Development*, Pearson Education, 2004
10. Richard Stillwell, *Electronic Product Design for Automated Manufacturing*, Marcel Dekker Pub
11. Bert Haskell, *Portable Electronics Product Design and Development*, McGraw Hill, 2004

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 1704 POWER ELECTRONICS

Module I:
Power Semiconductor devices: Basic structure, I V characteristics, switching characteristics and operation of devices like power diode, Bipolar Junction Transistor, Power MOSFET, thyristors, Gate Turn off thyristor, Insulated Gate Bipolar Transistor and TRIAC, two transistor model of thyristor, series and parallel connections of thyristors, protection of thyristors, snubber circuits, Gate and Base drive, firing circuits with resistor and UJT.

Module II
Power Electronic Circuits: Line frequency single phase and three phase diode rectifiers, performance parameters, controlled rectifiers: single phase, semi converter, full converter (with R and R L loads), three phase half converter and full converter (with R and R L loads). Inverters: single phase half bridge and full bridge inverters, three phase inverters, basic concept of Pulse Width Modulation, single pulse, multiple pulse and sinusoidal pulse, basic concept of resonant pulse inverters.

Module III
DC-DC Converters: Various types of commutation techniques, principle of chopper operation, types of chopper circuits, step down operation and step up operation, analysis of Buck regulator, Boost regulator and Buck-Boost regulator. Power Supply Applications: Switching DC power supply, over view of Switching power supplies, control of SMPS, power supply protection, Power Conditioners, Power Line disturbances and Uninterruptible Power supply (UPS), various block of UPS.

Module IV
Motor Drive Applications: Introduction, types of DC motors, basic characteristics of DC motor, operating modes, Single phase drives: Half converter, semi converter and full converter drives. Types of AC motors, induction motor drives, performance characteristics, various types of control drives: such as stator voltage, rotor voltage and frequency control, criteria for selecting drive components.

References:

1. Ned Mohan, Tore M. Undeland, William P. Robbins ,*Power electronics converter, applications and design*, John Wiley and Sons, Inc.
2. Muhammad H. Rashid, *Power Electronics Circuits, Devices and Applications*, PHI and Pearson Education, Third Edition.
3. John G Kassakian, Martin F Schlecht, George C Verghese, *Principles of Power Electronics*, Pearson, 3/e, 2010.
4. Jai P Agrawal , *Power Electronic System, Theory and Design*,Pearson,2001
5. Daniel W. Hart, *Power Electronics*, TataMcGrawHill,1/e,2011

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 1705E - ELECTIVE II

EC 1705E1 EMI/EMC

Module I
Introduction to EMC, Aspects of EMC, decibels and common EMC units. EMC requirements for Electronic systems: Governmental requirements, Product requirements. Antennas, elemental dipole antennas, characterization of antennas, Directivity and gain, effective aperture, Antenna Factor

Module II
Non Ideal behavior of components: Wires, resistance and internal inductance of wires, external inductance and capacitance of parallel wires, Resistors, Capacitors, Inductors, Ferrites and common-mode chokes.

Module III
Spectra of digital circuit waveforms, spectral bounds for Trapezoidal waveforms, Spectrum analyzers. Radiated Emissions and Susceptibility: Simple emission models for wires and PCB lands, Differential-mode versus common-mode currents, differential-mode current model, common-mode current model. Simple susceptibility models for wires and PCB lands.

Module IV
Conducted Emissions and Susceptibility: Measurement of conducted emissions, The Line Impedance Stabilization Network (LISN), Common and differential mode current gain, power supply filters. Electro static Discharge (ESD), origin of ESD and effects of ESD. Shielding, shielding effectiveness –far-field sources, shielding effectiveness – near-field sources,

References:

1. Clayton R. Paul, *Introduction to Electromagnetic compatibility*, John Wiley and Sons Inc,1992, ISBN-10: 0471549274, ISBN-13: 978-0471549277
2. Henry W Ott, *Electromagnetic CompatibilityEngineering,* John Wiley and Sons,1/e,2009, ISBN-13: 978-0470189306, ISBN-10: 0470189304
3. Archambeault Bruce R, Ramihi Omar M, Brench, *EMI/EMC Computational Modelling Handbook*, Springer publications,2/e,2001
4. James E. Vinson, Joseph C. Bernier, Gregg D. Croft , Juin Jei Liou, *ESD Design and Analysis Handbook*, Springer, 1/e, 2002, ISBN-10: 140207350X, ISBN-13: 978-1402073502
5. Ernest O Doebelin, Dhanesh.N.Manik, *Doeblin's Measurement System*, TMH, 6/e, 2011

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 1705E2 ADAPTIVE SIGNAL PROCESSING

Module I

Adaptive Systems – Definition & Characteristics – Properties - Open loop and closed loop adaptation –Example of adaptive system –Adaptive linear combiner – Input signal and Weight vectors – Desired response and Error – Performance Function – Gradient - Minimum mean square error – Example of performance surface - Alternative expressions of the Gradient – De-correlation of error and input components.

Module II

Properties of Quadratic performance surface – Normal form of input correlation matrix – Eigen values and vectors - Geometrical significance - Searching the performance surface – Methods – Gradient search methods – Stability and rate of convergence – learning curve – Newton's Method – Steepest Descent Method – Comparison of learning curves –Gradient estimation and its effect on adaptation – Performance penalty – Variance of gradient estimate – Excess Mean Square Error and Time constants – Misadjustment.

Module III

Adaptive Algorithms - The LMS Algorithm – Derivation - Convergence – Learning curve – Noise – Misadjustment – Performance - LMS/ Newton Algorithm – Properties –Sequential regression algorithm – Adaptive recursive filter – Random search algorithms – RLS Algorithm – The matrix inversion Lemma – Convergence.

Module IV

Adaptive modeling and system identification – Multipath communication channel –FIR digital filter synthesis – Introduction to adaptive arrays and beamforming – Sidelobe cancellation – Beamforming with a pilot signal – spatial configurations – Adaptive algorithms.

References:

1. Bernard Widrow and Samuel D. Stearns, *Adaptive Signal Processing*, Pearson Education, ISBN: 9788131705322
2. Simon Haykin, *Adaptive Filter Theory*, Pearson Education, 4/e, 2002.
3. B. Farhang-Boroujeny, *Adaptive Filters – Theory and Applications*, John Wiley and Sons, 1998, ISBN: 978-0-471-98337-8
4. Ali H Sayed, *Fundamentals of Adaptive Filtering*, John Wiley and Sons, 1/e,2003

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 1705E3 DIGITAL INTEGRATED CIRCUIT DESIGN

Module I

Designing combinational logic gates in CMOS

Introduction - Static CMOS Design - Complementary CMOS, Ratioed Logic, Pass-Transistor Logic - Dynamic CMOS Design - Dynamic Logic: Basic Principles, Speed and Power Dissipation of Dynamic Logic, Issues in Dynamic Design, Cascading Dynamic Gates

Module II

Designing sequential logic circuits

Static Latches and Registers - The Bistability Principle - Multiplexer-Based Latches - Master-Slave Edge-Triggered Register - Low-Voltage Static Latches - Static SR Flip-Flops - Dynamic Latches and Registers - Dynamic Transmission-Gate Edge-triggered Registers - C^2MOS—True Single-Phase Clocked Register (TSPCR) - Alternative Register Styles - Pulse Registers - Sense-Amplifier Based Registers

Module III

Designing arithmetic building blocks

Datapaths in Digital Processor Architectures - The Adder - The Full Adder: Circuit Design Considerations - The Binary Adder: Logic Design Considerations - The Multiplier - Partial-Product Generation - Partial Product Accumulation - Final Addition - The Shifter - Barrel Shifter - Logarithmic Shifter - Power and Speed Trade-off's in Datapath Structures - Design Time Power-Reduction Techniques - Run-Time Power Management - Reducing the Power in Standby (or Sleep) Mode

Module IV

Designing memory and array structures

Memory Classification - Memory Architectures and Building Blocks - The Memory Core - Read-Only Memories - Nonvolatile Read-Write Memories - Read-Write Memories (RAM) - Contents-Addressable or Associative Memory (CAM) - Memory Peripheral Circuitry - The Address Decoders - Sense Amplifiers - Voltage References - Drivers/Buffers - Timing and Control - Memory Reliability and Yield - Signal-To-Noise Ratio - Memory yield - Power Dissipation in Memories

References:

1. Jan M. Rabaey, A. Chandrakasan, B. Nikolic, Digital Integrated Circuits- A Design Perspective, Pearsoneducation,2/e,2003
2. Hubert Kaeslin, ETH Zürich *Digital Integrated Circuit Design - From VLSI Architectures to CMOS Fabrication*, ISBN:9780521882675, *2008*
3. John F Wakerly, *Digital Design – Principles and Practices*, Pearson education, Fourth edition

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

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 Technologies 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 Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.

Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC I7L1 EMBEDDED SYSTEMS LABORATORY

Objective: To Design, develop and validate a program in 8051 kit And to get hands on experience with the embedded system development

1. Familiarisation with 8051 based kit, peripherals, cross assembler/ cross-compiler (eg. KEIL)
2. Simple exercise to study the programming of 8051.
3. Simple exercise to use User interface of the kit (display/ keyboard etc..).
4. Simple exercise to the Interrupt Programming.
5. UART communication with 8051:
   Communication with PC over its RS232 port.
6. I2C communication with 8051:
   Read, write and validate data from a serial EPROM or I2C based temperature sensor etc.
7. 8051 interfacing with various sensors and ADC/ DAC .
8. 8051 for motor control :
   Control the speed of a stepper motor or DC motor.
9. Familiarization of ARM kit.

Note : 50 % marks is earmarked for continuous evaluation, and 50 % marks for end semester examination to be assessed 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.

EC I7L2 COMMUNICATION LABORATORY II

Communication experiments

1. Digital modulation techniques and it performance measures
2. Matched filter receiver for rectangular pulse.
3. Error correction & coding.
4. Link power budget calculation.

The above experiments should be done using MATLAB/Labview and Trainer Kit/ breadboard.

Microwave Experiments

1. Determine the Reflex Klystron frequency and mode characteristics
2. Obtain the characteristics of crystal detector
3. Measurement of guide wavelength and source frequency
4. Study of V-I characteristics of GUNN diode
5. Determine the Parameters of : directional coupler, isolator and circulator
6. Determine the unknown impedance using slotted section and smith chart
7. Study of: attenuators, E-plane, H-plane and Magic Tees
8. Determine the radiation patterns of E-plane sectoral, H-plane sectoral and horn antennas.
9. Study of input impedance and S parameters of various microwave networks using network analyzer.
10. Design and optimization of various microwave networks like filters and antennas using microwave simulators like HFSS/IE3D/MICROWAVE STUDIO/ADS

Reference:

1. K.C.Raveendranathan, Communication Systems Modelling and Simulation, Using MATLAB® and SIMULINK®, University Press, 1/e, 2011

Note : 50 % marks is earmarked for continuous evaluation, and 50 % marks for end semester examination to be assessed 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.

EC I7L3 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
- Bill of materials in standard format and cost model, if applicable
- 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. (iv)-(v) to be evaluated by the final evaluation team comprising of 3 internal examiners including the project guide, coordinator & a senior faculty member.*

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 atleast three faculty members including the project guide.

EC I7L4 SEMINAR

Students shall individually prepare and submit a seminar report on a topic of current relevance related to the field of Electronics & Communication 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 teachers based on style of presentation, technical content, adequacy of references, depth of knowledge and overall quality of the seminar report.

SEMESTER VIII

EC 1801-MULTIMEDIA COMMUNICATION SYSTEMS.

OBJECTIVE

This course introduces technologies for multimedia communications. The objective of this course lets students learn basic techniques and international standards for image, video, and audio coding. More specifically this course lets the students not only familiarize with the international standards but also provide the underlying concepts, principles, techniques related to video coding. We will also address how to efficiently represent multimedia data, including video, image, and audio, In the coding aspect, state-of-the-art compression technologies will be presented. Emphasis will be given to a number of standards, including H.26x, MPEG, and JPEG.

PREREQUISITES: (Digital Signal Processing)

Module I- Multimedia Communications.

Introduction to Multimedia towards a definition, The elements of Multimedia, Multimedia today and tomorrow, Using Multimedia: applications ,benefits and problems, Multimedia Authoring and Tools, Multimedia Information Representation, digitization principles, Text, Images, Audio, Fundamental Concepts in Video, Color in Image and Video, Basics of Digital Audio.

Module II- Multimedia Compression Techniques.

Basic Audio Compression Techniques- Quantization, Non-linear Quantization, Differential Encoding, Linear Prediction Coding-LPC, DPCM, DM, Adaptive DPCM.

Lossless Compression-Run Length Coding, Statistical Coding, Huffman Coding, Dictionary Coding, Arithmetic Coding. Lossy Compression-Transform coding, DFT, DCT, Harr Transform, KLT, Wavelet Transforms, Embedded Zero Tree Coder.

Module III- Multimedia Compression Standards.

JPEG Standards-Baseline JPEG, JPEG Models, JPEG 2000 Standards, JPEG-LS Standard, MPEG audio coders, Dolby audio coders. Basic Video Compression Principles, H.261, 263,264. MPEG Video Coding- MPEG-1, MPEG-2, MPEG-4, MPEG-7, MMDs, Applications Enabled by MPEG-7, MPEG-21 Digital Item Declaration.

Module IV- Multimedia Communications Systems.

Multimedia Interchange-QMF, OMFI, MHEG. Multimedia Conferencing. HFC Network, Satellite Television Networks, Terrestrial Television Networks, High-speed PSTN access technologies-ADSL, VDSL. High Definition Television, HDTV standards. Movie/ video on demand, Interactive Television, Kiosks, Content-Based Retrieval in Digital Libraries. Knowledge based Multimedia Systems, Intelligent multimedia System Design.

References:

1. Fred Halsall, *Multimedia Communications: Applications, Networks, Protocols and Standards,* Pearson,2011
2. Li, Ze-Nian, Drew, Mark S, *Fundamentals Of Multimedia,* PHI, 2011
3. Ralf Steinmetz, Klara Nahrstedt *Multimedia: Computing Communications & Applications* , Pearson, 2011
4. Krishna Kumar D N, *Multimedia communication*, Pearson 2010.
5. John F. Koegel Buford, *Multimedia Systems*, Pearson, 2009.
6. J.R. Ohm. *Multimedia Communication Technology,* Springer International Edition, 2005.
7. Judith Jeffcoate, *Multimedia in Practice*, Pearson,2009
8. K.Sayood, Morgan Kauffman, *Introduction to Data Compression*, 2/e, 2000.

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 1802 WIRELESS COMMUNICATION

Module I

Overview of Wireless Systems. Wireless spectrum, Signal Propagation, Path Loss Models and Shadowing, Shadowing, Combined Path Loss shadowing, Coverage Area, Statistical Fading Models, Narrowband Models, Signal Envelope Distribution, Fading Distributions and Duration. Markov Model. Wideband Fading. Doppler and Delay Spread, Wideband Channel Models.

Module II

Capacity of wireless channels- Fading Channels, Capacity of Flat and FS Fading Channels, Modulation schemes, Linear Modulation Performance in Fading, Performance in Fading and ISI. Diversity, receiver diversity, Transmit Diversity

Module III

Adaptive Modulation and Adaptive MQAM. Impact of Finite Constellations. MIMO and Space/Time Communications, MIMO Capacity, Beam forming, Diversity, Space time codes.

Module IV

Multi carrier modulation – OFDM- Multi user systems – multiple access-random access- multi used diversity. Adhoc wireless networks – cross layer Design- Energy Constrained Networks.

References:

1. A. Goldsmith ,*Wireless Communication* , Cambridge ,2011
2. C Y Lee, *Mobile Communication Engineering* , TataMcGrawhill ,2/e ,2008
3. Theodore S. Rappaport, Simon: *Wireless communication principles and practice* ,Pearson Education,2/e
4. Haykin, Michael Mohar, *Modern wireless communication*, Pearson Education,2008
5. William Stallings, *Wireless communication and networks*, Pearson Education, 2006.
6. Molisch ,*Wireless communication* ,Wiley India ISBN 9788126510566
7. William C Y Lee: *Mobile cellular Telecommunications*, McGraw Hill, 2/e.
8. John P Proakis&Salehi ,*Digital Communication*, McGrawHill,5/e, 2008,ISBN 9780070591172
9. S R Saunders AA Zavala, *Antennas and propagation for Wireless Communication Systems*, Wiley India, 2/ e

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 1803 COMPUTER COMMUNICATION AND NETWORKING

Module I

Communication Networks and Services: Network functions and network topology, basics of message switching, packet switching, circuit switching and cell switching. Application and Layered Architectures Layering architecture, the OSI reference model, unified view of layers, protocols and services, overview of TCP/IP architecture, TCP/IP protocol. digital Representation of Analog Signals, Line Coding, Modems and Digital Modulation, Circuit-Switching Networks, Multiplexing, SONET, Transport Networks, Circuit Switches, Signaling, Traffic and Overload Controls in Telephone Networks, Cellular Telephone Networks.

Module II

Peer-to-Peer Protocols and Data Link Layer, Peer-to-Peer Protocols, ARQ Protocols and Reliable Data Transfer Service. Derivation of Efficiency of ARQ Protocols. Data Link Controls, Framing, Point-to-Point Protocol, HDLC Data Link Control, Link Sharing Using Packet Multiplexers. Multiple access communications, local area networks (LAN) structure, the medium access control sub layer, the logical link control layer, random access, ALOHA, slotted ALOHA, CSMA, CSMA/CD, scheduling approaches to medium access control, reservation systems, polling, token passing rings, comparison of random access and scheduling medium access controls. IEEE LAN standards

Module III

Packet Switching Networks: Network services and internal network operation, packet network topology, connectionless packet switching, virtual circuit packet switching, routing in packet networks, routing algorithm classification, routing tables, hierarchical routing, link state versus distance vector routing, shortest path algorithms, Dijkstra's algorithm.

Module IV

TCP/IP : The Internet Protocol (IP), IP packet, IP addressing, subnet mask, classless inter domain routing (CIDR), address resolution, reverse address resolution, IP fragmentation and reassembly, User Date gram Protocol (UDP), Transmission Control Protocol (TCP), TCP Reliable stream service, TCP operation, Dynamic Host Configuration Protocol (DHCP), mobile IP, IPv6, internet routing protocols, distance vector multicast routing protocol. Integrated Services i, RSVP, Differentiated Services, Network Interconnection Models, MPLS, Real-Time Transport Protocol, Session Control Protocols

References:

1. Leon Garcia &Widjaja ,Communication Networks Tata McGraw Hill Publication, 2/e, ISBN 9780070595019
2. Bertsekas and Gallagar, Data Networks, Prentice Hall India, 2/e.
3. James F. Kurose and Keith W. Ross, *Computer Networking – A Top-Down Approach Featuring the Internet*, Pearson Education, 2/e
4. F. Halsall, *Data Communication, Computer Networks and Open System*s, Addison Wesley, 1996
5. S. Keshav, *An Engineering Approach to Computer Networkin*g, Pearson education, 2002
6. Uyless Black, *Computer Networks - Protocols, Standards and Interface*s, PHI Ltd, 1994
7. Andrew S. Tanenbaum, *Computer Networks*, Pearson education/ PHI Ltd., 4/e
8. Behrouz A. Fourouzan, *Data Communications and Networking*, Tata McGraw Hill, 2/e
9. Anurag Kumar, D. Manjunath, Joy Kuri, *Communication Networking : An Analytical Approach*, Elsiever, 2005
10. William Stallings, *Wireless Communications &Networks*, Prentice Hall, 2001

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 1804E - ELECTIVE III

EC 1804E1 COMPUTATIONAL ELECTROMAGNETICS

Module 1

Introduction: Elements of Computational Methods, Basis Functions, Sub-domain Basis Functions, Entire-domain Basis Functions, Convergence and Discretization Error Convergence Test, Order of Convergence, Disctretization Error and Extrapolation, Discretization of Operators, Discretization Error in FDM, FDTD, and FEM, Stability of Numerical Solutions, Stability of FDTD Solution, Stability of Matrix Solution, Accuracy of Numerical Solutions, Modeling Errors, Truncation Error, Round-off Error, Validation, Spurious Solutions, Formulations for the Computational Methods

Module II

Method of Moments: Basis Functions**,** Sub-domain Basis Functions, Entire-domain Basis Functions, Point Matching and Galerkin's Methods, Eigen value Analysis using MoM**.** Solution of Integral Equations using MoM**,** Static Charge Distribution on a Wire, Analysis of Stripline, Analysis of Wire Dipole Antenna**,** Scattering from a Conducting Cylinder of Infinite Length, Greens functions.

Module III

Finite Difference Time Domain Analysis: FDTD Analysis in One-Dimension: Pulse Propagation in a Transmission Line, Spatial Step Δx and Numerical Dispersion, Time Step Δt and Stability of the Solution, Source or Excitation of the Grid, Absorbing Boundary Conditions, Applications of One-Dimensional FDTD Analysis, Reflection at an Interface, Determination of Propagation Constant, Design of Material Absorber, Exponential Time-stepping Algorithm in the Lossy Region, FDTD Analysis in Two-Dimensions, Unit Cell, Numerical Dispersion in Two-Dimensions, Time Step Δt for Two-Dimensional Propagation, Absorbing Boundary Conditions for Propagation in Two, Dimensions, Perfectly Matched Layer ABC's FDTD Analysis in Three-Dimension, Yee Cell, Numerical Dispersion in Three-Dimension, Time Step Δt for Three-Dimensional Propagation, Absorbing Boundary Conditions and PML for Three-Dimensions Implementation of Boundary Conditions in FDTD, Perfect Electric and Magnetic Wall Boundary Conditions, Interface Conditions

Module IV

Finite Element Method: Basic Steps in Finite Element Analysis**,** Discretization or Meshing of the Geometry**,** Derivation of the Element Matrix**,** Assembly of Element Matrices**,** Solution of System Matrix**,** Post-processing**,** FEM Analysis in One-dimension**,** Treatment of Boundary and Interface Conditions**,** Accuracy and Numerical Dispersion**,** FEM Analysis in Two-dimension, Element Matrix for Rectangular Elements**,** Element Matrix for Triangular Elements**,** Assembly of Element Matrices and System Equations**,** Capacitance of a Parallel Plate Capacitor**,** Cut-off Frequency of Modes in a Rectangular Waveguide**,** FEM Analysis of Open Boundary Problems

References:

1. Ramesh Garg, *Analytical and Computational Methods in Electromagnetics*, Artech House, 2008, ISBN-10: 1596933852
2. Matthew N. O. Sadiku, *Numerical Techniques in Electromagnetics*, CRC press, 2/e, 2000.
3. David B. Davidson, *Computational Electromagnetics for RF and Microwave Engineering*, Cambridge university press,2/e,2010
4. Allen Teflove, Susan C Hagness, *Computational Electrodynamics: The Finite Difference Time Domain Method.*, Artech House publications,3/e,2005
5. R.F. Harrington, *Field Computation by Moment Method., Wiley,1993*
6. John L. Volakis, and Kubilay Sertel, *Frequency Domain Hybrid Finite Element Methods forElectromagnetics*, Morgan & Claypool Publishers ,*2006*
7. *Balanis.C.A. Advanced Engineering Electromagnetics,Wiley Publications*, 1989, ISBN-10: 0471621943

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.

Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC/EI 1804E2 RADAR AND NAVIGATION

Module I

Introduction to RADAR: General form of RADAR range equation – block diagram of simple pulsed RADAR and determination of range - maximum Unambiguous range, Radar resolution cell volume, pulse repetition frequency , relevance of Cosecant squared radiation pattern for RADAR antennas - RADAR displays - synthetic and Raw displays, Radar Types based on frequency, Waveform, prf, applications.

Probability of detection and false alarm - integration of RADAR pulses-RADAR cross section of various targets.

Module II

Radar Systems: Doppler frequency shift and determination of velocity –Block diagram and working principle of CW Doppler RADAR, FMCW Radar and Pulsed Doppler RADAR.

MTI Radar block diagram and use of Delay line cancellers- Blind speed-Digital MTI processing-

Tracking Radar: Types, Monopulse tracking-Amplitude comparison monopulse system in one/ two coordinates (block diagram)-phase comparison monopulse, Sequential lobing, Conical scan tracking Radar –tracking in range-comparison between Monopulse and conical scan tracking RADARs.

Module III

Radar Receivers: Block diagram of super heterodyne receiver- Detection of Radar signals in noise –Matched filter criterion- detection criterion – Extraction of information and waveform design.

Special purpose radars: Synthetic Aperture Radar- Height finder- 3D radars -Radar Beacons- Radar Jamming.

Microwave Radio communication – block schematics of Terminal transmitters and receivers -Salient features, radio repeaters, microwave radio stations, Line of sight path characteristics, Free space loss, Path clearance, Fade margin, Microwave Radio system gain, Receiver threshold, CNR and SNR, Noise figure.

Module IV

Satellite Communication: Communication satellites –sub systems of Space-craft - payload – repeater, antenna, control systems. Orbits- Orbital parameters, *Apogee&Perigee*, period, velocity, coverage angle and slant angle, geostationary orbits look angle, near-geostationary constellations, launching orbits.

Elements of digital satellite communication systems, Digital baseband signals, Digital modulation techniques, Satellite digital link design, inter modulation noise and inter satellite links.

Principle of Global Positioning Systems – Instrument landing system

References:

1. Merrill I. Skolnik, Introduction to Radar Systems, 3/e, McGraw Hill, 2006.
2. Dennis Roddy, Satellite Communications, Prentice Hall Inc., 4/e,ISBN:978-00-700-778-50
3. Byron Edde, Radar Principles, Technology, Applications, Pearson Education1/e,1993,ISBN: 9788131713839
4. Mark A Richards, Fundamentals of Radar Signal Processing, Mc Graw Hill ,2005,ISBN:978-80-0714-447-43
5. J. C. Toomay, Paul Hannen, *Principles of RADAR*, PHI, 3 /e, 2010.
6. Wayne Tomasi, *Electronic Communications Systems, Fundamentals through advanced*, Pearson Education 5/e,2008
7. Harvey Lehpamer, *Microwave Transmission Networks*, Planning, Design and Deployment, TMH,2/e,2010
8. Tri T Ha, *Digital Satellite Communication*, Tata McGraw Hill Publishers,/e, 2009,ISBN: 978-00-7007-775-22
9. G S N Raju, *Radar Engineering and Fundamentals of Navigational aids*, I K International Publishers.
10. W.L. Pritchard, HG Suyderhoud and RANelson, *Satellite Communication Systems Engineering*, Pearson education, 2/e, 2012,,978-81-3170-242-0
11. S. K. Raman, *Fundamentals of Satellite Communication*, 1/e, Pearson education, 2011, ISBN: 9788131762608.
12. Anil.K.Maini,Varsha Agrawal, *Satellite Communications*,Wiley publications,2011, ISBN 9788126520718

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.

Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 1804E3 ASIC Design

Module I

Introduction to ASICs: - Types of ASICs - Design flow

ASIC construction: Physical Design-Partitioning methods-simple partitioning- constructive partitioning - Interactive partitioning -KL algorithm- Ratio Cut algorithm- simulated annealing

Module II

Floor planning: Goals and Objectives- Floor planning tools- channel definition- I/O and Power planning- clock planning.

Placement: placement term and definitions -goals and objectives- placement algorithm- iterative placement improvement- placement using simulated annealing-time driven placement methods

Module III

Routing: Global routing-goals and objectives- global routing methods- global routing between blocks and inside flexible blocks- Detailed routing- measurement of channel density- left edge algorithm-constrains and routing graphs- area routing algorithm- multi level routing.

Special routing: Clock routing- power routing- circuit extraction – DRC.

Module IV

Testing: Importance- BST cell- Boundary scan Controller-BIST-LFSR- signature analysis – MISR-Test vector-test flow.

Faults: Fault models, physical faults, Stuck at fault model, Logical faults, Fault collapsing, Fault simulation – serial fault simulation, parallel fault simulation, concurrent fault simulation, nondeterministic fault simulation, ATPG-D-Calculus, Basic ATPG algorithm, PODEM algorithm, controllability, observability

References:

1. M.J.S .Smith, *Application Specific Integrated Circuits*, Pearson Education ,2006, ISBN:978-81-7758-408-0
2. Andrew Brown, *VLSI Circuits and Systems in Silicon*, McGraw Hill.
3. Dhiraj K. Pradhan, *Fault tolerant Computer system design*, PH, 2/e, 2003,I SBN:0-13-057887-8

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC/EI 1804E4 NEURO-FUZZY SYSTEMS

Objective:

This course introduces the basics of Neural Networks and essentials of Artificial Neural Networks with Single Layer and Multilayer Feed Forward and Feed Back Networks. Also deals with Associate Memories and introduces Fuzzy sets and Fuzzy Logic system components. The Neural Network and Fuzzy Logic application to Systems Engineering is also presented. This course gives an overview of Neuro – Fuzzy and Fuzzy – Neural Controllers.

Module I

Basics of Artificial Neural Networks-Biological Aspects, Development of Neural Network Principles, Artificial Neural Networks, Artificial neural net terminology, Model of a neuron, Topology, Perceptrons, Widrow-Hoff LMS algorithm; Multilayer networks, Back propagation algorithm, variants of Back propagation Learning, Types of learning-Supervised, Unsupervised, Reinforcement learning. Characteristics of Neural Networks. Basic Learning Laws. Activation Dynamic Models, Synaptic Dynamic Models, Learning Methods, Stability and Convergence. Feed Forward Neural Networks and Feed Back Neural Networks, Boltzmann Machine. Competitive Learning Neural Networks.

Module II

Neural Networks Based Control- Representation and identification, modeling the plant, control structures – supervised control, Model reference control, Internal model control, Predictive control. Architectures for Complex Pattern Recognition Tasks- Associative Memory, Pattern Mapping, Stability-Plasticity Dilemma-ART, Temporal Patterns, Pattern Variability: Neocognitron. Direct and Indirect Adaptive Control Using Neural Networks. Applications of neural nets - Pattern recognition, Optimization, Associative memories, Speech and Decision making. Vector quantization.

Module III

Fuzzy Logic- Introduction, Fuzzy Sets, Concept of Fuzzy Number, Operation of Fuzzy sets, Properties of Fuzzy Set, Fuzzy versus probability, Fuzzy relations and Fuzzy relation calculations – Fuzzy members – Indices of Fuzziness – Comparison of Fuzzy quantities – Methods of determination of membership functions. Fuzzy Rule systems and interpretability of Fuzzy Rule systems, Knowledge Processing with Fuzzy Logic, Fuzzy Linguistic variables, Linguistic Modifier, Fuzzy Implication Relations, Fuzzy Compositional Rules.

Module IV

Fuzzy Logic Control- Mamdani Model. Fuzzy Controllers: Basic construction of fuzzy controller –Analysis of static properties of fuzzy controller – Analysis of dynamic properties of fuzzy controller. Construction of FLC. Fuzzy PD controllers, Fuzzy PI Controllers. Case study – fuzzy control for smart cars.Neuro – Fuzzy and Fuzzy – Neural Controllers: Neuro – fuzzy systems: A unified approximate reasoning approach – Construction of role bases by self-learning: System structure and learning algorithm – A hybrid neural network based Fuzzy controller with self-learning teacher. Fuzzified CMAC and RBF network based self-learning controllers.

References:

1. B. Yegnanarayana, *Artificial Neural Networks,* Prentice Hall of India,2009
2. Yaochu Jin, *Advanced Fuzzy Systems Design and Applications*, Springer.
3. Bart Kosco, *Neural Networks and Fuzzy Systems: A Dynamic Approach to Machine Intelligence,* Prentice Hall of India.
4. Laxmidhar Behera, Indrani Kar, *Intelligent Systems and Control-Principles and applications.* Oxford.
5. M.Ganesh, *Fuzzy Set and Fuzzy Logic*, Prentice Hall of India.
6. John Harris, *An Introduction to Fuzzy logic Applications,* Springer.
7. James J Buckley, *Fuzzy Probabilities-New approach and Applications,* Springer.
8. James A Anderson, *An Introduction to Neural Networks,* Prentice Hall of India,2009
9. Robert J Schalkoff_*Artificial Neural network*, TMH,2011,
10. Satish kumar, *Neural Networks-A class room approach*,TMH,2011

Type of Questions for University Examination

Q1. Eight short answer questions of 5 marks each with two questions from each of the four modules.
Q2 to Q5 : Two questions A & B of 15 marks from each module with option to answer either A or B.

EC 18L1 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:

i.	Regularity and progress of work	60
ii.	Work knowledge and Involvement	60
iii.	End semester presentation and oral examination	60
iv.	Level of completion and demonstration of functionality/specifications	60
v.	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.*

EC 18L2 VIVA VOCE

Each student is required to appear for a viva-voce examination at the end of the complete course work. The students 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 students in terms of their conceptual grasp of the course of study and practical/analysis skills in the field.