SNDT Women's University

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Syllabus B. Tech. in Electronics Engineering

SNDT Women's University

1, Nathibai Thackersey Road,
Mumbai 400 020

Applicable to students taking admission in and after 2015

Revised – 2018

Faculty Name: Technology
Course Name: B. Tech (ENC/EE/IT/CST)

SCHEME: Semester I

Code	Subjects	L	Cr	P / T	D	TP	TW	P/V	T
	Engineering Mathematics-I	4	4		2.5	75	25		100
	Applied Science-I	4	4		2.5	75	25		100
	Engineering Drawing	4	4		2.5	75	25		100
	Electrical Circuits	4	4		2.5	75	25		100
	Programming in C	4	4		2.5	75	25		100
	Applied Science Lab-I		2	2	2		25	25	50
	Electrical Circuits lab		2	2	2		25	25	50
	C Programming Lab		2	2	2		25	25	50
	Workshop-I		2	2	2		25	25	50
	Engineering Drawing Tutorial		2	2	2		25	25	50
Total		**20**	**30**	**10**	**22.5**	**375**	**250**	**125**	**750**

SCHEME: Semester II

	Subjects	L	Cr	P / T	D	TP	T W	P/V	T
	Engineering Mathematics –II	4	4		2.5	75	25		100
	Applied Science-II	4	4		2.5	75	25		100
	Electronics Devices	4	4		2.5	75	25		100
	Mechanics and Thermodynamics	4	4		2.5	75	25		100
	Communications Skills- I	4	4		2.5	75	25		100
	Applied science lab-II		2	2	2		25	25	50
	Electronic Devices Lab		2	2	2		25	25	50
	Introduction to Computational Techniques		2	2	2		25	25	50
	Workshop-II		2	2	2		25	25	50
	Mechanics and Thermodynamics Lab		2	2	2		25	25	50
Total		**20**	**30**	**10**	**22.5**	**375**	**250**	**125**	**750**

SCHEME: Semester III

Code	Subjects	L	Cr	P / T	D	TP	TW	P/V	T
	Engineering Mathematics-III	4	4		2.5	75	25		100
	Discrete Electronic and Circuits	4	4		2.5	75	25		100
	Digital Logic Circuits	4	4		2.5	75	25		100
	Electrical Network Theory	4	4		2.5	75	25		100
	Electronic Measurements and Instrumentation	4	4		2.5	75	25		100
	Environmental Science	4	4		2.5	75	25		100
	Discrete Electronics Lab		2	2	2		25	25	50
	Logic Circuits Lab		2	2	2		25	25	50
	Measurements and Instrumentation Lab		2	2	2		25	25	50
	Electrical Network Theory Tutorial		2	2	2		25	25	50
Total		**24**	**32**	**8**	**23**	**450**	**250**	**100**	**800**

SCHEME: Semester IV

Code	Subjects	L	Cr	P / T	D	TP	TW	P/V	T
	Statistical Theory of Communication	4	4		2.5	75	25		100
	Numerical methods and Linear Algebra	4	4		2.5	75	25		100
	Signals and System	4	4		2.5	75	25		100
	Analog Circuits	4	4		2.5	75	25		100
	Electromagnetic Field Theory	4	4		2.5	75	25		100
	Computer Architecture and Organization	4	4		2.5	75	25		100
	Numerical methods lab		2	2	2		25	25	50
	Signals and System Tutorial		2	2	2		25	25	50
	Analog Circuits lab		2	2	2		25	25	50
	Electromagnetic Field Theory Tutorial		2	2	2		25	25	50
Total		**24**	**32**	**8**	**23**	**450**	**250**	**100**	**800**

SCHEME: Semester V

Code	Subjects	L	Cr	P / T	D	TP	T W	P/ V	T
	Microprocessor-I	4	4		2.5	75	25		100
	Filter Theory	4	4		2.5	75	25		100
	Antenna Theory	4	4		2.5	75	25		100
	Control System	4	4		2.5	75	25		100
	Communication Skills-II	4	4		2.5	75	25		100
	Principles of Communication	4	4		2.5	75	25		100
	Microprocessor-I Lab		2	2	2		25	25	50
	Principles of Communication Lab		2	2	2		25	25	50
	Filters Theory lab		2	2	2		25	25	50
	Control System Lab		2	2	2		25	25	50
Total		**24**	**32**	**8**	**23**	**450**	**250**	**100**	**800**

SCHEME: Semester VI

Code	Subjects	L	Cr	P / T	D	TP	T W	P/V	T
	Microprocessor-II	4	4		2.5	75	25		100
	Automotive Electronics	4	4		2.5	75	25		100
	Digital Signal Processing and Applications	4	4		2.5	75	25		100
	Industrial Electronics	4	4		2.5	75	25		100
	Digital Communication	4	4		2.5	75	25		100
	Microprocessor-II lab		2	2	2		25	25	50
	Automotive Electronics lab		2	2	2		25	25	50
	DSP lab		2	2	2		25	25	50
	Power Electronics Lab		2	2	2		25	25	50
	Digital Communication Lab		2	2	2		25	25	50
	Seminar		2	2	2		25	25	50
Total		**20**	**32**	**12**	**24.5**	**375**	**275**	**150**	**800**

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Faculty Name: Technology
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SCHEME: Semester VII

Code	Subjects	L	Cr	P / T	D	TP	TW	P/V	T
	Consumer Electronics	4	4		2.5	75	25		100
	Mechatronics	4	4		2.5	75	25		100
	Embedded and IOT System	4	4		2.5	75	25		100
	VLSI Design	4	4		2.5	75	25		100
	Elective –I	4	4		2.5	75	25		100
	VLSI Design Lab		2	2	2		25	25	50
	Mechatronics Lab		2	2	2		25	25	50
	Elective Lab I		2	2	2		25	25	50
	Embedded and IOT System Lab		2	2	2		25	25	50
	Consumer Electronics Lab		2	2			25	25	50
	Project –I (Stage I)		2	2			25	25	50
Total		**20**	**32**	**12**	**20.5**	**375**	**275**	**150**	**800**

SCHEME: Semester VIII

Code	Subjects	L	Cr	P / T	D	TP	TW	P/V	T
	Computer and Communication Network	4	4		2.5	75	25		100
	Elective II	4	4		2.5	75	25		100
	Communication Networks Lab		2	2	2		25	25	50
	Elective Lab II		2	2	2		25	25	50
	Project –II (Stage II)		10	8			150	100	250
	Project –III (Stage III)		10	8			150	100	250
Total		**08**	**32**	**20**	**9**	**150**	**400**	**250**	**800**

Elective List of Electronics

Sr. No	Elective-I	Elective-II
1	**Renewable Energy Sources**	**Management for Information and Communication Professional**
2	**Coding Techniques and Cryptography**	HD languages
3	RF Circuit Design	Wireless and Mobile Communication
4	**Advanced Electronics and Instrumentation**	Robotics

ENGINEERING MATHEMATICS – I			
Branch : ENC/EE/IT/CST	**Sem: I**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On completion of the course, the student will have:

- **Confidence in using mathematics to analyze and solve problems both in academic and technical field**

Module No.	Sr. No.	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Partial Differentiation** - Definition, differentiation of composite implicit functions, chain rule	**15**	**25**
		Euler's theorem on Homogeneous functions		
		Total differentiation of composite functions using partial differentiation.		
		Errors and approximation,		
		Extreme values of functions of two variables, applications in engineering.		
	2	**Expansion of functions** (real variables) Taylor's and Maclaurin's series		
II	1	**Matrices** 1– Types of Matrices. Adjoint of a matrix, Inverse of a matrix by using Adjoint	**24**	**40**
		Elementary transformations. Rank of a matrix. Reduction to a normal form.		
		Partitioning of matrices, Orthogonal Matrices		
	2	**Matrices 2** - System of homogeneous and non – homogeneous equations, their consistency and solutions		
		Linear dependence and independence of rows and columns of a matrix area in a real field		
		Eigen values and Eigen vectors. Cayley Hamilton theorem, Minimal Polynomial – Derogatory and non-derogatory matrices.		
III	1	**Complex Numbers** -Definition of complex numbers Cartesian, Polar and exponential form. Algebra of Complex numbers	**15**	**25**
		De–Moiver's theorem and roots of complex numbers.		
	2	**Hyperbolic functions –** Hyperbolic Functions, Separation real and imaginary parts of circular & Hyperbolic functions.		
	3	Logarithm of complex numbers.		
		Applications in Engg.		
IV	1	**Differential Calculus** - Successive differentiation, Leibnitz's theorem (without proof) and applications in engineering field.	**6**	**10**
		Indeterminate forms. L'Hospital's rule		
		TOTAL	**60**	**100**

Text / Reference Books:

1. P. N. Wartikar & J. N. Wartikar, "A Text Book of Applied Mathematics", 7th edition, Pune Vidyarthi Griha Prakashan, Reprint-J-2008.
2. B. S. Grewal, "Higher Engineering Mathematics", 41th edition, 1953, Khanna Publishers, Reprint-2011.
3. Shanti Narayan, "Matrices", S. Chand, 9th edition, 2011
4. Shanti Narayan, "Differential Calculus", S. Chand, 1st edition, 2010
5. A. R. Vashishtha, "Matrices", 42th edition, Krishna Prakashan Mesdia (P) Ltd., 2011.
6. Edwin Kreyszig, "Advance Engg. Mathematics", 9th edition, New Age International (P) Ltd; 2011.

APPLIED SCIENCE – I			
Branch : ENC/EE/IT/CST	**Sem: I**	**Lectures: 4 Hr**	**Credit: 4**

Objective : The students will acquire knowledge of

- **Different types diffraction and interference and perform experiments on the same.**
- **Prisms and gratings, sonic displays and sonogram, sound and acoustics.**
- **Lasers, optical fibers, hologram and concept of photocell, electron diffraction and modern physics which is the basis of electronics.**
- **Principles underlying various methods of water analysis and treatment.**
- **Photophysical and chemical process taking place in our surroundings and applications of spectroscopy in engineering.**
- **Materials used in different fields of engineering and their composition, construction and applications such as batteries, electrodes, etc.**

Module No.	Sr. No.	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Interference and diffraction of Light:** Interference due to division of wavefront and division of amplitude, Young's double slit expt., Superposition, Theory of Biprism, Interference from parallel thin films, wedge shaped films, Newton rings, Michelson interferometer. Fresnel Diffraction, Diffraction at a straight edge, Fraunhoffer diffraction, Diffraction grating, dispersive power of Grating, resolving power of prism and grating.	**15**	**25**
	2	**Polarization and ultrasonics:** Introduction, production of plane polarized light by different methods, Brewster and Malus Laws. Double refraction, Quarter & half wave plate, Nicol prism, specific rotation, Laurent's half shade polarimeter. Ramdson & Huygen Eye pieces, Electron microscope **Ultrasonics:** Classification of Sound- decibel- Weber–Fechner law – Sabine's formula- derivation using growth and decay method – Absorption Coefficient and its determination –factors affecting acoustics of buildings and their remedies. Production of ultrasonics by magnetostriction and piezoelectric methods - acoustic grating –Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C – scan displays, Medical applications – Sonogram		
II	1	**Fiber Optics and Holography:** Introduction, temporal and spatial coherence, principle of Laser, stimulated and spontaneous emission, Einstein's Coefficients, He-Ne Laser, Ruby Laser, Application of Lasers. Fundamental ideas about optical fiber, Types of fibers, Acceptance angle and cone, Numerical aperture, Propagation mechanism and communication in optical fiber. Attenuation, Signal loss in optical fiber and dispersion. Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.	**15**	**25**
	2	**Quantum mechanics:** Introduction, Wave particle duality, de Broglie wavelength; experimental verification of de Broglie theory; properties		

		of matter waves; Wave function, Physical interpretation of wave function; Heisenberg's uncertainty principle; Electron diffraction experiment and Gama ray microscope experiment; Applications of uncertainty principle; Schrodinger's time dependent wave equation, time independent wave equation, - Motion of free particle, Physical significance of wave function – Particle in a one dimensional box, Compton's effect.		
III	1	**Water and its treatment:** Impurities in water, Hardness of water, types of hardness. Determination of Hardness of water by EDTA method and problems. Softening of water by Hot and cold lime soda method and problems. Zeolite process and problems. Ion Exchange process • **Drinking water or Municipal water,** Treatments removal of microorganisms, by adding Bleaching powder, Disinfection by Ozone, Electro-dialysis and Reverse osmosis, ultra filtration. **BOD, COD** (def. & significance), sewage treatments activated sludge process, numerical problems related to COD	**15**	**25**
	2	**Photochemistry and analytical methods:** Laws of Photochemistry, Photo physical processes, Chemiluminescence and Photo-sensitization, Fluorescence and Phosphorescence, Photochemical reactions: Photolysis of HI, Photochemical reaction between H_2 and Br_2, Photosensitized reactions and photocleavage of water, Quantum efficiency. Elementary ideas and simple applications of U.V., visible, infra-red, microwave and HNMR spectral techniques.		
IV	1	**Lubricants:** Introduction, Definition, Mechanism of Lubrication, Classification of lubricants, Solid lubricants (graphite & Molybdenum disulphide), Semisolid lubricants (greases Na base , Li base , Ca base) , Liquid lubricants (blended oils). Properties of lubricants, definition and significance of viscosity ,viscosity index, flash and fire points, cloud and pour points, oiliness, Emulsification, Acid value and problems, Saponification value and problems.	**15**	**25**
	2	**Chemistry in the Service of Society** (Illustrative Examples and application Only) Building and Construction Materials(1), Health and Medicine(2), Materials for Electronics(1), Material for Transport Technology(1), Materials for Energy Devices(2), Environment-Pollution Monitoring and Control(2) and Catalysis and catalyst Development(1).		
		TOTAL	**60**	**100**

Text /Reference Books

1. Avadhanulu & Kshirsagar, "A Textbook of Engineering physics", 8th edition, S. Chand Publication, 1992.
2. Vasudeva, "Modern Engineering Physics", 1st edition, S. Chand Publication, 1999.
3. J. C. Upadhya, "A textbook of Mechanics", Himalaya Publishing House, 2008.
4. Jain & Jain, "Engineering Chemistry", 1st edition, Dhanpat Rai Publications, 2009.
5. Dara & Dara, "Engineering Chemistry", 5th edition, S. Chand, 1996.
6. Shashi Chawla, "A Text Book of Engineering Chemistry", Dhanpat Rai Publications.

ENGINEERING DRAWING			
Branch : ENC/EE/IT/CST	**Sem: I**	**Lectures: 4 Hr**	**Credit: 4**

Objective : After studying this course:-

- **Students should be able to visualize the objects.**
- **They should be able to understand and read drawing.**
- **They should be able to present the same.**

Module No.	Sr. No.	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Principles of Drawing:** Drawing Instruments and their uses**,** Standard sizes of drawing sheets (ISO-A series), Letters and numbers (single stroke vertical), Convention of lines and their applications, Scale (reduced, enlarged & full size) plain scale and diagonal scale, Dimensioning technique types and applications of chain, parallel and coordinate dimensioning, Geometrical constructions.	**15**	**25**
	2	**Engineering curves:** **Conic Section** To draw an ellipse by Arcs of circle method & Concentric circles method. To draw a parabola by Directrix and focus method &Rectangle method To draw a hyperbola by Transverse Axis and focus method & rectangular hyperbola. **Engineering curves** To draw involutes of circle & pentagon, To draw a cycloid, epicycloids, hypocycloid.		
II	1	**Orthographic projections:** Introduction to Orthographic projections, Concept of Quadrants, First angle and Third angle Method of Projection Conversion of pictorial view into Orthographic Views (First Angle Projection Method Only) – elevation, plan and side view.	**15**	**25**
	2	**Projection of points:** Points lying in all the four quadrants		
	3	**Projection of lines** (Lines inclined to one plane only)		
III	1	**Projection of Planes**: Triangular, Square, Rectangular, Pentagonal, Hexagonal and Circular planes inclined to either HP or VP only.	**15**	**25**
	2	**Projection of Solids:** (Prism, Pyramid, Cylinder, Cone only) Solid projection with the axis inclined to HP and VP.		
IV	1	**Isometric projections:**	**15**	**25**

		Isometric scale, comparison of true scale with isometric scale. Conversion of orthographic views into isometric View / projection.		
		TOTAL	**60**	**100**

Text /Reference Books

1. N. D. Bhatt, "Engineering Drawing (Plane and solid geometry)", Charotar Publishing House Pvt. Ltd., 51th edition, 2012.
2. N. D. Bhatt & V.M. Panchal, "Machine Drawing", Charotar Publishing House Pvt. Ltd., 43rd edition, 2008.
3. M. B Shah & B.C Rana, "Engineering Drawing", Pearson Publications, 22nd edition, 2012.
4. P. J. Shah, "Engineering Graphics", S Chand Publications, 32nd edition, 1995.
5. Dhananjay A Jolhe, "Engineering Drawing" Tata McGraw Hill, 2011.

ELECTRICAL CIRCUITS			
Branch : ENC/EE/IT/CST	**Sem: I**	**Lectures: 4 Hr**	**Credit: 4**

Objective : The students will be able to

- **Acquire knowledge about basic components of electrical circuits**
- **Understand working of different electrical circuits**
- **Analyze AC circuits**
- **Analyze DC circuits**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Classification of devices of electrical circuits:** Basic components of the circuit model a) Resistance b) Inductance c) Capacitance, Parameters and its representations (sign conventions and graphical representations.	15	25
	2	**Electrical Sources** : Different types of Energy Sources ,Ideal sources a) current b) voltage, Dependent and independent sources, transformation of energy sources		
	3	**Classification of Elements** : Criteria for classification, a) Lumped /Distributed b) Linear/Nonlinear elements c) Passive/Active elements d) Bilateral/non-bilateral elements e) Time variant/Time invariant elements		
	4	**Basic circuit Analysis** : Nodal analysis with voltage source, nodal analysis with current source, Mesh analysis using Matrix and Loop method a) Super mesh b) super node		
II	1	**Network Theorems** : Superposition, Thevenin's theorem, Norton's theorem, Substitution, Reciprocity, Maximum power transfer theorem, Tellegen's theorem, star-delta transformation	15	25
III	1	**Introduction to A.C. Circuits/Steady state analysis:** Introduction & alternating currents and voltages a) sine wave, angular relation, phase of a sine wave, sine wave equation b) concepts of lead/lag c)voltage and current values of a sine wave, Instantaneous value, peak value, R.M.S. value, average value .form factor Phase relation:- a) in a pure resistor b) pure inductor c) pure capacitor d) AC thru. RL in series e) AC thru. RC in series f) series RLC Series resonance, Parallel branched A.C. circuit: - a) RLC b) parallel resonance. Power in A.C. circuits: a) pure resistor, capacitor and inductor circuits b) Concepts of power factors, application of power factor, phase diagrams.	15	25
IV	1	**Transient Analysis**: Introduction, Differential equation, order of the circuit, network equation, initial and final conditions of basic elements, Problems based on the above concepts concentrating on RL,RC,LC,RLC circuits	15	25
	2	**Transformers** : Types of transformers, testing of transformers, Ideal transformers		
		TOTAL	**60**	**100**

Text / Reference Books:

1. Murthy & Kamath, “Basic Circuit Analysis”, 2nd Edition, Jaico Publishing Home, 2002
2. B. L. Theraja, “Electrical Engg. &Technology”, 2nd Edition, S. Chand & Co, 2010.
3. Van Valkenberg, “Network analysis”, 3rd Edition, Prentice Hall of India, 2011.
4. V. N. Mittal, “Basic Electrical Engg.”, 10th edition, 2009.
5. B. R. Patil, “Basic Electrical and Electronics Engineering”, 2nd edition, Oxford University Press2013.
6. Dr. K Uma Rao, Dr. A. Jayalaxmi,“Basic Electrical Engineering”, Pearson Publication, 2011
7. D. C. Kulshreshtha, “Basic Electrical Engineering”, 3rd edition, Tata McGraw-Hill, 2013.

PROGRAMMING IN C			
Branch : ENC/EE/IT/CST	**Sem: I**	**Lectures: 4 Hr**	**Credit: 4**

Objective :

- **This course is designed to provide a comprehensive study of the C programming language. It stresses the strengths of C, which provide students with the means of writing efficient, maintainable, and portable code.**
- **The nature of C language is emphasized in the wide variety of examples and applications.**
- **To learn and acquire art of computer programming**
- **To know about some popular programming languages and how to choose Programming language for solving a problem**.

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weight-age in %
I	1	**Introduction and Basic notation:** Flowcharts, algorithms, importance of C, Basic structure of C programs. Constants such as integer, real, character, string, and backslash character, variables, declaration of variables, Data types such as fundamental, user defined, and derived, user defined type declaration, assignment statement, defining symbolic constants, Operators, different types of operators such as arithmetic, relational, logical, assignment, increment, decrement, conditional, bitwise, and special, Expression, precedence of arithmetic operator, computational problems, type conversions in expression, different rules of conversion, casting a value, operator precedence and associativity.	**15**	**25**
	2	**Input – Output Functions:** different format specifiers, formatted input function scanf (), other input functions such as getchar (), getch(), getche(), gets(), formatted output function printf(), other output functions such as putchar (), puts() different character test functions.		
II	1	**Decision Making and Branching:** Simple if statement, the if-else statement, Nested if … else statements, the else … if ladder, the switch statement, goto statement, continue statement, break statement, **Loop:** loops, different types of loop such as entry control, and exit control, the while statement, the do statement, the for statement, nested for loop jumps in loops.	**15**	**25**
III	1	**Arrays:** Definition, one–dimensional array, general form of array declaration, initialization of array, two–dimensional array, initializing two–dimensional array, multidimensional array, applications of array, **Strings:** Reading a string, writing a string, different string handling functions such as strcat(), strcmp(), strcpy(), and strlen().	**15**	**25**
	2	**Functions:** Different types of functions such as library and user defined, difference between them, need of function, advantages of functions, declaration of a function, function call, definition of a function, return values and their types, category of a function, void function, nesting of functions, recursion, function with array, scope		

		of a variable, internal and external variable, storage classes such as automatic, external, static, register.		
IV	1	**Structures:** Definition, various ways of declaration of structure variable, structure initialization, arrays of structures, arrays within structure, structures within structures, structures and functions, unions, bit fields.	**15**	**25**
	2	**Pointers:** Why pointers, accessing the address of a variable, pointer declaration, pointer initialization, accessing a variable through its pointer, pointer to pointer, pointer expressions, passing address to a function(call by reference), function returning pointers, pointers and arrays, passing array elements to a function, pointer and two dimensional array, pointer and three dimensional array, arrays of pointers, pointers and structure.		
	3	**File Management:** Defining and opening a file, closing a file, Input/ Output operations on files, structure storage in file.		
		TOTAL	**60**	**100**

Text / Reference Books:

1. E. Balgurusamy, "Programming in ANSI C", 6th edition,Tata McGraw Hill, 2013.
2. Yashavant Kanetkar, "Let Us C", 13th edition, BPB Publications, 2013.
3. P.B. Mahapatra, "Thinking in C", 2nd edition, Wheeler Publishing, 1997.
4. Yashavant Kanetkar, "Understanding Pointers in C", 4th edition, BPB Publication., 2013.
5. Harbert Schildt, "C : The Complete Reference", 4th edition, Tata McGraw Hill, 2005.

LABS/ TUTORIALS FOR SEMESTER I

APPLIED SCIENCE LAB – I			
Branch : ENC/EE/IT/CST	**Sem: I**	**Practical Hrs.: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	To understand the concept of fiber optics, junction diode, lasers, Diffraction and interference. Determination of hardness of water, alkalinity, percentage of chlorine in bleaching powder, COD, acid value and saponification value of lubricant, Study of Beer-Lambert's law		

ELECTRICAL CIRCUITS LAB			
Branch : ENC/EE/IT/CST	**Sem: I**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	Objective:-Students should understand the concepts of network theorems and its verifications. Practicals should consist of the verification of the various theorems applicable to the circuit, verification of Kirchhoff's laws, charging and discharging of the capacitors, testing of the transformers. Sources of energy, Power calculation/estimation of a particular setup, Stabilizer		

C PROGRAMMING LAB			
Branch : ENC/EE/IT/CST	**Sem: I**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	Introduction to Linux operating system. Problem solving techniques, flowchart Drawing, Algorithm development. Use of these techniques for solving problems using C language.		

WORKSHOP-I			
Branch : ENC/EE/IT/CST	**Sem: I**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	Workshop consist of the jobs to be done in Mechanical Engineering		

ENGINEERING DRAWING TUTORIAL			
Branch : ENC/EE/IT/CST	**Sem: I**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	**Sheet-1**: engineering curves (o4 problems) **Sheet -2:** Orthographic projection.(2 problems). **Sheet -3**: Orthographic projection. (2 problems). **Sheet- 4**: Isometric Projections (2 problems). **One A-3 size sketch book consisting of:-** 1. 4 problems each from Projection of Curves, Lines, Planes and Solids. 2. 4 problems from orthographic projection. 3. 4 problems each from Isometric projections.		

ENGINEERING MATHEMATICS – II			
Branch : ENC/EE/IT/CST	**Sem: II**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On completion of the course, the student will have:

- **Confidence in using mathematics to analyze and solve problems both in academic and technical field**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weight -age in %
I	1	**Differential equations** - Differential equation of 1st order and 1st degree, Linear differential equations, Bernoulli's equations. Exact differential equations, Integrating factors.	**15**	**25**
	2	**Differential equations** - Differential equations of higher order. (Linear equations) Differential operator D, Solutions of f(D)y=X		
		Linear differential equations with constant and variable coefficients. (Cauchy Linear Equations and Legendre's Linear equations).		
		Applications (where the differential equation is given) in Engg. Field (first order and higher order)		
II	1	**Vector Algebra** – Product of three or more vectors, La-Grange's Identity, Application Engineering field	**15**	**25**
	2	**Vector Calculus** Vector differentiation – rules and theorems on vector differentiation		
		Scalar point functions and vector point functions, gradient, divergent and curl and applications		
		Solenoid and irrotational fields, scalar potential of irrotational vectors, Laplace's equations in harmonic function - applications in engineering.		
III	1	**Integral Calculus** – Curve tracing (Standard curves) Rectification (Arc length).	**15**	**25**
		Double Integrals –Evaluation, Change of order of integration, double integration of polar coordinates,		
		Application of single and double integration – mass and volume, Triple integration, Evaluation and applications		
IV	1	**Differentiation Under Integral Sign** – Theorems on differentiation under integral sign (without proof). Application in evaluating integrals	**15**	**25**
	2	**Error Functions** –Error functions and its properties, problems **Beta And Gamma Functions** – beta and gamma functions, properties,		
	3	Relation between beta & gamma functions, Duplication formula and problems based on it, applications in engineering.		
		TOTAL	**60**	**100**

Text / Reference Book:

1. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 41th edition, 2011.
2. P.N.Wartikar & J. N. Wartikar, "Elements of Applied Mathematics", Pune Vidyarthi Griha Prakashan, 1st edition, 2008.
3. Shanti Narayan, "Differential Calculus", S. Chand, 14th Edition, 2010.
4. Murry Spiegal, "Vector Analysis", 2nd edition, 2010.
5. Edwin Kreyszig, "Advance Engg. Mathematics", New Age International (P) Ltd, 5th Edition, 2011.

APPLIED SCIENCE – II			
Branch : ENC/EE/IT/CST	**Sem: II**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On completion of the course, the student will be able to

- **To understand the crystal structure of solids, conductors, semiconductors, magnetic and superconductor materials, properties of these materials which are responsible for their applications, theories to understand their behavior etc.**
- **To study the polymers, alloys, various engineered materials and nanomaterials and their applications in various fields.**
- **The topics on motion and mechanics are useful in understanding concepts of motion, velocity, impulse and applications such as recoil of gun, motion of lift, potential, kinetic energy, torque etc.**
- **Approach to demonstrate the working of electrodes, their behavior and differentiate various types of corrosion, gain knowledge on control measures associated with corrosion.**
- **To gain knowledge about different types of fuels and understand the terminologies involved in the field of fuel and combustion.**

Module No.	Sr. No	Topics and Details	No. of Lectures assigned	Weight -age in %
I	1	**Crystal structure:** Crystallography: Space lattice, Unit Cell, Lattice parameters, Bravais lattices and Crystal systems, Cubic crystal system & lattices; Density & Packing Fraction; Miller indices of crystallographic planes & directions; interplanar distance; Diamond structure, NaCl structure, HCP structure, BaTiO3 structure; Ligancy and Critical radius ratio; Determination of crystal structure using X-ray diffraction techniques viz. Laue method, rotating crystal method (Bragg method) & powder method; Real crystals & point defects; photonic crystals; Liquid crystal phases and application in LCD (with brief introduction of optical polarization).	**15**	**25**
	2	**Electromagnetic Theory (EMT):** Motion of Charged Particles in crossed electric & magnetic fields, Velocity Selector & Magnetic focussing, Gauss law, continuity equation, inconsistency in Ampere's Law, Maxwell's equations, poynting vector, Poynting Theorem (Statement only), propagation of plane electromagnetic waves in conducting and non-conducting medium.Cathode ray tube (CRT); Cathode ray Oscilloscope (CRO); Application of CRO.		
II	1	**Mechanics:** Central and non-central forces, Inverse square force, SHM, Damped, undamped and forced Oscillations. **Special theory of Relativity:** Frame of reference, Michelson-Morley experiment, basic postulates of special relativity, Lorentz transformations (space – time coordinates & velocity only), mass energy relation.	**15**	**25**
	2	**Physics of some Technologically important Materials: Magnetic materials:** Definition of terms – classification of magnetic materials and properties – domain theory of ferromagnetism- hard and soft magnetic materials – applications. **Conductors:** classical free electron theory of metals. Quantum theory – Fermi distribution function – Effect of temperature on		

		Fermi Function – Density of energy states – carrier concentration in metals. **Semiconductors:** Introduction to band theory, metals, semiconductors and insulators, charge carriers in semiconductors, conductivity and mobility of charge carriers, concepts of Fermi level, Fermi level in intrinsic and extrinsic semiconductors, semiconductor diodes. **Superconductors:** definition – Meissner effect – type I & II superconductors – BCS theory (qualitative) – high temperature superconductors – Josephson effect – quantum interference (qualitative) – SQUID – applications. **Nanomaterials:** Introduction to nano-science and nanotechnology; Two main approaches in nanotechnology -Bottom up technique and top down technique; Tools used in nanotechnology such as Scanning electron microscope, Scanning Tunneling Microscope, Atomic Force Microscope. Nano materials: Methods to produce nanomaterials; Applications of nanomaterials; Different forms of carbon nanoparticles, carbon nanotubes, properties and applications.		
III	1	**Polymers and Composites:** Introduction to polymers, Functionality, Degree of polymerization, Linear, branched and cross-linked polymers, Tacticity of polymers, Homo and Copolymers (Classification based on repeat unit), Thermoplastic and Thermosetting plastic. Ingredients of the plastic (Compounding of plastic.) Fabrication (moulding) of plastic. Preparation, properties and uses of Phenol formaldehyde, PMMA , Kevlar. Glass transition temperatures, Conducting Polymers: Properties and applications. **Rubbers:** Natural rubber, Drawbacks of natural rubber, vulcanization of rubber, Preparation, properties and uses of Buna-S, Silicone and Polyurethane rubber. **Composites:** Classification, Fibre and particle reinforced composites.	**15**	**25**
	2	**Phase Rule and Alloys:** Gibb's Phase Rule, Explanation, One Component System (Water), Reduced Phase Rule, Two Component System (Pb-Ag), Pattinson's process, applications and Limitations. • Introduction, purpose of making alloys, Ferrous Alloys, plain carbon steel, heat resisting steels, stainless steels (corrosion resistant steels), effect of the alloying element, Ni, Cr, Co, Mg, Mo, W, and V. • Non-Ferrous Alloys- Alloys of Al – i) Duralumin ii) Magnalumin. Alloys of Cu-Brasses – i) Commercial brass ii) German Silver. Bronzes – i) Gun metal ii) High – phosphorus bronze. Alloys of Pb– i) Wood's metal. ii) Tinman's solders. Their composition, properties & uses. Metallic glasses: preparation, properties and applications. Shape memory alloys (SMA)		

IV	1	**Fuels:** Definition, Classification of fuels – solid, Liquid & Gaseous. Calorific value – def. Gross or Higher C.V. & Net or lower C.V. units of heat numericals for calculations of Gross & Net C.V. Analysis of coal – i) Proximate Analysis with numericals and its importance ii) Ultimate Analysis with numericals and its importance, Characteristic properties of the good fuel. Liquid Fuels – Crude petroleum oil; its composition & classification & mining (in brief). Refining of crude oil. Cracking – Definition; Types of cracking – I) Thermal Cracking, II) Catalytic Cracking. Petrol: Refining of petrol, unleaded petrol (MTBE use of catalytic converter), power alcohol. Knocking, Octane number (antiknocking agents), Cetane number. Combustion: calculations for requirement of only oxygen & air (by weight & by volume only), Bio-diesel, Trans-esterification, advantages and disadvantages of Biodiesel.	**15**	**25**
	2	**Electrochemistry and Corrosion:** Electrochemical cell - redox reaction, electrode potential- origin of electrode potential- oxidation potential- reduction potential, measurement and applications - electrochemical series and its significance - Nernst equation (derivation and problems). Corrosion- types chemical, electrochemical corrosion (galvanic, differential aeration, pitting corrosion), Factors affecting the rate of corrosion, corrosion control – material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method. Paints- constituents and function. Electroplating of Copper and electroless plating of nickel.		
		TOTAL	**60**	**100**

Text /Reference Books:

1. Applied Solid State Physics - Rajnikant, Wiley india
2. Engineering Physics - R.K.Gaur & S.L. Gupta, Dhanpat Rai publications, 8th edition, 2014.
3. Concepts of Modern Physics- Arther Beiser, Tata Mcgraw Hill, 13th edition, 2013.
4. Concept of physics (I & II): H. C. Verma
5. Engineering Chemistry – Jain & Jain, Dhanpat Rai, 5th edition, 2009.
6. Engineering Chemistry – Dara & Dara, S Chand, 5th edition, 1996
7. A Text Book of Engineering Chemistry – Shashi Chawla (Dhanpat Rai)

ELECTRONIC DEVICES			
Branch : ENC/EE/IT/CST	**Sem: II**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, students will be able to

- **Acquire knowledge about physics of basic semiconductor devices**
- **Understand different electronic devices**
- **Analyze characteristic of different semiconductor devices**
- **Knowledge about advanced semiconductor devices and their applications**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weight -age in %
I	1	Introduction to Semiconductor: mobility and conductivity, intrinsic semiconductor, donor and acceptor impurities, Fermi level, Drift currents and Diffusion currents, Energy Band Diagrams	**15**	**25**
	2	Semiconductor Diodes:- PN junction, Depletion layer, characteristics, Piece-wise linear characteristics & equivalent circuits, Diode resistance, Capacitance, switching time, Small signal models of diodes		
	3	Diode Application: Diode clipping, Clamping types of biasing in detail, voltage multiplying circuits.		
II	1	Varactor diode: Working and characteristics, Tunnel diode: V-I Characteristics and working, TED (Transferred Electron Device): Basic concept, Negative differential resistance, IMPATT: Static and Dynamic Characteristics	**15**	**25**
	2	Regulators:- Rectifiers (half, full, center tapped and bridge) with its detail analysis, Filters (C,L,LC,CLC) with its analysis in detail, Zener diodes and its regulation, regulators IC 78XX and 79XX		
III	1	BJT:- Construction and types, characteristics, BJT as a amplifier, CB, CE, CC Configuration ,Biasing Types, dc analysis and stability factor, DC load line and Ac load line	**15**	**25**
IV	1	JFET:- Construction and working with its characteristics FET as a amplifier, CS, CD, CG, configuration Biasing Types, Low frequency small signal ac equivalent circuit of JFET amplifiers	**15**	**25**
	2	Structure and physical operation of Enhancement type MOSFET. The Depletion Type MOSFET ,V-I and CV characteristics, Channel length modulation, Short Channel effects, MOSFET Model MESFET: Device structure, principle of operation, V-I characteristics, High frequency performance		
		TOTAL	**60**	**100**

Text /Reference Books

1. Boylstead and Nshelasky, "Electronic Devices and Circuits", PHP, 11th Edition, 2013.
2. Milman Grabel, "Microelectronics", McGraw Hill, 27th Edition, 2012.
3. Bhargav Gupta, "Basic Electronics and Linear Circuits", 34th edition, 2002.
4. Bell, David A. "Electronic Devices & Circuits" Oxford, 5th edition, 2013.
5. S Slivahanan and N. Suresh Kumar, "Electronic Devices and Circuits", McGraw Hill, 3rd edition, 2012.

MECHANICS AND THERMODYNAMICS			
Branch : ENC/EE/IT/CST	**Sem: II**	**Lectures: 4 Hr**	**Credit: 4**
Objective : To develop the ability, in the engineering student, to understand, formulate, and solve a given problem in a logical manner and to apply it to solve a few basic problems in Mechanics and Thermodynamics			

Module	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
UNIT I	1	MECHANICS- Force System– Fundamental concepts, force, characteristic of a force, resolution of a force, resultant of coplanar concurrent force system, method of resolution and composition, resultant of non-coplanar concurrent force system, principle of moments, resultant of coplanar parallel force system, Couple..	7	10
	2	EQUILLIBRIUM – Free body diagram (fad), conditions of equilibrium for a concurrent coplanar force system, Lami's theorem, and support reactions.	7	10
UNIT II	3	CENTRE OF GRAVITY – Methods to determine centre of gravity, problems based on plane laminate, problems on solids.	7	10
	4	ANALYSIS OF TRUSSES - Types of supports, method of joints, method of sections, comparison between method of joints and method of sections	7	10
UNIT III	5	FRICTION – Introduction, types of friction, concept of dry friction, types of friction problems, laws of friction, problems	7	10
	6	**ENGINEERING THERMODYNAMICS** Introduction and Basic concepts, Thermodynamics and its laws, classification of system, macroscopic and microscopic view of a system, Thermodynamic process, Quasi static process, Pressure, Temperature, Volume, Numerical.	6	12
	7	I-law of Thermodynamics- statement, Work , Energy, Heat, Law of conservation of Energy, Heat & Work, path function, specific heats, Numerical, Equation of steady flow, Non flow processes, Limitations of I-law of Thermodynamics, PMM-I	6	12
UNIT IV	8	II-law of Thermodynamics, statement, Kelvin Planck Statement, Claudius Statement, PMM-II , Heat engine, C.O.P., Refrigerator, Numerical, Thermal Efficiency, Carnot cycle, Limitations of Carnot cycle, Numerical on Carnot cycle	6	12
	9	Heat Transfer – basics, modes of heat transfer, Newton's Law of cooling, Fourier's law of heat conduction ,	7	14

		Numerical, Thermal conductivity, Heat Transfer by conduction, Heat Transfer by convection and radiation, Numerical, Heat Transfer through composite slab, Radial Heat Transfer through a thick cylinder, Numerical, Heat sink , basic concepts, applications.		
		TOTAL	**60**	**100**

Text Books:

1.”Engineering Mechanics” by R.S.Khurmi, Scand publications.
2.”Engineering Mechanics” by Ramamruthum.

Reference Books:

1. Thermal Engineering by Ballaney.
2. Engineering Thermodynamics by P. K. Nag.

COMMUNICATION SKILLS – I			
Branch : ENC/EE/IT/CST	**Sem: II**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On completion of this course, students will be able to

- **Understand the various genres of communication**
- **Understand communicative behavior**
- **Build capacities for self-criticism and think of professional and linguistic growth**
- **Use LSRW skills for linguistic competence**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Communication:** Concept and meaning of communication, barriers to communication, methods of communication, techniques to improve communication.	**15**	**25**
II	1	**Summarization :** Techniques to summarize a given passage to test comprehension and ability to present written matter in a brief and concise manner.	**15**	**25**
	2	**Comprehension and vocabulary:** Technical, scientific or general text with multiple-choice questions to test analytical skills, comprehension, expression, vocabulary and grammar (synonyms, antonyms, one-word substitution, word formation).		
III	1	**Basic official correspondence :** Principles of Correspondence, language and style in official letters, formats of letters, (complete-block, modified-block, semi-block) types of letters, (enquiry, replies to enquiries, claims and adjustments, application letters with bio-data)	**15**	**25**
IV	1	**Technical writing :** Framing definitions, classification and description of objects, explanation of a process, writing instructions.	**15**	**25**
		Oral Communication: Topics to be assigned for speech practice in the form of elocution and debates to test diction, modulation, fluency and non-verbal communication.	**Internal Assessment**	
		TOTAL	**60**	**100**

Text / Reference Books:

1. Business correspondence & report writing – R.C.Sharma & Krishna Mohan, Tata McGraw Hill, 4th edition, 2011.
2. Rai & Rai Business Communication (Revised Edition), , Himalaya Publishing House. Lesiker & Petit: Business Communication – McGraw Hill Publications, 3rd edition, 2008.

3. Modern Business Correspondence, McCommas & Satterwhite, Sixth Edition, McGraw Hill Publications.
4. English for Engineers & Technologists: A skills approach. (Books 1 and 2) Course Authors (Humanities and Social Sciences Division, Anna University, Madras. Orient Longman. (Mainly for comprehension.
5. Technical Writing, Eisenberg, Anne, McGraw Hill Publications. (Teacher reference only)
6. Technical Writing & Professional Communication, Huckins, Thomas, McGraw Hill publications, 2nd edition, 1991.
7. Written Communication, Freeman, Sarah, Orient Longman.

LABS/ TUTORIALS FOR SEMESTER II

APPLIED SCIENCE LAB II			
Branch : ENC/EE/IT/CST	**Sem: II**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	To learn the estimation of copper in brass, iron, manganese. Synthesis of polymer. To study the factors affecting corrosion To estimate the calorific value of a fuel Study of various Lasers characteristics of photo electric devices to understand the concepts involved in Newton's ring and air wedge film study of spectrometer study of crystal structures		

ELECTRONIC DEVICES LAB			
Branch : ENC/EE/IT/CST	**Sem: II**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	Study and identification of electronics devices and components, Basic construction and use of common measuring Instruments, Characteristics of the various electronics two terminal and three terminal devices, study of half wave and full wave rectifier using diodes, filters, application of diode clippers, clampers. BJT characteristic, BJT as amplifier characteristics of transistors FET		

INTRODUCTION TO COMPUTATIONAL TECHNIQUES			
Branch : ENC/EE/IT/CST	**Sem: II**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	Practical using Octave/MATLAB to understand the computational techniques.		

WORKSHOP-II			
Branch : ENC/EE/IT/CST	**Sem: II**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	Identify different types of cables & test it.		
2	Identify different types of connectors, Switches and Fuses & Discover their application.		
3	Identify different types of MCB with ratings, fuses and relays and discover their usage.		
4	i) Identify, find value using color code chart and test different types of resistors. ii) Identify, find value and test different types of capacitors. iii) Identify, find value and test different types of Inductors.		
5	Identify Various IC packages and SMD components.		
6	i) Interpret data sheet of various P-N junction diode, BJT and FET draw ii) Interpret data sheet of various IC and SMD components.		
7	Study of different network connectivity devices used to establish computer network. i) NIC(Network interface Card) ii) The Hub iii) The Switch iv) The Router v) The Gateway		
8	i) Study soldering and disordering of PCB ii) Study PCB making Artwork using Software.		

MECHANICS AND THERMODYNAMICS LAB			
Branch : ENC/EE/IT/CST	**Sem: II**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	1. Polygon law of coplanar forces. 2. Non concurrent non parallel (general). 3. Bell crank lever. 4. Support reaction for beam.. 5. Inclined plane (to determine coefficient of friction). 6. Simple / compound pendulum. 7. Collision of elastic bodies (Law of conservation of momentum). 8. Moment of Inertia of fly wheel. Any other experiment based on the syllabus.		

ENGINEERING MATHEMATICS – III			
Branch : ENC/EE/IT/CST	**Sem: III**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On completion of the course, the student will have:

- **Good Knowledge of Series and Transforms**
- **Confidence in using mathematics to analyze and solve problems both in academic and technical field**
- **Skill in Formulating and analyzing mathematical problems**

Module No.	Sr. No.	Topic and Details	No. of Lectures assigned	Weigh -tage in %
I	1	**Laplace Transform** - introduction Definition, properties with regards to summation, differentiation and integration. Laplace Transform of standard functions. Theorems on Laplace Transform Shifting properties. Laplace Transform of functions of the form t*f(t), f(t) /t.	15	25
	2	**Inverse Laplace Transform** : Evaluation of inverse Laplace transform (by standard formulae and partial fraction method) Laplace Transform of periodic functions, step functions, Dirac Delta functions Convolution integral and its application in finding the inverse Laplace Transform. Solving differential equation by Laplace Transform.		
II	1	**Fourier series** – definition and conditions for its existence, Evaluation of Fourier coefficients. Even and Odd functions. Evaluation of Fourier series of even and odd functions. Half range sine and cosine series, Parseval's theorem and its relations. Complex form of Fourier series, Introduction to Fourier Integrals.	15	25
	2	**Fourier Integrals and Transforms**: Derivation of Fourier Integrals, Fourier transform, Sine transform and cosine transform – properties and its elementary applications. Parseval's identity and evaluation of definite integrals by using it. Orthogonal functions, expression of function in a series of orthogonal functions.		
III	1	**Complex number** – representation in Cartesian, Polar and Exponential forms. De – Moiver's Theorem and its application to complex numbers. Hyperbolic functions.	15	25
	2	**Complex variables** – Continuity and Differentiability of functions of complex variables. Necessary and sufficient conditions for a function to be analytic (Cauchy – Riemann equations in Cartesian and Polar coordinate system with proof). Determining the function f(z)of complex variable from its real and		

		imaginary parts using Cauchy – Riemann equations.		
IV	1	**Mapping or Transformation**: Conformal mapping and Bilinear mapping – Geometrical representation of mapping.	**15**	**25**
	2	I**ntegration of Complex Variables** Concept of line integral and its relation with Riemann integral. Concept of point functions and path independent functions. Contour integration, Cauchy's theorem for analytic functions and its applications for multiply connected domains. Cauchy's integral formula and nth derivative of a complex function. Morera's theorem, maximum modulus theorem. Taylor's and Laurent's development of function of a complex variable. Singularities – isolated essential singularity and non-isolated singularity. Poles, evaluation of residues. Residue theorem and its application to evaluate real integrals.		
		TOTAL	**60**	**100**

Text/ Reference Books:

1. P. N. Wartikar & J. N. Wartikar, Elements of Applied Mathematics, 7th edition, Pune Vidyarthi Griha Prakashan, 2008.
2. B. S. Grewal, Higher Engineering Mathematics, 41th edition, Khanna Publishers, 2011.
3. Edwin Kreyszig, Advance Engg. Mathematics, 9th Edition, New Age International (P) Ltd; 2011.

DISCRETE ELECTRONICS AND CIRCUITS			
Branch : ENC/EE	**Sem: III**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, students will be able to

- **Understand AC models, H-models, Pi models of semiconductor devices such as BJT, JFET and usefulness of these devices for various applications like amplifiers and oscillators**
- **Apply concepts of DC and AC modeling of semiconductor devices for the design and analysis.**
- **Understand theoretical concepts and verify through laboratory and simulation experiments.**
- **Deliver the core concepts and reinforce the analytical skills learned in Electronic Device**
- **Motivate students to use MOS Power and opto devices for designing and analyzing electronic circuits**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weight-age in %
I	1	**Single stage Amplifiers**: Hybrid transistor Model(h-parameters small signal low frequency),accurate model and analysis, Simplified h-model, approximate analysis of BJT Amplifiers(CE, CB, CC stages), Millers theorem. Emitter follower and high input impedance circuits-Bootstrapping principle-effect of biasing resistors. Hybrid Pi model of BJT, Approximations in hybrid Pi model, high frequency response of amplifiers JFET-Small signal model-Analysis of CS and CD stages.	**15**	**25**
	2	**Design:** Design of single stage RC Coupled amplifiers.		
II	1	**Multistage Amplifiers**: General characteristics of multistage amplifiers, Gain BW product, Methods of coupling, RC, Direct, transformer, Darlington Pair. Frequency response of RC coupled amplifier(BJT-CE,FET-CS)small signal transient response of amplifiers-rise and fall time, tilt or sag, square Wave testing of amplifiers.	**15**	**25**
	2	**Design**: Design of multistage RC Coupled amplifiers.		
III	1	**Feedback Amplifiers**: concept of feedback, characteristics of negative feedback amplifiers, analysis of feedback amplifiers – voltage series, voltage shunt, current series, current shunt.	**15**	**25**
	2	**Oscillators**: Classification of oscillators, Barkhausen's criterion, RC phase oscillators, Wien bridge oscillators, LC oscillators, Hartely and Collpits, crystal oscillators-series resonant(pierce)parallel resonant (miller)oscillators		
IV	1	**Multivibrators**: Transistorized bistable Multivibrators, commutating capacitors.	**15**	**25**
	2	**Power amplifiers**: Classification of power amplifiers, second harmonic distortion. push pull and complimentary symmetry stages-cross over distortion, analysis of power amplifiers.		
	3	**Power and opto devices**: Diac, Triac, UJT, UJT relaxation oscillator, LDR, phototransistor- characteristics and applications.		
		TOTAL	**60**	**100**

Text / Reference Books:

1. Milliman Halkies, “Integrated Electronics”, 2nd Edition, McGraw Hill, 2010.
2. Boylsted and Nashlsky, “Electronics devices and circuits” 11th Edition, PHI, 2013.
3. Salivahanan, S & Kumar, N, “Electronic Devices & Circuits”, 3rd edition, McGraw Hill, 2012.
4. David Bell, “Electronics Devices and circuits”, 5th Reprint, PHI, 2013.

DIGITAL LOGIC CIRCUITS			
Branch : ENC/EE/CST/IT	**Sem: III**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, students will be able to

- **Learn the basics of number systems, Boolean algebra and the methods for simplifying Boolean expressions**
- **Understand the concept of the logic gates, the procedures for the analysis and design of combinational circuits and sequential circuits**
- **Discuss the various applications of flip-flops and study the different shift registers**
- **Understand the concept of memories, various logic families, programmable logic devices**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Concept of Digital and Analog circuit** Diodes and transistors as switch in Digital Circuits, Applications of Digital Logic circuits, Positive and negative logic.	**15**	**25**
	2	**Logic Gates:- OR, AND, NOT, NOR, NAND, EX-OR, EX-NOR.** Realization of Boolean expression using gates. De- Morgan's Theorems. Reduction Techniques: Laws of Boolean algebra, K-map reduction technique SOP & POS using universal gates, K-map using two, three, four and five variables, Duality theorem (pairs, quads, rolling, overlapping etc)		
	3	**Combinational Circuits** (Data Processing Circuits) Encoders and Decoders IC7445,IC 7448 Decoder drivers: seven segment display IC 7446, IC 7447, IC 7448.decimal to BCD encoder IC 74147. **Multiplexers and Demultiplexers:** IC 74150,IC 74151 and IC 74155		
II	1	**Arithmetic Circuits:-**Half and full adder, Half and full subtractor. B421 adder-subtractor, BCD adder subtractor, XS-3 adder, 4 bit parallel binary adder-subtractor.8421 adder-subtractor using IC 7483, BCD adder using IC7483, XS-3 adder using IC 7483 comparator.	**15**	**25**
	2	**Sequential Circuit**:- Flip-flops R-S, JK, D, T, master slave JK FF their Properties and truth tables conversion of one type of FF into another without using K-maps. Timing diagrams, Design of sequential circuits.		
III	1	**Applications of flip flops**: Counters- Principles of working of a 3-bit ripple counter, synchronous counter, preset table counter, mod-3, mod-6, mod-5, mod-7, mod-10, mod-12, using decoding gates. Ring counter, Twisted ring counter, Glitch and gating of a counter. IC7490, IC7493, IC7495, IC74193.	**15**	**25**
	2	**Shift registers**:-Principles of working of buffer register, shift-left, shift-right register. Four types of register: SISO, SIPO, PISO, PIPO, Typical shift register. Mode controlled shift register.		

IV	1	**Memories:** Classification of characteristics of memories. Methods of address decoding, memory cells. ROM memories:- Masked ROM, PROM, EPROM, EEPROM RAM memories:- TTL RAM, NMOS RAM, Dynamic RAM, SRAM(Asynchronous, Synchronous burst, Zero Bus Turnaround (ZBT)) **Logic families**:- Various logic families, their properties, comparison **Implementation using programmable devices** (ROM, PLA ,PAL , FPGA)	**15**	**25**
		TOTAL	**60**	**100**

Text / Reference Books

1. H. Taub and D.Schilling, "Digital Integrated Electronics", McGraw Hill, 2009
2. Malvino Leach, "Digital Electronics", 2nd edition, PHI, 2013.
3. Willam Gotmann, "Digital Electronics-An Intro. to theory & Practice", 2nd edition, PHI, 2009.
4. Tocci , "Digital Systems: Principles and Applications",6thedition, PHI, 2006.
5. R,.P. Jain, "Modern Digital Electronics" 4th edition, Tata McGraw-Hill Education, 2010.
6. F.J.Hill and G.L.Peterson, "Switching Theory and logic Design", John Wiley, 1981.
7. Kumar Anand A., "Fundamentals of Digital Circuits", 3rd edition, PHI, 2014.

ELECTRICAL NETWORK THEORY			
Branch : ENC/EE	**Sem: III**	**Lectures: 4 Hr**	**Credit: 4**

Objective : This subject would constitute a basic building block for electrical engineers, in the understanding of

- **Electric power and its steady state characteristics.**
- **Time and frequency domain analysis**
- **Electric current and conventions used to find the current characteristics**

Such understanding would also help the engineer to design his system after analyzing the circuit under all conditions.

The students would be able to do the analysis of

- **Graph Theory, Signal Flow Graph.**
- **Initial Conditions with respect to time domain analysis**
- **Laplace Transform applications with respect to network theory**
- **Transfer functions, Driving point functions,Poles and Zeros, Two port network to find various parameters for T and pi Section**
- **Lumped elements.**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Network Topology:** Graph-oriented, planar, sub-graph, concept of tree, incidence matrix, reduced incidence matrix, Tie-set /fundamental loops of graph, KVL equations for f-loops, rank, Cut-set & its orientation, KCL equations for cut-set, cut-set matrix, formulations of network equations, Networks with mutual inductances & controlled sources, Duality concept.	**15**	**25**
	2	**Signal Flow Graph:** State Space Representation, Masson's Gain Formulae		
II	1	**Mathematical Modeling of Electrical Circuits:** Ordinary differential equations.	**15**	**25**
	2	**State Variable Analysis:** State equations and their formulations, equivalent source method& topological method, Time –Domain solution to state equations. Laplace transform and their application to networks.		
III	1	**Time Domain approach to electrical networks:** Transient responses to networks , General & particular solution-L & R-C network, Time constant ,DC forcing response, initial conditions in networks, RL, RC and RLC networks .	**15**	**25**
	2	**Frequency Domain approach to Electrical Networks:** Laplace Transform, Basic Properties, Transformed circuit, Applications of Laplace Transform with respect to electrical network		
IV	1	**Two Port Networks:** Z, Y, H, G, ABCD or transmission parameters, Inter-conversion of	**15**	**25**

		parameters, condition of reciprocity & symmetry.		
	2	**Transfer Functions:** Network functions of some typical networks, Pole-Zero Plot of network functions, restrictions on Pole-Zero locations.		
		TOTAL	**60**	**100**

Text / Reference Books:

1. Gopal Bhise & Prem Chadha, "Engineering Network Analysis & filter design", 1st edition, Umesh Publication, 2009.
2. Van Valkenburg, "Network Analysis & Synthesis", 3rd edition, PHI Publication, 2014.
3. K. M. Soni, "Circuits & systems", S. K. Kataria & Sons Publications.

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION			
Branch : ENC/EE	**Sem: III**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, students will be able to

- **Understand performance criteria and design aspect for different measurement instruments**
- **Understand the classification, construction, working principle and application of various transducers**
- **Use Signal Generator, frequency counter, CRO and spectrum analyzer for appropriate measurement.**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	Properties of Instruments, Properties of Measurements like average, mean, deviation and standards of Measurement	15	25
	2	**Transducers** Electrical Transducers, Active & Passive Transducers Resistive Transducer - Potentiometer, Resistance Pressure Transducer, Resistive Position Transducer Temperature Transducer - Resistance Thermometer, Thermistor, Thermo couple, RTD Inductive Transducer - Using Self Inductance, Variable Reluctance type, Differential Output Transducers, LVDT, RVDT Capacitive Transducer-Capacitive Pressure Transducer Photo Electric Transducer(Photo emissive, Photo Conductive, Photo Voltaic)		
II	1	**Measurement of Resistance** Wheatstone's Bridge, Kelvin's Double Bridge **Measurement of Inductance & Capacitance** Maxwell's Inductance bridge, Maxwell's Inductance & Capacitance Bridge, Hay's bridge , Anderson's Bridge, Desaugthy's Bridge, Schering Bridge,Q meters	15	25
	2	**Analog Meters:** Moving coil and Moving iron Ammeters & Voltmeters. Extension of ranges by using shunt, AC voltmeters, and true rms Meters, **Digital Meter:** Advantages of digital meters over analogue meters. Resolution & sensitivity of digital meters. Working principles of digital Voltmeter		
III	1	**Oscilloscopes:** Basic Working of CRO and types. Sampling CRO and digital storage oscilloscope (DSO).	15	25
	2	**Signal generators:** Low frequency oscillators and function generators, Wide range RF generators, synthesized function generators.		

IV	1	**Measurement in the presence of noise:** Lock in amplifiers, signal averages, Improvement of SNR with averaging. **Computer aided Measurements:** Measurement system architectures, Data acquisition cards and plug in instruments, IEEE 488 based instruments.	**15**	**25**
	2	**Spectrum analyzers:** Real time, FET based dynamic and super heterodyne spectrum analyzers, Optical spectrum analyzer and OTDR		
		TOTAL	**60**	**100**

Text / Reference Books:

1. W. D. Cooper, "Electronic Instrumentation and Measurement Technique" 3rd Edition, Prentice Hall of India., 2014
2. A.K. Shawny, "Electronic Measurement and Instrumentation", 7th edition, 2011.
3. H. S. Kalsi, "Electronic Instrumentation", 3rd edition, Tata McGraw Hill, 2014.
4. Alan. S. Moris, "Principle of Measurement & Instrumentation", Prentice Hall of India.

ENVIRONMENTAL SCIENCE			
Branch : ENC/EE	**Sem: III**	**Lectures: 4 Hr**	**Credit: 4**

Objective:

- **To create awareness about the environment and its allied problems**
- **To identify and solve environmental problems as engineers**
- **Develop social responsibility towards environmental protection**
- **Inculcate attitude and values towards understanding and interdependence of man and nature and work towards sustainable development.**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	The multidisciplinary nature of environmental studies, definition, scope and importance, need for public awareness.	**15**	**25**
	2	Natural resource:- renewable and non-renewable resources, associated problems with the resources such as Forest, water, minerals, food, energy, land		
II	1	Ecosystem:- concept, structure, functions, producers, consumers and decomposers, energy, ecological succession, forest ecosystem, grass land ecosystem, Desert ecosystem, aquatic ecosystem.	**15**	**25**
	2	Biodiversity and its conservation: Introduction, definition, genetic species and ecosystem diversity, bio-geographical classification of India, value of biodiversity.		
III	1	Environmental pollution:- Causes effects and control measures in Air pollution, water pollution, soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear Hazards	**15**	**25**
	2	Social issues and environment:- From unsustainable to sustainable development, Urban problem related to energy, Environmental ethics issues and problem solution, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, consumerism and waste products, environment protection act and various acts related to Air pollution, water pollution and wild life protection, forest conservation, public awareness		
IV	1	Introduction to Green IT, internal assessment for organization for green IT policy, understanding carbon footprints, carbon offsetting, carbon neutrality and carbon trading, audit of organization for existing IT functions and process, risk issues and opportunities, sustainable IT procurement process, reuse, recyle and reprocess of IT assets, development of green IT action plan, roles and responsibilities with green IT,	**15**	**25**
	2	Electronics waste and its disposals		
		TOTAL	**60**	**100**

Text / Reference Books:

1. R. Rajagopalan, "Environmental Studies", 2nd Edition, Oxford University Press, 2012.
2. Kurian Joseph & Nagendran, "Essentials of Environmental Studies", Pearson Education.
3. Godfrey Boyle, "Renewable Energy", Oxford Publications.
4. Kaushik and Kaushik, "Perspective Of Environmental Studies", New Age International.
5. Anandita Basak, "Environmental Studies", 1st edition, Pearson Education, 2009.
6. Benny Joseph, "Environmental Studies", Tata McGraw Hill.

LABS / TUTORIALS FOR SEMESTER III

DISCRETE ELECTRONICS LAB			
Branch : ENC/EE	**Sem: III**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	**Hardware based** 1. Frequency response of Single Stage CE amplifier 2. Frequency response of Single Stage CS amplifier 3. Bootstrap Circuit 4. UJT relaxation oscillator 5. Bistable Multivibrator 6. Monostable Multivibrator 7. Phototransistor based applications 8. Diac, Triac based applications 9. Power Amplifiers		
2	**Simulation Through PSPICE** 10. Frequency response of Single Stage CE amplifier 11. Frequency response of Single Stage CS amplifier 12. Bootstrap Circuit 13. Frequency response of two Stage CE amplifier 14. Bistable Multivibrator 15. Monostable Multivibrator 16. Design of RC phase shift oscillators 17. Design of Wein-Bridge oscillators		

LOGIC CIRCUIT LAB			
Branch : ENC/EE/CST/IT	**Sem: III**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
	To implement basic gates To implement universal gates To implement adder (half and full) To implement subtractor (half and full) To implement multiplexer To implement decoder To implement flip flop To implement counter To implement shift register		

MEASUREMENT AND INSTRUMENTATION LAB			
Branch : ENC/EE	**Sem: III**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
	Study of CRO Balanced and unbalanced condition of Bridges Measurement using analog meters Study characteristic of transducers Study of digital storage oscilloscope LCR Q meter Study of Spectrum Analyzer		

ELECTRICAL NETWORK THEORY TUTORIAL			
Branch : ENC/EE	**Sem: III**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
	To solve problems based on Graph Theory To solve problems based on Transient analysis To solve problems based on Frequency domain analysis To solve problems based on State variable analysis To solve problems based on Parameters To solve problems based on Signal Flow graph To solve problems based on Transfer Function		

STATISTICAL THEORY OF COMMUNICATION			
Branch : ENC/EE	**Sem: IV**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On completion of the course, the student will have:

- Good knowledge of probability theory application in communication
- Good knowledge of various distributions and their properties as well as properties of a random sample.
- Good ability to identify structure and analyze Communication problems using probability theory.

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Introduction:** The Analysis of Random Experiments, Probability in Electrical and Computer Engineering: Signal Detection and classification, speech Modeling and recognition, coding and data transmission, Computer Networks.	15	25
	2	**The Probability Model:** The Algebra of Events, Probability of Events ,Some Applications ,Conditional Probability and Bayes' Rule, Applications: The binary communication channel and Measuring information and coding.		
	3	**Random Variables and Transformations** Discrete Random Variables, Some Common Discrete Probability Distributions, Continuous Random Variable, Some Common Continuous Probability Density Functions, CDF and PDF for Discrete and Mixed Random Variables, Transformation of Random Variables, Distributions Conditioned on an Event, Application: Optimal signal detection and Object Classification.		
II	1	**Expectation, Moments, and Generating Functions:** Expectation of a Random Variable, Moments of a Distribution, Generating Functions Application: Entropy and Source Coding	15	25
	2	**Two and More Random Variables** Two Discrete Random Variables, Two Continuous Random Variables, Expectation and Correlation, Gaussian Random Variables, Multiple Random Variables, Sums of Some Common Random Variables, Random Vectors, Application: An Application to signal Detection.		
III	1	**Inequalities, Limit Theorems, and Parameter Estimation, Hypothesis Testing** Inequalities, Convergence and Limit Theorems, Estimation of Parameters, Maximum Likelihood Estimation, Testing of	15	25

		Hypothesis (cases of large sample) Application: Signal Estimation		
IV	1	**Random Processes:** Random Process, First and Second Moments of a Random Process, Properties: Independence, stationarity, and Ergodicity, Power Spectral Density, Noise source, Response of Linear systems.	**15**	**25**
	2	**Markov, Poisson, and Queueing Processes:** The Poisson Model, Discrete-Time Markov Chains, Continuous-Time Markov Chains, Basic Queuing Theory		
		TOTAL	**60**	**100**

Text / Reference Book:

1. M. O'Flynn, Harper & Row, "Probabilities, Random Variables and Random Processes"
2. S. P. Gupta, "Fundamental Statistics", Sultan Chand, 1998.
3. Papoulis, Probability, Random Variables and Stochastic Processes, 4th edition, McGraw Hill, 2012.
4. H. Stark and J. W. Woods, "Probability, Random Processes and Estimation Theory for Engineers", 4th edition, 2011.

NUMERICAL METHODS AND LINEAR ALGEBRA			
Branch : ENC/EE	**Sem: IV**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, students will be able to

- **Develop and implement numerical methods for approximately solving problems from continuous mathematics**
- **Apply these methods to application problems of communication systems**
- **Understand the concept of linear algebra**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Solution to Linear Circuits** using Gaussian and Crout's algorithms	**15**	**25**
	2	**Solution to non-linear Circuits** using Newton–Raphson's method, secant method, fixed point iteration method, and its convergence.		
II	1	**Transient analysis of the circuit** using Euler's algorithm, trapezoidal and Adams Moulton algorithm.	**15**	**25**
	2	**Solution to sparse matrix techniques**		
III	1	**Linear Mappings** Introduction , Mappings, Functions ,Linear Mappings (Linear Transformations) ,Kernel and Image of a Linear Mapping , Singular and Nonsingular Linear Mappings, Isomorphism ,Operations with Linear Mappings , Algebra A(V) of Linear Operators	**15**	**25**
	2	**Linear Mappings and Matrices** Introduction, Matrix Representation of a Linear Operator, Change of Basis, Similarity, Matrices and General Linear Mappings		
IV	1	**Inner Product Spaces, Orthogonality** Introduction , Inner Product Spaces, Examples of Inner Product Spaces, Cauchy–Schwarz Inequality, Applications, Orthogonality, Orthogonal Sets and Bases , Gram–Schmidt Orthogonalisation Process, Orthogonal and Positive Definite Matrices, Complex Inner Product Spaces	**15**	**25**
		TOTAL	**60**	**100**

Text /Reference Books:

1. S. S. Sastry, "Introductory Methods of Numerical Analysis", 5th edition, PHI, 2013.
2. V. Rajaraman, "Computer Oriented Numerical Methods", 3rd edition, PHI ,2011
3. R. Raghuram, "Computer Simulation of Electronics Circuit"1st Edition, Wiley Eastern India, 1991
4. Seymour Lipschutz, Marc Lars Lipson, "Linear Algebra" 4th Edition, Schaum's Outline Series McGraw-Hill, 2009

SIGNALS AND SYSTEMS			
Branch : ENC/EE	**Sem: IV**	**Lectures: 4 Hr**	**Credit: 4**

Objective : The students will be able to

- **Understand the properties of continuous and discrete time signals.**
- **Understand the properties of continuous and discrete time systems.**
- **Use mathematical model of signals for analysis.**
- **Represent a system by mathematical model.**
- **Analyze and predict the behavior of linear system.**
- **Use different tools in the time- and frequency- domain.**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Introduction to signals and systems** :- Continuous and discrete time signals, digital signals, Introduction to standard signals Continuous and discrete time systems.	**15**	**25**
	2	**Representation of signals** :- Classification of Signals – Periodic/non-periodic, Deterministic and random, energy and power signals. Even/odd signals, causal/non-causal signals Basic operations on signals – Time reversing, time scaling, time shifting and amplitude scaling.		
II	1	**Time domain representation of systems :-** Classification of systems:- causal/non-causal, Linear/nonlinear, time variant/time invariant, invertible/ noninvertible, stable/unstable Convolution:-Convolution sum, discrete- time convolution: linear and circular convolution	**15**	**25**
	2	**Analysis of continuous time signals and systems** :- Laplace Transform analysis : Laplace transform of standard signals, ROC, properties of Laplace transform, analysis of CT-LTI system using Laplace transform. Continuous time Fourier Transform : Fourier transform of non-periodic signals, Frequency response of a system using Fourier Transform		
III	1	**z-transforms :-** Representation of continuous time signals by its sample - Sampling theorem – Reconstruction of a Signal from its samples, Basic principles of z-transform - z-transform definition – region of convergence – properties of ROC – Properties of z-transform, z-transform of basic signals, inverse z-transforms, Analysis of DTLTI system using z-transform, convergence of s-plane to z-plane, Relationship between z-transform and Laplace transform, Relationship between z-transform and Fourier transform.	**15**	**25**

IV	1	**Introduction to Fourier series** :- Exponential Fourier series, Trigonometric Fourier series, frequency response using Fourier series	**15**	**25**
	2	**Sampling** : Introduction, sampling theorem, different sampling techniques		
	3	**Introduction to wavelet transforms**		
		TOTAL	**60**	**100**

Text /Reference Books

1. Alan Oppenheim, Allan Willisky, "Signals and Systems", 2nd Edition, Pearson Education, 2013.
2. R.F Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems", 4th Edition, Prentice Hall, 1998.
3. P. Ramesh Babu, "Signals and Systems", 4th Edition SciTech Publications Pvt. Ltd., 2013.
4. Simon Haykins, "Signal and Systems", 2nd edition. , Wiley India, 2006.
5. H P Hsu, "Signals and Systems", TMH, 2006.
6. S. Salivahanan, "Digital Signal Processing", 2nd edition, TMH, 2010.

ANALOG CIRCUITS			
Branch : ENC/EE	**Sem: IV**	**Lectures: 4 Hr**	**Credit: 4**

Objective : The students will be able to

- **Understand the concept of multistage electronic Circuits and its design**
- **Differentiate between discrete and integrated biasing techniques**
- **Design different applications like frequency , nonlinear parameters**
- **Learn about specialized power amplifier IC, timer IC and voltage regulator IC**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Differential amplifier**: Differential amplifier circuit configurations Dual/Single I/P balanced o/p, Dual/Single I/P unbalanced o/p, DC & Ac analysis, swamping resistors, constant current bias, current mirror, level shifter.	**15**	**25**
	2	**Operational Amplifiers:** Block diagram of typical op-amp, schematic symbol, Ideal op-Amp, Op-Amp equivalent circuit, Types of Integrated circuits and package type. Open loop op-amp: Differential amplifier, inverting & non-inverting amplifier, transfer characteristics, Op-Amp parameters-DC –offset voltage & current ,compensation for offset voltage, AC parameters-CMRR, Slew rate, gain bandwidth product. thermal drift, noise		
II	1	**Closed loop Op-Amp:** Feedback configurations-Voltage series& voltage shunt feedback amplifier, inverting, non-inverting & differential Op-Amp, effect of f/b on different parameters, voltage follower & current to voltage converter.	**15**	**25**
	2	**Frequency Response:** Frequency response of internally compensated & non –compensated op-amps, compensation for frequency, Op-Amp at high frequency, causes & effects of slew rate.		
III	1	**Linear Applications:** Peaking amplifier, summing amplifier, averaging amplifier, instrumentation amplifier, integrator & Differentiator, Log & Antilog Amplifier.	**15**	**25**
	2	**Oscillators:** Oscillator principle, Barkhausen criterion, Types: Phase Shift, wein Bridge, Quadrature oscillators, Waveform generators-Square, triangular & sweep generator, voltage controlled oscillator.		
IV	1	**Non-linear applications:** Basic Comparator, Zero crossing detector, Schmitt trigger, window detector, V/F & F/V converters, Sample & hold circuits, voltage limiters, A-D & D-A converters, clippers & clampers, peak detector.	**15**	**25**
	2	**Specialized IC applications**: IC 555 timer –monostable Multivibrators & applications, Astable Multivibrators & applications.		

		Phase locked loop: Operating principle, monolithic PLLs, IC565 PLL applications. **Voltage regulators:** Fixed & variable regulators, IC 723 voltage regulators **Power Amplifiers:** Monolithic power amplifiers, LM380 power amplifier.		
		TOTAL	**50**	**100**

Text / References Books:

1. Ramakant Gayakwad, "Op-Amps and Linear Integrated Circuits", 4th edition,PHI,2010
2. K.R. Botkar, "Integrated circuits", 9th edition, Khanna Publication, 2008.
3. Graeme Tobey, "Operational Amplifier, Design & applications", 21st printing, 1989.

ELECTROMAGNETIC FIELD THEORY			
Branch : ENC/EE	**Sem: IV**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, students will be able to

- **Understand field concepts.**
- **Apply Field concepts to wave Theory.**
- **Understand basic of wave propagation in guided and unguided medium.**

Module No.	Sr. No.	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Introduction:** Recent Trends in Electromagnetic, Application of Electromagnetic Waves, Wave fundamentals, Frequency bands,Phasors and complex numbers review. Review of vector analysis, Orthogonal coordinate systems:- Cartesian, cylindrical and spherical, differential volume elements for each	**15**	**25**
	2	**Electrostatic :** Maxwells equations for Electrostatics, Basic laws:- Coulomb's Law, derivation of fields for different cases, Charge distributions:- point, line and surface, Gauss's Law and its application to diff. cases, Divergence theorem, Electric scalar potential, Electric properties of dielectrics, Boundary conditions.		
II	1	**Magnetostatics :** Quantities of interest, Basic laws:- Biot saverts Law, Current distributions, Convection & displacement Current, Guass's law for magnetism. Ampere's circuital law, Maxwell's equations for magnetostatics, stoke's theorem, Vector magnetic potential Magnetic Boundary Conditions, Faraday's law of Electromagnetic Inductance, Self inductance, Mutual Inductance.	**15**	**25**
	2	**Maxwell's Equation :** Maxwell's equations for time varying fields, Boundary conditions for Electromagnetic, Continuity equation, Pointing theorem		
III	1	**Plane wave Propagation:-** Time harmonic fields, complex permittivity, Uniform plane wave in charge free medium, Types:- TEM, TE, TM , Relation between E & H Wave polarization:- linear, Circular, elliptical, Plane wave propagation in lossy medium, skin depth.	**15**	**25**
	2	**Wave reflection and transmission** At normal incidence, at oblique incidence, reflectivity and transitivity		

IV	1	**Transmission lines :** Role of wavelength, fundamental modes of propagation, Lumped equivalent circuit, line parameters & equations, Types of line:- lossless & lossy Wave propagation on lossless line, Voltage reflection coefficient, standing waves , Input impedance **Special Cases:** Short circuited line, Open circuited line, Line as a circuit element, λ/2 line and Quarter Wave transformer, Matched termination **Smith Chart:** measurement of Input impedance, SWR, Voltage maxima and minima, admittance Impedance matching with single and double stubs	**15**	**25**
	2	**Wave guides:-** types- rectangular circular, Comparison between 2 wire line and waveguide, Propagation of waves in waveguides in rectangular waveguides (TEM, TE, TM) Propagation of TE and TM waves in rectangular waveguides, Various modes ,Propagation of TE and TM waves in Circular waveguides, Various modes.		
		TOTAL	**60**	**100**

Text /Reference Books:

1. E. C. Jordan & K. G Balmain,"Electromagnetic waves & Radiating systems", 2nd edition, Prentice Hall of India, Delhi, 2009.
2. Fawwaz T. Ulaby, "Fundamentals of Applied Electromagnetics" PHI Ltd 2011 Media edition.
3. M. Kulkarni , "Microwave Engg.", Umesh Publications 4th Edition 2010.
4. R. K. Shevgaonkar, "Electromagnetic waves", Tata McGraw Hill Publications 2010.
5. N. Narayana Rao, "Basic Electromagnetic with applications", Prentice Hall of India, New Delhi.
6. Ramo & Whinnery, "Fields and Waves in Communication Electronics", Wiley Eastern (1997)

COMPUTER ARCHITECTURE & ORGANIZATION			
Branch : ENC/EE	**Sem: IV**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, students will be able to

- **Understand the basic building blocks of computer and their interconnection**
- **Study various input output devices, memories and CPU structures**

Module No.	Sr. No.	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Introduction:** Brief history of computers, basic building blocks of computer, organization & architecture, structure & functions, evolution of Pentium & power PC, various generations of computer evolutions, impact of VLSI on computer systems.	15	25
	2	**Buses**: Concept of buses, types of buses, concept of system bus, overview of various bus architectures used in computer, Peripheral Component Interconnect (PCI) bus, interconnection structures and bus interconnection, Bus control logic, bus arbitration techniques.		
	3	**Internal memory**: Concept of memory, size, unit, and its organization, computer memory systems overview, hierarchy of memory in computer, memory device characteristics, random access memory, serial access memory, multilevel memories, address translation, memory allocation, advanced DRAM organization. Cache memory: – concept of cache, performance of cache, types of cache architectures, memory mapping techniques, and page replacement policies		
II	1	**External memory**: Construction and working principles of magnetic memories, magnetic disk, hard disk, magnetic tape, optical memory.	15	25
	2	**I/O Devices**: Role of I/O devices in computer, overview of commonly used I/O devices such as keyboard, VDU, mouse. External devices, I/O module and its organization, various data transfer techniques – Programmed I/O, Interrupt driven I/O, Direct memory access (DMA), I/O channels and I/O Processors.		
	3	**Operating System Support**: Operating system overview, role of operating systems in computer, scheduling, memory management, concept of virtual memory.		
III	1	**CPU Organisation:** The role of CPU, functions of CPU, CPU structure and CPU functions, processor organization, register organization inside CPU, instruction cycle, instruction pipelining, branch penalty, branch prediction,	15	25

		overview of Pentium processor		
	2	**Data path design:** Concept of data processing unit, Fixed-point arithmetic: addition, subtraction, multiplication, and division. Designing aspects related to arithmetic operations, combinational ALU and sequential ALU, advanced ALU.		
IV	1	**Control Circuit Design**: Basic concepts related to control unit, types and design of control circuit such as micro-programmed control unit, and hard wired control unit, microinstruction formats, microinstruction sequencing, microinstruction execution, applications of microprogramming.	**15**	**25**
	2	**System Organisation**: Use of computer in commutations, serial communications and parallel communication, network topologies, LAN and WAN in brief, various ways to improve the speed of computer, concept of parallel processing, Flynn's classification of parallel computers, benefits of parallel processing, multiprocessing.		
		TOTAL	**50**	**100**

Text / Reference Books:

1. William Stallings, Computer Organization and Architecture, 9th Edition, PHI, 2014.
2. John P Hayes, Computer Architecture and Organization, 3rd Edition, McGraw Hill, 2013.
3. Andrew C. Tanenbaum, Structured Computer Organization, 6th Edition, PHI, 2014.
4. M. Morris Maw, Computer System Architecture, 3rd Edition, PHI, 2003.

LABS / TUTORIALS FOR SEMESTER IV

NUMERICAL METHOD LAB			
Branch : ENC/EE	**Sem: IV**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
	Study various numerical methods and develop the understanding of matrices To implement methods to solve Nonlinear equations To study transient analysis using numerical methods To implement trapezoidal rule to find integral of given function To implement various Linear mapping Techniques To implement various matrix techniques		

SIGNALS AND SYSTEM TUTORIAL			
Branch : ENC/EE	**Sem: IV**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
	(*Some of the tutorials will be conducted in OCTAVE/MATLAB)* Tutorials will be conducted batchwise. Following topics will be covered in tutorials: • Basic operations on Signals • Classification of Signals • Classification of Systems • Analysis of CT-LTI System • Analysis of DT-LTI System • Use of Fourier transform/ Series to plot Frequency Response.		

ANALOG CIRCUITS LAB			
Branch : ENC/EE	**Sem: IV**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
	Study of differential amplifier Study of inverting & non inverting amplifier Study of op-amp parameter Study of summer, subtactor &average. Study of integrator & differenior. Study of wein bridge oscillator Study of square,triangular & sawtooth wave generator Study of 555 as monostable & astable multivibrator. Study of op-amp as comparator & Schmitt trigger. Study of 1st order LPF and HP filters. Study of peak detector and sample and hold circuit.		

ELECTROMAGNETIC FIELD THEORY TUTORIAL			
Branch : ENC/EE	**Sem: IV**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
	Recent Trends in Electromagnetic waves Vector Analysis Electrostatic Magnetostatic Maxwell's Equation Uniform Plane Wave Wave Reflection and Transmission. Transmission Line Waveguides Simulation based on Transmission Line Simulation based on Uniform Plane Wave		

MICROPROCESSORS – I			
Branch : ENC/EE	**Sem: V**	**Lectures: 4 Hr**	**Credit: 4**

Objective: The learners will be able to:

- **Study Architecture of microprocessor 8085**
- **Details of all the Peripherals**
- **Study the interfacing of the peripherals with 8085**

Module No.	Sr. No.	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Introduction of Microprocessor**: Brief history of Microprocessors, Basic building blocks of microcomputer systems.	15	25
	2	**8085**: Pin diagram and pin description, Internal architecture with functional block diagram. Register organization inside 8085 Interfacing devices - tri state buffer, decoder, and latch.		
	3	**Instruction set of 8085**: Study of instructions from instruction set of 8085. Grouping of instructions. Addressing modes of 8085 – their types with suitable examples. Programming of 8085 - Program development for 8085 using instruction set		
II	1	**Stacks and subroutines**: Concept of stack and stack pointer, use of PUSH, POP and other stack related instructions, subroutines, their types and execution of subroutines.	15	25
	2	**Interrupts:** Hardware and software interrupts, maskable and Non-maskable interrupts, vectored and non-vectored interrupts, interrupt structure of 8085, Instructions related to interrupt like EI, DI, RIM and SIM.		
III	1	**I/O data transfer techniques**: programmed I/O, interrupt driven I/O, DMA, data transfer with handshake signals and ready signals.	15	25
	2	**I/O device interfacing** – I/O mapped I/O and memory mapped I/O techniques. Programmable I/O devices – study of 8155, 8355/8755, block diagram, pin functions and modes of operation. Programmable Peripheral Interface (PPI) 8255-block diagram, pin functions, features, modes of operations, interfacing with 8085.		
IV	1	**Timers and DMA Controller:** Programmable Interval Timer 8253/54- block diagram, pin function, features, modes of operations, interfacing with 8085. Programmable interrupt controller 8259-block diagram, pin function, features, modes of operation, interfacing with 8085. DMA Controller 8257- block diagram, pin function, features, modes of operation, interfacing with 8085.	15	25
	2	**ADC/DAC interfacing:** Study of ADC/DAC IC'S – 0800, 0808,0809,generation of various waveforms.Debugging tools: Assemblers, Logic Analyzers. 8085 Microprocessor based system Design.		

		TOTAL	**60**	**100**

Text / Reference Books :

1. R. S. Gaonkar, "Microprocessor", Penram International Publications, 6th edition, 2013.
2. Borole and Vibhute, "Microprocessor", Technova Publications, 5th edition, 2008.
3. A. P. Godse , "Microprocessor", Nirali Publications, 1st edition,2000.
4. A .P. Godse, Gilmore , "Microprocessor", 2nd edition, McGraw Hill International.
5. Kenneth J. Ayala, 'The 8051Microcontroller", Penram International, 5th edition, 2014.

FILTERS THEORY			
Branch : ENC/EE	**Sem: V**	**Lectures: 4 Hr**	**Credit: 4**

Objective: On the completion of this course, students will be able to

- **Understand the concept of filter and different types of filter.**
- **Concept of network functions and their reliability.**
- **Solve the approximation problems of different filters.**
- **Synthesis of active filter and passive filter.**
- **Bi-quad circuits of positive feedback and negative filter.**
- **Active networks synthesis by Passive Ladder Structures.**
- **Introduction to digital filters and their types.**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weight-age in %
I	1	**Introduction to filters**: Types of filters, Low pass, high pass, band pass and band reject filter, magnitude and phase response of it. Network function and driving point function. Comparison of Analog filters and digital filters	**15**	**25**
	2	**Analog filters:** Concept of Approximation Theory, Types of approximation filters, Mathematical analysis and synthesis of Butterworth, Chebyshev, elliptical and Bessel		
II	1	**Frequency transformations:** Converting low pass to high pass, low pass to band pass, low pass to band reject filters.	**15**	**25**
	2	**Active filter synthesis:** Using Op-amp, synthesis of active filter, Active elements such as GIC, FDNR, Gyrator, RC-Op-Amp Biquad circuits for synthesis based on positive and negative feedback topologies		
III	1	**Biquad circuits for synthesis** based on positive and negative feedback topologies.	**15**	**25**
	2	**Active networks** based on passive ladder structure, effects of real op-amp on active filters.		
	3	Introduction to switched capacitor filters. Introduction of microwave filters		
IV	1	**Digital filters:** Classification of digital filters, Design of IIR filters, Design of FIR filters	**15**	**25**
		TOTAL	**60**	**100**

Text /Reference Books

1. G. Darayanani, "Principle of Active Networks Synthesis and Design", John Wiley and Sons, 2011.
2. Hulesman, "Active and Passive Analog Filter Design", McGraw Hill, 1993.
3. Chen, "Passive and Active Filter" John Wiley, 1986.
4. Proakis, "Digital Signal Processing, Principles, Algorithms and Applications", 4th edition, PHI 2013.

ANTENNA THEORY			
Branch : ENC/EE	**Sem: V**	**Lectures: 4 Hr**	**Credit: 4**

Objective: On the completion of this course, students will be able to

- **Understand basic principles of electromagnetic radiators**
- **Analyze and design different types of antenna's**
- **Anderstand the concept of aperture**
- **Study, analyze and design microstrip antennas**

Module No.	Sr. No.	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Introduction:** Recent Trends in Antennas, Basic Antenna concepts and antenna terminology, Radiation Fundamentals	15	25
	2	**Wire Antenna:** Detailed mathematical analysis of Electric dipole & linear antennas, Half-wave dipole, Radiation from small current loop, Radiation from an arbitrary current source. Reflectors, image theory.		
II	1	**Antenna Array:** Antenna Arrays, Superposition of radiating elements, broadside/end fire array, Linear arrays with n isotropic elements, Array factor, Concept of pattern multiplication, Electronic steering (phased array). Cross-coupling effects, Binomial and Dolf-chebyshev arrays	15	25
	2	Aperture Antennas, reflectors, Radiation from horns and slots		
III	1	**Application Antenna :** Helical , Lens antenna, Yagi-uda array	15	25
	2	**Broadband and Frequency Independence:** Broadband and Frequency Independent Antenna, Log Periodic Antenna		
IV	1	**Microstrip Antenna:** Basic Characteristic, Feeding Methods, Mathematical Analysis: Transmission Line Model and Cavity Model, Design of rectangular and Circular Patch design ,Resonance Frequency, Radiating Fields, Resonant input Resistance/Impedance, Directivity, Bandwidth, Circular polarisation, Microstrip Antenna	15	25
		TOTAL	60	100

Text /Reference Books:

1. K. D. Prasad, "Antenna and Wave Propagation", 3rd Edition, Satya Prakashan, 2013.
2. J. D. Kraus, "Antennas", Tata MacGraw Hill, 2006.
3. R.C. Collin, "Antennas & Radio wave Propagation" McGraw-Hill, 1985.
4. C. A Balanis, "Antenna Theory –Analysis and Design", 3rd Edition, John Wiley & Sons, 2013.

CONTROL SYSTEM			
Branch : ENC/EE	**Sem: V**	**Lectures: 4 Hr**	**Credit: 4**

Objective: On the completion of this course, students will be able to

- **Control systems are integral part of human being's daily life. The need for control system, classification of control systems and servomechanism can be understood easily**
- **Time and frequency response of control systems can be understood.**
- **Stability is the basic requirement of the control system. Routh's Method is the easiest method to test the stability of the control system.**
- **Root locus is a very powerful time-domain method of analysis and design of control systems.**
- **Even the analysis and design of control systems in frequency domain is studied. Correlation between them is obtained by using polar and Bode plots.**
- **Nyquist plots are very useful for the determination of absolute as well as relative stabilities and also for the design of control systems.**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	Basic concepts: Notion of feed-back; open and closed-loops systems.	**15**	**25**
	2	Transfer functions; Block diagrams reduction		
II	1	Time domain analysis; first and second order systems; characteristic equations and roots and specifications.	**15**	**25**
	2	Frequency domain analysis, interrelation with time domain , specifications		
III	1	Stability Concept, Routh Hurwitz criteria, Frequency domain techniques; root locus methods, Nyquist stability criterion, polar plots, nyquist plots	**15**	**25**
	2	Frequency responses; Bode plots; Gain Margin & phase margin		
IV	1	Compensator design; proportional, planned PID controllers, Phase compensators.	**15**	**25**
	2	State Space Concepts: Controllability, Observability, minimal representations.		
		TOTAL	**50**	**100**

Text / Reference Books:

1. B. L. Kuo, "Automatic Control Systems", 2nd edition, PHI, New Delhi, 2012
2. I. J. Nagrath & M. Gopal "Control System Engineering", 5th edition, Wiley Eastern, New Delhi, 2012.

COMMUNICATION SKILLS – II			
Branch : ENC/EE/IT/CST	**Sem: V**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, students will be able to

- **Select appropriate mediums for effective communication**
- **Appreciate the importance of non-verbal aspects of communication**
- **Strengthen understanding of communication and soft skills**
- **Use communication and soft skills to achieve professional goals**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Communication in a Business Organization** Internal (upward, downward, horizontal, grapevine), External Communication, Strategies for conducting successful business meetings, documentation of meetings, Introduction to modern communication techniques, legal and ethical issues in communication (intellectual property rights, patents).	15	25
	2	**Advanced technical Writing:** Report writing and presentation: Definition and importance of reports, qualities of a good report, language and style in reports, types of reports, formats, methods of compiling data. A computer aided presentation of a project report based on technical, survey-based, reference based or campus related topic. Topics to be assigned to a group of 8-10 students. The written report should not exceed 20 printed pages.		
II	3	**Technical paper writing** **I**EEE format of writing a technical paper. Choosing the right topic, collecting information, Importance of visual aids, making a good presentation.	15	25
	4	**Writing Proposals:** Formats of proposal writing, style and language.		
III	5	**Interpersonal Skills:** Introduction to emotional intelligence, motivation negotiation and conflict-resolution. Assertiveness, leadership, team building, decision making, time management.	15	25
	6	Exercises in Vocabulary and comprehension to improve reading and writing skills		
IV	7	**Interview Techniques:** Preparing for job interviews, verbal and non-verbal communication during interviews. Role play project to be taken up by the entire class.	15	25
	8	**Group Discussion:** Dynamics of group behaviour, techniques for effective participation**.**		
		TOTAL	**60**	**100**

Text / Reference Books:

1. Fred Luthans, 'Organizational Behavior", 12th edition, Mcgraw Hill International, 2011.
2. Lesiker and Petit, 'Report writing for Business', Mcgraw Hill International edition.
3. Huckin and Olsen, ' Technical Writing and Professional Communication", Mcgraw hill International Edition.
4. Wallace and Masters, 'Personal Development for life and work' Thomson Learning
5. Lewicki, saunders, Minton 'Essentials of Negotiation' Mc Graw hill
6. Hartman Lemay 'Presentation Success" Thomson Learning.

PRINCIPLES OF COMMUNICATION			
Branch : ENC/EE	**Sem: V**	**Lectures: 4 Hr**	**Credit: 4**

Objective On the completion of this course, students will have the knowledge of

- **The fundamentals of basic communication system**
- **Different modulation and demodulation schemes used in analog communication**
- **Working principles of transmitter and receiver of modulation schemes used in analog communication**
- **The basics of sampling and pulse modulation techniques**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Basic communication system:** Block diagram, electromagnetic spectrum, signal bandwidth and power, types of communication channels. **Noise:** Types of noise, signal to noise ratio, noise figure and noise temperature. **Wave propagation** in Atmosphere, Ionosphere; Surface wave propagation, Multi-hop Propagation, Submarine communication.	**15**	**25**
	2	**Amplitude modulation:** Basic concept, signal representation, need for modulation, Frequency spectrum, waveforms, modulation index, bandwidth, voltage distribution and power calculation.		
II	1	**Double sideband full carrier (DSBFC):** Principles, modulating circuits, low level and high level transmitters. **DSBSC**:-Multiplier modulator, nonlinear modulator and switching modulator. **Single sideband (SSB):** Principle, Generation of SSB by using Filter method, phase shift method and third method, Independent sideband (ISB) and vestigial sideband (VSB).	**15**	**25**
	2	**Amplitude demodulation:** Diode detector, practical diode detector and square law detector, Application of AM and use of VSB in broadcast television.		
III	1	**Frequency modulation (FM):** Basic concept, mathematical analysis, frequency spectrum of FM wave, modulation index, frequency deviation and percent modulated waves, bandwidth requirement of FM, narrowband and wideband FM. **Generation of FM:** Varactor diode modulator, FET reactance modulator, stabilized reactance modulator, stabilized reactance modulator-AFC, Direct FM transmitter, indirect FM transmitter, noise triangle in FM, pre-emphasis and de-emphasis.	**15**	**25**
	2	**Phase modulation (PM):** Principle and working of transistor direct PM modulator and comparison between FM and PM. **FM Demodulation:** Balanced slope detector, Foster-Seeley		

		discriminator ,ratio detector, phase lock loop(PLL) FM demodulator, amplitude limiting and thresholding, comparison between AM , FM and PM, Applications of FM and PM.		
IV	1	**Radio receivers:-**TRF, Super-heterodyne receiver, receiver parameters and selection of IF. AM receiver circuits and analysis, simple AGC, delayed AGC, forward AGC and communication receiver. FM receiver circuits, comparison with AM receiver.	**15**	**25**
	2	**Sampling techniques:** Theorem for low pass and band pass signals, Nyquist criteria, Aliasing error and aperture effect, **Pulse modulation and demodulation:** PAM, PWM and PPM generation and detection. PCM, Delta modulation, Adaptive delta modulation, principle, generation and detection. TDM and FDM basic concept with block diagram. Application of pulse communication, Recent trends in communication.		
		TOTAL	**60**	**100**

Text Books/ References Books

1. George Kennedy, "Electronic Communication Systems", 5th edition, Tata Mcgraw Hill, 2011.
2. Roody Collin, Electronic Communication, 4thEdition, PHI, 2008.
3. Singh and Sapre, "Communication Systems", 2nd edition, McGraw Hill, 2007.
4. Blake, "Electronic Communication Systems", 2nd Edition, Thomson, 2002.
5. Wayne Tomasi, "Electronic Communication System ", 6th edition, Pearson Education, 2004.
6. Taub, Schilling and Saha, "Principles of Communication systems", 4th edition, Tata McGraw Hill, 2013.

LABS / TUTORIALS FOR SEMESTER V

MICROPROCESSOR-I LAB			
Branch : ENC/EE	**Sem: V**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	Executing program using various instruction using simulators a. Add / Subtract, Multiply and Divide using internal memory b. Executing External memory related instruction e.g. 8255(as a memory map ext RAM or external EPROM) Designing mathematical calculator a. Add b. Subtract c. Multiply d. Divide e. Square Using simulator kit Timing diagram of typical target board using DSO and logic analyzer of typical instruction. Creating program using assembler and downloading using EEPROM/Flash programmer small program to flash LED. Interfacing keypad and LCD display and program to detect the key and display on LCD Interfacing 8 bit and 12 bit ADC. Find out average value over 10 readings Interfacing D/A converter a. Generating various waveforms Debugger using simulator and emulator Serial communication to PC Controlling motor/stepper motor		

PRINCIPLES OF COMMUNICATION LAB			
Branch : ENC/EE	**Sem: V**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	To study the amplitude modulation (AM) and to find the modulation index for over and under modulation. To study the generation of SSB (single sideband) with different filters. To study the amplitude demodulation by using linear diode detector method. To study the frequency modulation (FM) and to observe the sidebands of it. To study the concept of Preemphasis and deemphasis. To study the frequency demodulation by using fosterseely and ratio detector method. To study the Pulse modulation types i.e. PAM, PWM, PPM. To study the analog signal sampling and reconstruction of it. To Study the Concept of multiplexing by using TDM.		

FILTERS THEORY LAB			
Branch : ENC/EE	**Sem: V**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	All the practical would be implemented in OCTAVE To implement sin cosine plot To implement butterworth filter Low pass High pass Bandpass Bandstop To implement chebyshev filter Low pass, High pass Bandpass Bandstop To implement elliptical filter To implement FIR using rectangular and hamming window To implement IIR using rectangular and hamming window		

CONTROL SYSTEM LAB			
Branch : ENC/EE	**Sem: V**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	To perform AC servo Stabilizer To perform synchro transmitter and receiver To perform lead compensating network To perform lag compensating network To perform lead-lag compensating network To plot bode plot To plot nyquist plot To plot polar plot To perform PID controller		

MICROPROCESSOR- II			
Branch : ENC/EE	**Sem: VI**	**Lectures: 4 Hr**	**Credit: 4**

Objective : The learners will be able to understand

- **Architecture of microcontroller like Intel 8051 and ARM**
- **Analysis and design skill using microcontrollers and various peripherals.**
- **To design and develop a simple microcontroller based application.**

Module No	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Introduction to Microcontrollers:** Microprocessors and Microcontrollers, CISC and RISC Processors, Harvard and Von Neumann Architectures, Architecture of a Microcontroller, Family members, Microcontroller resources, Resources in Advanced and Next Generation Microcontrollers.	15	25
	2	**ARM Architecture** : Features, purpose, and advantages, Processor operating states, memory formats, data types, operating modes, registers , program status registers, exceptions, interrupt latencies, and pipelined architecture advantage		
II	1	**8051 Architecture:** MCS-51 architecture, Pin description, Internal and external memories, timing diagrams for memory interfacing, Counters and Timers, Serial communication, Stack and Stack Pointer, Port Structure and Interrupts.	15	25
	2	**Addressing modes and Instructions:** 8051 Addressing modes, MCS-51 Instruction set, Microcontroller Application Development tools-Simulator, Emulator, In-circuit Emulator (ICE), Logic Analyzer, ISP, Cross assembler, Embedded C.		
III	1	**Serial and Parallel Port Interfacing:** RS232, RS485, I2C bus standard, Interfacing ADC, DAC, memory, RTC with 8051/89C51 using I2C bus. Interfacing 8051/89C51 to LED with and without interrupt, ADC, DAC, LCD and keypad (debounce) Stepper motor, SPI bus.	15	25
IV	1	**The Intel 80386 Microprocessor:** Brief overview of 8086. Features, pin diagram and pin description of 80386, internal architecture of 80386, register organization inside 80386, addressing modes of 80386, modes of operation such as real mode, protected mode, and virtual mode.	15	25
	2	**Memory management** in 80386, address translation mechanism, segmentation and segment descriptor tables, segment selectors and segment descriptors Hard ware organization of 80386 memory address space, 80386 signal interface, bus states, pipelined and non-pipelined bus cycles, memory and I/O interfaces, Protection model for 80386, privilege rules, data access and control transfer, multitasking, task state segment and switches, I/O level protection, paging, Virtual 86 mode of operation		
		Total	**60**	**100**

Text / Reference Books:

1. Tribel, “The 80386 DX microprocessor hardware, softwae and interfacing”, PHI.
2. Crawford and Gelsinger, “Programming the 80386”, Sybex Publisher.
3. 80386 Hardware reference manual - Intel Corporation.
4. Tom Shanley, “Pentium Processor System Architecture”, 2nd edition, Addison Wesley, 1995.
5. Tom Shanley, “ISA system architeture”, 3rd Edition, Addision Wesley, 1995.
6. Tom Shanley, “PCI System Architeture”, Addison Wesley, 1995.
7. F. Schmidt, “SCSI Bus IDE Interface”, by Addison Wesley.
8. Bary Brey, “The Intel Microprocessor”, 8th edition, PHI, 2009.
9. David Seal, “ARM Architecture”, Reference Manual (2nd Edition).

AUTOMOTIVE ELECTRONICS			
Branch :EE	**Sem: VI**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, students will be able to

- **Understand the fundamentals of automotive electronics.**
- **Discuss the latest trends used in automobiles**
- **Learn to use electronic systems in automobile for increasing the safety and comfort of human beings.**

Module No.	Sr. No.	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Fundamentals of automotive electronics:** Principle of Sensors, actuators and electronics control units, Types of sensors & actuators used in automobile batteries, vehicle circuit systems. Automobile physical configuration	15	25
	2	**Generation of Electrical Energy:** Four stroke cycle of SI engine, Spark plug configuration, Combustion and Ignitions, Ignition circuit, working of distributor, Spark generation, starting motor system, Engine management.		
II	1	**Vehicle lighting system:** Lighting fundamentals, Types of bulbs, External lights used in automobile, Headlight reflectors, Poly-ellipsoidal headlight system (PES system), Headlight lenses.	15	25
	2	**Instrumentation & signaling equipments:** Windscreen washers & wipers, flasher units, brake lights, electric horn, computer based modern instrumentation system, fuel quantity measurement, oil pressure measurement, speed measurement, display devices		
III	1	**Heating ventilation and engine cooling:** Requirement of ventilation, Heating system used in automobile, Electronic heating control, Principle of refrigeration, Air conditioning system used in automobile, Automatic temperature control.	15	25
	2	**Road wheel control system:** Requirements of ABS(Anti-lock brakes), General system description, ABS components, Anti-lock brake system control, suspension system, Traction control, Control of gear shift and torque converter, Electric power steering,		

IV	1	**Vehicle security & In car entertainment :** Central locking and electric windows, Door locking circuit, Electric window operation, Cruise control, Adaptive cruise control, In-car multimedia, speakers, Airbags and belt, Tensioners	15	25
	2	**Advanced systems used in automobile:** Automotive navigation system, Embedded Systems in Automobiles, Auto PC system, Digital audio broadcast (DAB),,Radio data system (RDS),		
		TOTAL	**60**	**100**

Text /Reference Books:

1. Tom Denton, "Automobile electrical and electronic system" 3rd edition,elsevier.2.
2. S. Krueger, W Gesner, "Advance Microsystems Automotive Applications" 1st Edition, Springer, 2002.
3. V.A. W Helier, "Fundamentals of Automotive Electronics" 2nd Edition, Neson, Thomes, 1996.
4. William Ribbens, "Understanding Automotive Electronics",5th edition,Newnes.

DIGITAL SIGNAL PROCESSING AND APPLICATIONS			
Branch : ENC/EE	**Sem: VI**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, students will be able to

- **Understand the time and frequency domain concepts.**
- **Do time –frequency domain analysis of a signal.**
- **Different methods of time domain and frequency domain implementation.**
- **Provide a thorough understanding and working knowledge of properties of discrete Fourier transform.**
- **Understand the implementation of the DFT in terms of the FFT, as well as its applications like convolution sum, linear filtering etc.**
- **Learn the different forms of realization for IIR and FIR filters.**
- **Basic concepts of Digital Signal Processor**
- **Become aware of some applications of digital signal processing**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1.	**Introduction to DSP**:- Introduction to DSP, comparison of ASP and DSP	15	25
	2.	**Frequency analysis of DT signals**:- Power density spectrum, DTFT, DTFT of Basic signals Energy density spectrum, Frequency response of DTLTI system using DTFT.		
	3.	**Discrete Fourier transform**:- Introduction, properties of DFT Linear filtering methods based on DFT, frequency analysis of signals using DFT, Relationship between DTFT & DFT, DFT and Z transform.	15	25
II	2.	**Computation of DFT** :- Introduction, Radix 2 FFT algorithms, (DIT & DIF), IDFT algorithms, split Radix algorithms, quantization effects in computation of DFT, linear filtering using FFT.		
III	1.	**Implementation of Discrete time system**:- Structure for the realization of DT systems, Structure for FIR system, Direct form structure, cascade form structure, lattice structure, structure for IIR Direct form, signal flow graph, transpose structure , cascade form, parallel form and lattice form.	15	25
IV	1.	**DSP processors**:- Comparison of general purpose microprocessor with DSP, Internal architecture of ADSP 21XX Family, Features of ADSP 21XX, TMS 320C5X		
	2.	**Applications of DSP**: - Digital audio mixing, speech synthesis and recognition, the compact disc digital audio system. Subband coding, channel Vocoder, Homomorphic Vocoder, Digital Processing of Audio signals , Radar Signal Processing	15	25
	3.	**Introduction to Adaptive signal processing.**		
		TOTAL	**60**	**100**

Text /Reference Books

1. John G. Proakis, Dimitris Manolakis, “Digital Signal processing”, 4th Edition, PHI, 2007.
2. S Salivahanan, “Digital Signal Processing”, 2nd edition, TMH, 2011.
3. Oppenham & Scafer, "Discrete Time Signal Processing", 3rd edition, PHI, 2013.
4. J. R. Johnson, "Introduction to Digital Signal Processing", PHI, 2011.
5. P.Ramesh Babu, “Digital Signal Processing”, 5th edition, SCITECH, 2014.
6. Sanjeev Mitra , “Digital Signal processing”, 2nd edition, McGraw-Hill, 2001.

INDUSTRIAL ELECTRONICS			
Branch : EE	**Sem: VI**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, student will have the knowledge of

- **The basic concepts of Industrial Electronics**
- **Important power devices in detail along with basic application of SCR to get skill of developing and design related to power electronics circuits**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Power semiconductor devices** History of power electronics development, Overview of Power electronics system, Power semiconductor devices ,their symbols and static characteristics and ratings, SCR protections, Turn-on and turn-off circuits, Series and parallel connections of SCR, Applications of thyristor, Comparison between thyristor and transistor	15	25
	2	**Single phase controlled rectifier** Single phase half wave controlled rectifier with resistive and inductive loads, effect of freewheeling diode, Single phase fully controlled and half controlled bridge converters, Performance Parameters		
II	3	**Three phase controlled rectifier** half wave and full wave fully controlled with resistive load	15	25
	4	**Triggering circuit for controlled rectifier** Inverse cosine method, Transistorized firing circuit, Using logic gates, Three phase firing using inverse cosine		
III	5	**D.C. Choppers** Introduction, Basic classification, Operation Control strategies, Configurations, Thyristor chopper circuits, Jones and morgan chopper	15	25
	6	**Inverters** Introduction, Classification, Single phase half-bridge and full bridge inverters, Performance parameters, Voltage control of Single phase inverters, PWM inverters, Three phase inverters		
IV	7	**Cycloconverters :** Introduction, Operation, Single phase - Single phase, Three phase- Single phase, Three phase- Three phase	15	25
	8	**DC and AC motor control** Single phase series dc motor drives: semi converter and full converter, Three phase semi converter and full converter, Induction motor drives, Performance measurements, Various speed-torque characteristics control methods		
		TOTAL	**60**	**100**

Text / Reference Books:

1. M H rashid," Power electronics : Circuit Devices and applications", THI India 3rd edition 2004.
2. MD singh and KB Khanchandani," Power electronics", TMH 2005.
3. P C Sen," Power electronics", TMH 2005.

DIGITAL COMMUNICATION			
Branch : ENC/EE	**Sem: VI**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, students will be able to

- **Understand the concept of information theory and source coding techniques**
- **Learn different Digital Modulation techniques and compare their performances**
- **representation of signals using these techniques, signal space diagram, spectra of modulated signals**
- **Detection of digital modulated signals**
- **Learn and discuss the performances of different channel coding techniques used for reliable transmission digitally modulated signals over channel**
- **Understand the concept of OFDM and different techniques of spread spectrum**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**INTRODUCTION TO DIGITAL COMMUNICATION** block diagram of digital communication system along with sub-system description, comparison with analog communication system, Introduction of baseband and bandpass modulation	15	25
	2	**SOURCE ENCODING** **Information Theory:** Self information, Entropy, Average information **Coding for discrete sources:** Fixed/variable length coding, Prefix condition, Kraft's Inequality, Uniquely decodable code, Huffman coding, Lempel-Ziv coding. **Channel Models:** Binary symmetric channel, channel capacity.		
II	1	**BANDPASS MODULATION** Study of transmitter, receiver, signal space representation, Euclidean distance, PSD, bandwidth efficiency, error probability of : BPSK, DPSK, DEPSK, QPSK, M-ary PSK, QASK, BFSK, M-ary FSK, MSK. Comparison and Applications of digital modulation techniques Duo-binary encoding	15	25
	2	**SPECTRAL ANALYSIS** Orthogonalisation, Orthonormal ,Gram-schimidth Procedure		
III	1	**DEMODULATION/DETECTION** Integrate and dumb filter**,** Matched filter**,** Optimum filter**,** Correlator.	15	25
	2	**CHANNEL ENCODING** **Linear block codes:**Generator Matrix, Parity Check Matrix, Syndrome decoding, error detection and correction, implementation of decoder **Cyclic codes:** Systematic and non-systematic encoding,		

		systematic encoder implementation with shift registers, error detection **Convolution codes:** Code tree, State diagram, Trellis diagram **Convolution decoding:**Viterbi algorithm, Sequential decoding.		
IV	1	**OFDM** Introduction to OFDM, transmitter, receiver, advantages, disadvantages	15	25
	2	**SPREAD SPECTRUM** Frequency-hopping spread spectrum (FHSS), direct-sequence spread spectrum (DSSS), time-hopping spread spectrum (THSS), chirp spread spectrum (CSS)		
		TOTAL	**60**	**100**

Text / Reference Books

1. Taub and schilling,"Principles of communication systems", 4th Edition, Tata McGraw, 2013.
2. Proakis, "Digital communication", 5th Edition,Tata Mcgraw Hill, 2008.
3. B. Sklar, "Digital communication Fundamentals and applications", 2nd Edition, Pearson Education, 2009.
4. K. Sam Shanmugan , "Digital and Analog Communication systems", John Wiley and Sons, 1996.
5. Singh R. P. & Sapre S. P. , "Communication Systems", 2nd edition, McGraw Hill, 2007
6. B. P. Lathi, Zhi Ding, "Morden Digiital & Analog Communication System", Oxford University Press, 4th edition, 2014.

LABS / TUTORIALS FOR SEMESTER VI

MICROPROCESSOR II LAB			
Branch : ENC/EE	**Sem: VI**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	Programming of 8051 (simple programs) Programming of 8051 (complex programs) 8051 LED interfacing 8051 and LCD and keypad interfacing RS 232/485 communication with 8051 with and without interrupt 80386 practical's		

AUTOMOTIVE ELECTRONICS LAB			
Branch : EE	**Sem: VI**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	Study of automotive fundamentals Study of LCD display. Study of automatic switching. Speed control of DC motor. Speed control of stepper motor. Study of safety buzzer. Study of automatic indicators. Study of automatic temperature control. Fault diagnosis in automobile.		

DSP LAB			
Branch : ENC/EE	**Sem: VI**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	(All DSPA Practicals will be conducted in OCTAVE/MATLAB) Waveform generation using OCTAVE Frequency Response Of DT-LTI System Discrete Fourier Transform and inverse discrete Fourier Transform Frequency response using Fast Fourier Transform Linear Convolution Circulation Convolution Cross Correlation And Auto Correlation Cascade Realization of DT-LTI system Impulse response of DT-LTI system		

POWER ELECTRONICS LAB			
Branch :EE	**Sem: VI**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	To study SCR characteristics To study applications of DIAC and TRIAC To study different turn on methods of SCR To study different turn off methods of SCR To study single phase half controlled rectifier or full controlled rectifier with R and RL load To study various triggering circuits of SCR To Study step up and step down choppers To study Inverters To study Cycloconverters To study DC and AC Drive To study Jones or Morgan Choppers		

DIGITAL COMMUNICATION LAB			
Branch : ENC/EE	**Sem: VI**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	Study various digital modulation/demodulation techniques, and various sources and channel coding techniques		

CONSUMER ELECTRONICS			
Branch : EE	**Sem: VII**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, students will be able to

- **Illustrate product manufacturing process.**
- **Understand the concept of product development for Consumer Electronics, Compliance**
- **Acquire the knowledge of various Video/ Audio systems and products**
- **Learn about various applications of consumer electronics products**
- **Troubleshoot consumer electronics products.**
- **Understand various audio and video compression algorithms.**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Product Development for Consumer Electronics**: Product policy, product life cycle, product classification; new product development systems, generation of new product ideas, consumer based concept screening and evaluation, economic evaluation.	**15**	**25**
	2	**Compliance**: Product safety and liability issues; standards related to electrical safety and standards related to fire hazards, e.g., UL and VDE. EMI/EMC requirements and design techniques for compliance, e.g. ESD, RF interference and immunity, line current harmonics and mains voltage surge.		
II	1	**Video Systems & Product:** Digital TV :Introduction to Digital TV, Principle of Digital TV, Digital TV signals and parameters, Digital TV Transmitters, MAC signals, advanced MAC signal transmission, Digital TV receivers, Basic principles of Digital Video compression techniques, MPEG1, MPEG2, MPEG4, Video compression ITU-Standards(H.). **3D TV** **HDTV:** HDTV standards and systems, HDTV transmitter and receiver/encoder, direct to home TV, set top box with recording facility	**15**	**25**
	2	**Gaming Applications**: PS3,XBOX		
III	1	**Office Applications:** CCTV, CATV, Scanners – Barcode / Flat bed , Printers , Xerox, Solar Cells and Panels, Projectors, **mobile phones,**	**15**	**25**
	2	**Consumer Applications :** Digital cameras, Camcoders, Handycams, and Digicams, , MPEG, MP3, **microwave oven**		
IV	1	**Audio Systems & Products**: Audio quality and standards: toll, broadcast, CD; compression of audio signal, recording of audio signal; over-sampling; CD/ DVD player, MP3 player, Blue Ray DVD Players	**15**	**25**
	2	**Design Case Studies** :Audio and video systems and products; domestic appliances and office automation equipment; SoC.		
		TOTAL	**60**	**100**

Text Books /Reference Books

1. Television and video Engineering, A. M. Dhake, 2nd edition, TMH Publication, 1999.
2. Video Demisified, Kelth jack, Penram International Publication.
3. Audio Video Systems, R.G. Gupta, Technical Education.
4. P.A. Chatterton and M. A. Houlden, EMC: Electromagnetic Theory to Practical Design, Wiley.
5. J.A.S. Angus, Electronic Product Design, Chapman and Hall, 1996.
6. S. P. Bali, "Color TV Theory and Practice", 1994.
7. Bernard Grobb, Charles E, "Basic TV and Video Sytems", 1999.
8. Gulati, "Monochrome & Color TV", 13th edition, 1989.
9. C.M. Wintzer, International Commercial EMC Standards, Interference Control Technologies, 1988.
10. Y.J. Wind, Product Policy: Concepts, Methods, and Strategy, Addison-Wesley Pub. Co., 1982.

MECHATRONICS			
Branch : EE	**Sem: VII**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, students will acquire the knowledge of

- **Strong foundation in science and focus in mechanical, electronics, control,software, and computer engineering, and a solid command of the newest technologies**
- **Design, analyze, and test "intelligent" products and processes that incorporate appropriate computing tools,sensors, and actuators**
- **Key elements and basic concept of the mechatronics system**
- **Various sensors and actuators applicable to Mechatronics system**
- **Interfacing of the electromechanical devices.**
- **Practice professional and ethical responsibility and be aware of the impact of their designs on humankind and the environment**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weight-age in %
I	1	**INTRODUCTION TO MECHATRONICS** key element of mechatronics, mechatronics systems in factory, home and business applications, basic Components of mechatronics systems, Mechatronics Design process, objectives, advantages of mechatronics **man machine interface, industrial design and ergonomics, information transfer, safety.**	**15**	**25**
	2	**SENSORS AND ACTUATORS** **Sensors:** Proximity sensors(Optical, Inductive, Capacitive) Motion Sensors(Variable Reluctance), Temperature Sensor(RTD, Thermocouples); Force / Pressure Sensors(Strain gauges); Flow sensors(Electromagnetic) **Actuators:** Harmonic drive, Comb drive; Piezoelectric drives; Selection of actuator **Control devices – Electro hydraulic control devices, electro pneumatic proportional controls – Rotational drives,Pneumatic motors ,Hydraulic motor**		
II	1	**Programmable Logic Controller (PLC) in automation:** Basic structure, I/O processing. Ladder logic diagram, PLC for industrial process control, Selection of PLC	**15**	**25**
	2	**Data Acquisition**: Data Acquisition systems (DAQs), dataloggers, supervisory control and data acquisition,.		

III	1	**System Interfacing:** interfacing requirements; Brief overview of buffers, handshaking, polling and interrupt, digital communication, parallel communication, serial communication interface; Universal asynchronous receiver and transmitter (UART), peripheral interface device (PIA), analog interfacing, Component interconnection and impedance matching, interfacing sensors and motor drives with microcomputer system	**15**	**25**
IV	1	**Mechatronics case studies**: Autonomous Mobile Root, Wireless Surveillance Balloon, Fire Fighting robots, Cantilever beam vibration control using piezo sensors and actuators, Car engine management, pick and place robot, automatic camera, CNC machine	**15**	**25**
		TOTAL	**60**	**100**

Text /Reference Books

1. Mechatronics System Design, Shetty and Kolk, Cengage Learning, India Edition
2. Introduction to Mechatronics and Measurement Systems, Alciatore and Histand Tata McGraw-Hill
3. Mechatronics, Necsulescu, Pearson education.
4. Mechatronics - Electromechanics and Control Mechanics, Mill Springer-Verlag.
5. **Bolton, Mechatronics – Electronic Control Systems in Mechanical and Electrical Engineering, 2nd Edition, Addison Wesly Longman Ltd., 1999.**

EMBEDDED AND IOT SYSTEM			
Branch : ENC/EE	**Sem: VII**	**Lectures: 4 Hr**	**Credit: 4**

Objective :

- **Understand the fundamentals of embedded systems**
- **To introduce on processor scheduling algorithms , Basics of Real time operating system**
- **To learn the Essentials of Open Source RTOS and their usage.**
- **Understand IoT Market perspective with Data and Knowledge Management and use of Devices in IoT Technology**
- **The learner will be able to use of Devices, Gateways and Data Management in IoT.**

Module No	Sr. No	Topic and Details	No. of Lectures assigned	Marks assigned
I	**1**	**Introduction :** Introduction to embedded system, embedded system architecture, classifications of embedded systems, challenges and design issues in embedded systems, Design trade offs due to process compatibility, thermal considerations	**15**	**25**
	2	Technologies with ES - RS232, RS485,Zigbee		
II	**1**	**Rtos Based Embedded System Design -** Introduction to basic concepts of RTOS- Need, Task, process & threads Hard Real time and Soft Real-time, Differences between General Purpose OS & RTOS, interrupt routines in RTOS, Multiprocessing and Multitasking,	**15**	**25**
	2	**Open Source Rtos** -: Basic architecture of an RTOS, Scheduling Systems, Introduction to Inter-process communication, Performance Matrix in scheduling models **Comparison of Real time Operating systems:** VxWorks, чC/OS-II, RT Linux		
III	**1**	**Overview of IOT :** Architecture, Main design principles ,needed capabilities, IoT architecture outline, standards considerations.	**15**	**25**
	2	**IoT Reference Architecture-** Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. **Challenges in IoT** - Design challenges, Development challenges		
IV	**1**	**M2M and IoT Technology Fundamentals-** Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management	**15**	**25**
	2	**Developing in IoTs -** Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Implementing basic IoT concepts with python		
		TOTAL	**60**	**100**

Text/Reference Books

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition, Apress Publications, 2013
4. Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1-4493- 9357-1
5. J. W. Valvano, "Embedded Micromputer System: Real Time Interfacing" Brooks Cole, 2000.
6. Dr. K.V.K. Prasad, "Embedded / Real-Time Systems: Concepts, Design and Programming Black Book" , New ed (MISL-DT) Paperback – 12 Nov 2003
7. Han Way Huang, PIC Microcontroller, Cengage learning Design with PIC Microcontrollers By John B. Peatman, Pearson Education Asia LPE
8. Venkateswaran Sreekrishnan," Essential Linux Device Drivers" , Ist Kindle edition, Prentice Hall, 2008
9. Seppo J. Ovaska Phillip A. Laplante,"Real-Time Systems Design and Analysis:Tools for the Practitioner", 4ed Paperback – 2013
10. Ward, Paul T & Mellor, Stephen," Structured Development for Real - Time Systems v1, v2,V3 : Implementation Modeling Techniques " Prentice hall, 2015
11. David E. Simon, ".Embedded Software Primer": Addison-Wesley Professional , 2000

VLSI DESIGN (need to be arranged in 4 modules)			
Branch : EE	**Sem: VII**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, students will be able to

- Understand principles of VLSI circuit design, layout techniques ,choice of technology and technology scaling
- Design MOS based circuits with different design styles
- Understand system level design

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	Review of MOS transistor models **Fabrication process flow for NMOS and CMOS, Types of scaling, short channel effects, Level 1 and Level 2 MOSFET Models.** **Lambda based design rules, MOSFET capacitances**	**15**	**25**
	2	CMOS logic families		
II	1	Integrated Circuit layouts **MOSFET Inverters, Circuit Analysis: Static and dynamic analysis (Noise, propagation delay and power dissipation) of resistive load and CMOS inverter. Comparison of all types of MOS inverters. Design of CMOS inverters and its layout.** **Analysis and design of 2 I/P NAND and NOR using equivalent CMOS inverter.**	**15**	**25**
III	1	**MOS circuit Design Styles:** **Static CMOS, Pass Transistor Logic, Transmission Gate, Pseudo NMOS, Domino, NORA, Zipper, C2MOS.** **Circuit Realization of SR Latch, JK FF, D FF, 1 Bit Shift Register, MUX, Decoder using above design styles and their layout**	**15**	**25**
IV	1	VLSI system design:- data and control path design, **Adder: Bit adder circuits, Ripple carry adder, CLA adder** **Multipliers and shifter:** **Partial product generation, partial product accumulation, final addition, Barrel Shifter** **Semiconductor Memories: SRAM, DRAM.** **layout of SRAM and DRAM**	**15**	**25**
	2	Design examples		
V	1	Introduction to HDL,		
	2	**Low Power CMOS Circuits:** **Various components of power dissipation in CMOS,**		

		Limits on low power design, low power design through voltage scaling. **Interconnect & Clock Distribution** **Interconnect delays, Cross Talks, Clock Distribution**		
		TOTAL	**60**	**100**

Text / Reference Books

1. N. Weste and K. Eshranhain, "Principles of CMOS VLSI Design" Addision Wesley, 2014.
2. L. Glaser and D. Dobberpuhl, " Design and Analysis of VLSI Circuit" Addision Wesley.
3. **Sung Mo Kang and Yusuf Leblebici, "CMOS Digital Integrated Circuits Analysis and Design", Tata McGraw Hill, 3rd Edition, 2012.**
4. **John P. Uyemura, " Introduction to VLSI Circuits and Systems", Wiley, Student Edition, 2013.**
5. **R. Jacob Baker, "CMOS Circuit Design, Layout and Simulation ",Wiley, 2nd Edition, 2004.**

RENEWABLE ENERGY SOURCES (Elective I)			
Branch : ENC/ EE	**Sem: VII**	**Lectures: 4 Hr**	**Credit: 4**
Objective : On the completion of this course, students will be able to ● **Understand the various renewable energy resources and sustainability.**			

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Solar Energy:** Solar radiation, types of solar thermal collectors - flat and concentrating collectors, **Solar thermal applications -** water heaters, dryers, stills, refrigeration, air-conditioning, solar pond, central receiver power generation.	15	25
	2	**Wind Energy:** Basic principle of wind energy conversion system, wind data and energy estimation, site selection, components of wind energy conversion systems, design consideration of horizontal axis wind mill.		
II	1	**Biomass Energy:** Biomass, sources of biomass, thermo-chemical and bio-chemical conversion of biomass -pyrolysis, gasification, combustion and fermentation. **Gasifiers –** up draft, downdraft and fluidized bed gasifiers. Digesters-fixed and floating digester biogas plants, economics of biomass power generation.	15	25
	2	**Ocean, Hydro and Geothermal Energy:** Wave and tidal energy, ocean thermal energy conversion - principle, types, power plants- small, mini and micro hydro power plants. Exploration of geothermal energy, geothermal power plants. **Introduction to direct energy conversion systems –** fuel cells and magneto hydrodynamic power generations.		
III	1	**Renewable Energy Policy:** Renewable energy policies, including feed-in tariffs, portfolio standards, policy targets, tax incentives, and biofuels mandates. International policies for climate change and energy security. Economic analysis and comparisons, Life cycle analysis, financial analysis, cost of conserved energy, and externalities. Cost assessment of supply technologies versus energy-efficiency.	15	25

IV	**1**	**Sustainable Energy :** Sustainable energy futures, global scenarios, promising technologies, development pathways, clean coal and carbon technologies, electric vehicles, energy fluctuation and energy storage, distributed generation and smart grids.	**15**	**25**
		TOTAL	**60**	**100**

Text /Reference Books:

1. Rai.G.D, "Non-Conventional Energy Sources", Khanna Publishers, 4th edition, New Delhi, 2009.
2. Roland Wengenmayr, Thomas Buhrke," Renewable energy: Sustainable energy concepts for the future", Wiley-VCH, 1st edition, 2008.
3. Godfrey Boyle, "Renewable energy", Oxford University Press, 2nd edition, 2010.
4. Hans-Josef Fell, "Global cooling strategies for climate protection", CRC Press, 2012.
5. Ottmar Edenhofen, "Renewable energy sources and climate change mitigation", Cambridge University Press, 2011.
6. B.K. Hodge, "Alternative energy systems and applications", John Wiley & Sons, 2009.
7. Mark Diesendrof, "Greenhouse solutions with sustainable energy", University of New South Wales Press, 2007.

Coding Techniques and Cryptography (Elective I)			
Branch : ENC/ EE	**Sem: VII**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, students will be able to

- **Understand error–control coding.**
- **Understand encoding and decoding of digital data streams.**
- **Be familiar with the methods for the generation of these codes and their decoding techniques.**
- **Understand the properties of codes and their respective fitness for specific applications.**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Block Codes: The Digital Communication Channel, Introduction, Single parity check codes, Product codes, Repetition codes, Hamming Codes, minimum distance of block codes.** **Linear Codes: Generator matrices, standard array,parity check matrices, error syndrome, error detection and correction,shortened and extended linear codes.**	**15**	**25**
	2	**Cyclic codes: Definition, Polynomials, Generator Polynomial, Encoding and decoding of cyclic codes. Factors of X^n+1. , Dual Cyclic codes.Generator and parity check matrices of cyclic codes.**		
II	1	Introduction to finite fields .**Properties of finite field ,Prime Field and Extension Field. Arithmetic of finite field.** **The field $GF(2^3)$,$GF(2^4)$, $GF(2^5)$. Primitive field element, Irreducible and minimal polynomial**	**15**	**25**
	2	**Bose-Chaudhuri-Hocquenghem codes: Definition and construction of Binary BCH codes, error syndrome in finite fields, Decoding SEC and DEC binary BCH codes, the error location polynomial. Reed Solomon Codes.**		
	3	Convolution codes; **Encoding convolution codes, Generator matrices and generator polynomial for convolutional codes, Graphical representation of convolutional codes.**		
III	1	Introduction to Cryptography: **Security Attacks, Security Services, Security Mechanish. Classical encryption techniques ,Substitution and transposition techniques. Types of Cryptography.**	**15**	**25**
	2	**Block Cipher Principles, Block Ciphers modes of operation. symmetric key Cryptography , DES and AES Algorithm. Asymmetric Key cryptography (Public Key Cryptosystem) RSA and ECC algorithm. Diffie Hellman Key Exchange Algorithm.**		
IV	1	**Authentication algorithm**	**15**	**25**

		Cryptographic Hash Function and MAC requirement and Application. Digital signature standard.		
	2	**Network and Internet security :Transport layer security, wireless network security, Electronic mail security, IP security**		
		Total	**60**	**100**

Text /Reference Books

1. S Lin and D.J Costello ,Error Control Coding: Fundamentals and Applications , Prentice Hall.
2. Behrouz A. Forozan ,Debdeep Mukhopadhyay ,Cryptography and Network Security,McGraw Hill.
3. **William Stallings, Cryptography and network Security Principle and practice, Fifth Edition, Prentice Hall.**

R. F CIRCUIT DESIGN (Elective I)			
Branch : ENC/ EE	**Sem: VII**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, student will be able to

- **To provide knowledge in the field of RF circuits and systems.**
- **To study various methodologies for the design of RF filters, various RF active and passive circuits, etc.**
- **To learn the design schemes currently being used for RF circuits and systems.**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Introduction** : Importance of radio frequency design ,RF dimensions, units, RF behavior of passive components	15	25
	2	T**ransmission Line Analysis** : Theory ,equivalent circuit, theoretical foundation, parameters, General transmission line equation, Microstrip transmission lines, terminated lossless transmission line, special termination condition.		
	3	**Smith chart for design of RF circuits: reflection coefficient to load impedance, impedance transformation, admittance transformation, parallel series connections.**		
II	1	Single and Multi-port Networks: Definition, interconnecting networks, network properties and applications, scattering parameters.	15	25
	2	**Active RF components such as RF diodes, BJT and FET, high electron mobility transistors**		
	3	**RF Filter Design: basic resonator and filter configuration, special filter realization, filter implementation, coupled filter.**		
III	1	**Matching and biasing the network: impedance matching using discrete components, microstrip line matching networks, amplifier classes of operation and biasing networks**	15	25
	2	**RF transistor amplifier design: characteristic of amplifiers, power relations, stability consideration, constant gains, noise figure circles, constant VSWR circuits, broadband, high power and multistage amplifier**		
IV	1	**Oscillator and Mixer Design: basic model, feedback mechanism high frequency oscillator configuration, basic Mixer characteristics**	15	25
	2	**Design of Printed Circuit Boards**		

		Introduction to technology of printed circuit boards (PCB), General layout and rules and parameters, PCB design rules for Digital, High Frequency, Analog, Power Electronics and Microwave circuits, Computer Aided design of PCBs		
		TOTAL	**60**	**100**

Text /Reference Books

2. Reinhold Ludwing , Pavel Bretchko , "RF Circuit Design Theory and Applications", Pearson Publication, 2011.
3. **Walter C.Bosshart, Printed Circuit Boards – Design and Technology, TMH, 1983.**
4. **David Pozar " Microwave Engg." 4th Ed. Wiley Eastern 2014.**
5. **Matthew M. Radmanesh, "RF & Microwave Design Essentials: Engineering Design and Analysis from DC to Microwave", AuthorHouse, 2007.**

ADVANCED ELECTRONICS AND INSTRUMENTATION (Elective I)			
Branch : EE	**Sem: VII**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, student will be able to

- **Understand the measurement of Flow, Level, Density, Viscosity, Humidity, Speed, Force And Torque**
- **Acquire the knowledge of the operation and applications of various instruments**
- **Analyze and test various Advance Electrical Instruments**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Measurement Of Flow And Level** Flow: Expression for flow rate through restriction (compressible and incompressible flow), Variable head type flow meters–variable area flow meter–turbine flow meter–electromagnetic flow meter–ultrasonic flow meter–coriolis and thermal mass flow meter–open channel flow measurement–solid flow measurement. **Level:** Measurement of level using float and displacer–level switch–Hydrostatic type–bubbler method–Electrical methods-resistance, inductive, capacitance type–gamma radiation method –ultrasonic level gauging.	**15**	**25**
II	1	**Measurement Of Density, Viscosity, Humidity** **Density**: Measurement of density using pressure head type, float type and bridge type densitometer **Viscosity**: Viscosity terms–say bolt viscometer–rotameter type viscometer. **Humidity:** Humidity terms – dry & wet bulb psychrometers, hot wire electrode type hygrometer, Dew point hygrometer and IR sensors	**15**	**25**
	2	**Measurement Of Speed, Force And Torque** **Speed:** Measurement of speed–moving iron and moving coil type–AC and DC tachogenerators, photo electric pickup–stroboscope **Force:** Measurement of force – Load cell, pneumatic and hydraulic load cell. **Torque:** Measurement of torque–Inductive principle and Digital methods.		
III	1	**Biomedical instrumentation** (Non Electrical Parameters Measurement And Diagnostic Procedures)- Measurement of blood pressure – Cardiac output – Heart rate – Heart sound – Pulmonary function measurements – spirometer –	**15**	**25**

		Photo Plethysmography, Body Plethysmography – Blood Gas 82 analysers, pH of blood –measurement of blood pCO2, pO2, finger-tip oxymeter – ESR, GSR measurements.		
IV	1	**Power Instrumentation** Survey of methods of power generation :– hydro, thermal, nuclear, solar and wind power – Importance of instrumentation in power generation – Thermal power plant – Building blocks –Combined Cycle System – Combined Heat and Power System – sub critical and supercritical boilers	**15**	**25**
	2	**SCADA** Definition – elements of SCADA system – history of SCADA – remote terminal unit (RTU) – discrete control – analog control – master terminal unit – (MTU) – operator interface		
		TOTAL	**60**	**100**

Text / Reference Books

1. Patranabis. D "Principles of Industrial Instrumentation", Tata McGraw Hill, 3rdEdition, New Delhi, Reprint 2010.
2. Krishnaswamy K.& Vijayachitra S., "Industrial Instrumentation" New age International, Reprint 2008.A.K.
3. Alan.S.Moris , "Principle of Measurement & Instrumentation", 2nd edition, Prentice Hall of India, 1990.
4. Doebelin, E.O.and Manik,D.N., Measurement Systems Application and Design, Special Indian Edition, Tata McGraw Hill Education Pvt. Ltd., 2007.
5. Patranabis, D. Principles of Industrial Instrumentation, 3rd Edition, Tata McGraw Hill, New Delhi, 2010.
6. David W. Spitzer, Industrial Flow Measurement; ISA-The Instrumentation, Systems, and Automation Society, 01-Jan-2005.
7. Leslie Cromwell, Biomedical Instrumentation and Measurement, Prentice hall of India, New Delhi, 2007.
8. Joseph J.carr and John M. Brown, Introduction to Biomedical Equipment Technology, John Wiley and sons, New York, 4th Edition, 2012.
9. Rajput R.K., A Text book of Power plant Engineering. 5th Edition, Lakshmi Publications, 2013.

LABS / TUTORIALS FOR SEMESTER VII

VLSI DESIGN LAB			
Branch : EE	**Sem: VII**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	Design and Simulation of various logic building blocks using HDL language		

ADVANCED ELECTRONIC INSTRUMENTATION LAB			
Branch : EE	**Sem: VII**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
	Measuring various electrical parameters Learning operation and applications of various instruments Analyzing and testing various Advance electrical Instruments		

ELECTIVE LAB I			
Branch : ENC/EE	**Sem: VII**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
	Study and simulation and research paper supporting the course elective I		

EMBEDDED AND IOT SYSTEMS LAB			
Branch : EE	**Sem: VII**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
	Implementation of various embedded applications on PIC microcontroller and 6811 TEXAS Simulator		

CONSUMER ELECTRONICS LAB			
Branch : ENC/EE	**Sem: VII**		**Credit: 22**

Sr. No	Detail Syllabus		
	At least seven experiments/tutorials covering the whole Consumer Electronics syllabus		

COMPUTER AND COMMUNICATION NETWORK			
Branch : EE	**Sem: VIII**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, student will be able to

- **To understand the basic types of computer networks.**
- **To study the functionality of each network layer**
- **To have knowledge of the protocols for networking**
- **To learn different network security aspects**

Module No.	Sr. No.	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Introduction**:- Uses of Computer networks, Network hardware, and Network software, Reference Models: OSI, TCP/IP.	15	25
	2	**The Physical Layer**:-Theoretical basis for data communication, Multiplexing, Transmission Media: Twisted pair, coaxial cable, optical fiber, wireless transmission etc., Switching: Circuit switching, Packet switching, X.25, Frame Relay.		
	3	**ATM, ISDN**		
II	1	**The Data Link Layer**:-Design Issues Error detection and correction- hamming codes, CRC, bit stuffing, character stuffing etc. Elementary data link Protocols: A simplex Stop and Wait (Noiseless and Noisy channel) Sliding Window Protocols: 1 bit SWP, Go Back n protocol, Selective Reject protocol . High Level Data Link Control protocol (HDLC), PPP	15	25
	2	**Network Layer: Routing Algorithms, and Congestion Control Algorithms: Leaky bucket algorithm, Token bucket algorithm**		
III	1	**The Medium Access Sub-layer**:-Multiple Access Protocols: ALOHA, CSMA, CSMA/CD, Wavelength Division multiple access, wireless LAN protocols. IEEE standards 802 for LANs, MANs etc.: IEEE 802.3, IEEE 802.4, IEEE 802.5, IEEE 802.11, IEEE 802.15, IEEE 802.15.4 , High Speed LANs , Fast/Gigabit Ethernet.	15	25
IV	1	**Transport Layer**:-Study of TCP/IP suite, Design Issues, . Brief study of the Transport Layer and The Presentation Layer.	15	25
	2	**Gateways and Application Layer Protocols**: HTTP, DNS, and SMTP etc.Network Security issues- brief study		
		Total	**60**	**100**

Text Books /Reference Books:

1. Andrew S. Tannenbaum, "Computer Networks", 3rd Edition, PHI.
2. Larry Peterson & Davie, "Computer Networks- A systems approach", 3nd Edition, Harcourt India
3. William Stallings, "Data and Computer Communications", 6th Edition, Pearson Education Asia.

MANAGEMENT FOR INFORMATION AND COMMUNICATION TECHNOLOGY (Elective II) (4 modulewise suggestion)			
Branch : EE	**Sem: VIII**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, student will be able to

- **To help students prepare for careers in the ICT (Information & Communication Technologies) industry with skills required in today's workplace.**
- **Familiarizing with the Business eco system and ICT industry**
- **Understanding key business/management principles and concepts**
- **Understanding key business/management functions and processes**
- **Understanding how ICT enables Business**
- **Learning about Management Tools and techniques**
- **Familiarizing with popularly referred/adopted ICT industry frameworks and standards - TMF, ITIL, PMP, PRINCE etc.**
- **Understanding basic business models in ICT Industry – Hardware, Software, Services, Start-ups etc.**

1	**IT Business an Overview:-** Business concepts – conventional business, knowledge based business Growth of Indian IT Business – NASSCOM Report Basic types of IT Business – Products and Services Different avenues of IT Business. Operations of IT Business – onshore, offshore Business and environment – Economic, Political and Social Ethics in Business Management Careers in Information Technology	05	10
2	**Management for IT Professionals – an overview** Management Concepts, Responsibility of Management Hierarchy of Management , Management Approaches, Styles of Management ,Types of Management , Managerial Functions Role of Management ,Job of a Manager – Functional Management, General Management, Project Management	05	10
3	**Relational Management Human Resource Management** Role, Scope, Purpose and Importance of Human Resource Management in IT, Human Resource Planning, Training & Development Human Resource Allocation Performance, Appraisal and Compensation Welfare.	05	10
4	Managerial Economics and Financial Management Role, Scope, Purpose and Importance of Managerial Economics and Financial Management in IT, Managerial Economic, Theory and types of costs, Financial Management – Sources of Finance Financial Statements Accounting	05	10
5	**Operation Management:-** Role, Scope, Purpose and Importance of Operations Management in IT, Manufacturing v/s Service Organizations, Manufacturing Systems.	05	10
	ERP (Enterprise Resource Planning), SCM (Supply Chain Management), CRM (Customer Relationship Management) Financial Management, MRP (Material Requirement Planning) Management of Excellence – Business Performance Excellence Models – Malcolm Bald-ridge Award **Management Tools and Techniques**		

	System Analysis, Forecasting and Prediction, Strategic Analysis, Decision Making, Problem Solving Techniques, ABC (Activity Based Coding), Financial Engineering, Business Process Re-engineering, Bench Marking, Six Sigma Bri Score Card		
6	Maintenance Management, Material Management, Total Quality Management, Marketing Management	10	20
7	Project Management Role, Scope, Purpose and Importance of Project Management in IT. Meaning of Project and Project Management, Classification of Projects, Hierarchy of Projects, Project Life Cycle, Role and Responsibility of Project Manager Project Development – Project Formulation and Appraisal, Feasibility Study, Project Planning and Scheduling, Implementation and Control, Project Completion and Handover, Evaluation Project Management Body of Knowledge – An Overview Computer Based Project Management	05	10
8	Management Information System Role, Scope, Purpose, Data and Information Producing, Characteristics value of Information. Characteristics, Importance, Requirements, Types, Identification, Designing, Planning and Implementation of Management Information System. Expert systems, Miscellaneous Management Systems	05	10
10	Introduction to RTI Act	05	10
	Total	**50**	**100**

Text Books /Reference Books

1. R.N. Nauhria, "Management of Systems", New Delhi Wheeler, 1998.
2. Business Management & Functions – The ICFAI Business School.

Hardware Descriptive Languages (Elective II) (4 modulewise suggestion)			
Branch : EE	**Sem: VIII**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, student will be able to

- **Understand the basics of HDL, VHDL and VERILOG**
- **Design digital circuits by using different description of digital circuits using verilog HDL, and VHDL**
- **Verify these Models and synthesizing RTL models to standard cell libraries and FPGAs.**
- **Students aim practical experience by designing, modeling, implementing and verifying several digital circuits.**

Module No.	Sr. No.	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Introduction** **Why HDL? , A Brief History of HDL, Structure of HDL Module, Operators, Data types, Types of Descriptions, simulation and synthesis, Brief comparison of VHDL and Verilog**		
II	1	**Data –Flow Descriptions** **Highlights of Data-Flow Descriptions, Structure of Data-Flow Description, Data Type – Vectors.**		
	2	**Behavioral Descriptions** **Behavioral Description highlights, structure of HDL behavioral Description, The VHDL variable –Assignment Statement,sequential statements.**		
III	1	**Structural Descriptions** **Highlights of structural Description, Organization of the structural Descriptions, Binding, state Machines, Generate, Generic, and Parameter statements.**		
	2	**Procedures, Tasks, and Functions** **Highlights of Procedures,tasks, and Functions, Procedures and tasks, Functions. Advanced HDL Descriptions: File Processing, Examples of File Processing**		
IV	1	**Mixed –Type Descriptions** **Why Mixed-Type Description? VHDL User-Defined Types, VHDL Packages, Mixed-Type Description examples**		
	2	**Mixed –Language Descriptions** **Highlights of Mixed-Language Description, How to invoke One language from the Other, Mixed-language Description Examples, Limitations of Mixed-Language Description.**		
V	1	**Synthesis Basics** **Highlights of Synthesis, Synthesis information from Entity and Module, Mapping Process and Always in the Hardware Domain.**		

		TOTAL		

Text / Reference Books

1. **J Bhasker, "VHDL Primer", Addison Wesley**
2. **Douglas Perry, "VHDL", Tata McGraw HILL**
3. **William I. Fletcher, "An Engineering approach to Digital Design", Prentice Hall India.**
4. **Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", Pearson Education, Second Edition.(Text1)**
5. **Nazeih Botros, "HDL programming VHDL and VERILOG" https://books.google.co.in/books?id=L0PB2VWg7PgC&printsec=frontcover#v=onepage&q&f=false**
6. **Thomas Moorby's, fifth edition "The verilog hardware description language"**

WIRELESS AND MOBILE COMMUNICATION (Elective II)			
Branch : EE	**Sem: VIII**	**Lectures: 4 Hr**	**Credit: 4**

Objective : On the completion of this course, students will be able to

- **Learn the basics of wireless and mobile communication**
- **Understand the concept of Cellular radio system design, Various Multiple access schemes, Resource and mobility management**
- **Learn about Practical Cellular Systems**

Module No.	Sr. No	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Introduction to Mobile communication:** Cellular mobile telephone architecture overview, Generations of Mobile Communication system	**15**	**25**
	2	**Cellular radio system design** Frequency assignments, frequency reuse channels, concept of cell splitting, Handover in cellular systems, Handoff algorithms		
II	1	**Multiple access schemes in mobile communication:-** TDMA, FDMA, CDMA, Random Multiple Access Schemes, Performance analysis issues, Interference suppression and power control.	**15**	**25**
	2	Tele-traffic modeling and queuing theoretic analysis of cellular mobile networks, Resource allocation and mobility management.		
III	1	**Practical Cellular mobile systems**- GSM system architecture overview, Call management and system operation, CDMA (IS95) based cellular system.	**15**	**25**
	2	**3G and 4G Systems :** 3G system, CDMA2000 system , Architecture, UMTS technology, **3GPP LTE**		
IV	1	Wireless Personal Area Network, Bluetooth, Zigbee, Wireless LAN, Architecture and standards,	**15**	**25**
	2	**Adhoc and Sensor Networks**: Characteristics of MANETs, Table driven and source initiated. On demand routing protocols , hybrid protocols, Wireless sensor networks classification, MAC and routing protocols.		
		TOTAL	**60**	**100**

Text /Reference Books

1. Rappaport "Wireless communication", 2nd Edition, Pearson Education, 2010.
2. W. Lee. "Mobile Cellular Telecommunication Systems", 2nd edition, Mc Graw Hill 1995.
3. V. K. Garg and J.E Wilkes, "Wireless and Personel Communication Systems" PHI 2014.
4. Wireless communication and Networking-Vijay Garg, ELSEVIER Inc. Video Demisified, 2014.
5. Kelth jack, Penram International Publication.
6. Next Generation Wireless Systems and Networks: Hsiao . Hwa Chen, Mohsen Guizani . Wiley.

7. Essentials of UMTS: Christopher Cox.
8. Wireless communication and Networking-William Stallings, 2nd edition, Pearson/Prentice Hall Publication, 2012.

ROBOTICS (Elective II)			
Branch : EE	**Sem: VIII**	**Lectures: 4 Hr**	**Credit: 4**
Objective : On the completion of this course, students will be able to ● **Understand the basics of Robotics along with its kinematics** ● **Learn about Static analysis, Path Planning, Dynamics and control** ● **Get the knowledge of multiple robot-machine interfacing**			

Module No.	Sr. No.	Topic and Details	No. of Lectures assigned	Weightage in %
I	1	**Introduction:** Definition and origin of robotics - different types of Industrial robotics – various generations of robots - degrees of freedom - Asimov's laws of robotics – dynamic stabilization of robots-Standard Robot configuration and construction.	15	25
	2	**Power Sources And Sensors** Hydraulic, pneumatic and electric drives - electronic and pneumatic manipulator control circuits. Determination of HP of motor and gearing ratio - variable speed arrangements - path determination - micro machines in robotics - machine vision - ranging - laser - acoustic - magnetic, fiber optic and tactile sensors.		
II	1	**Robot Kinematics** Mathematical representation of Robots - Position and orientation – Homogeneous transformation-Various joints-Representation using the Denavit Hattenberg parameters -Degrees of freedom-Direct kinematics-Inverse kinematics-PUMA560 & SCARA robots- Solvability – Solution methods-Closed form solution.	15	25
	2	**Manipulator Differential Motion And Statics** Linear and angular velocities-Manipulator Jacobian-Prismatic and rotary joints–Inverse -Wrist and arm singularity - Static analysis - Force and moment Balance.		
III	1	**Robot End Effectors** End Effectors, Tools and Grippers-Gripper design and Gripper force.	15	25
	2	**Path Planning** Definition-Joint space technique-Use of p-degree polynomial-Cubic polynomial-Cartesian space technique - Parametric descriptions - Straight line and circular paths - Position and orientation planning.		
IV	1	**Dynamics And Control** Lagrangian mechanics-2DOF Manipulator-Lagrange Euler formulation-Dynamic model –Manipulator control problem-Linear control schemes-PID control scheme-Force control of robotic manipulator.	15	25
	2	**Case Studies**		

		Multiple robots - machine interface - robots in manufacturing and nonmanufacturing application - robot cell design - selection of a robot.		
		TOTAL	**60**	**100**

Text / Reference Books

1. R. K. Mittal and I. J. Nagrath, "Robotics and Control", Tata McGraw Hill, New Delhi, 4th Reprint, 2005.
2. JohnJ. Craig , "Introduction to Robotics Mechanics and Control", Third edition, Pearson Education, 2009.
3. M.P.Groover, M.Weiss, R.N. Nageland N. G.Odrej, "Industrial Robotics", McGraw-Hill Singapore, 1996.
4. Mikell. P, Weiss .G.M, Nage.l R.N and Odraj .N.G, "Industrial Robotics", McGraw Hill Singapore, 1996.
5. Ghosh, "Control in Robotics and Automation: Sensor Based Integration", Allied Publishers, Chennai, 1998.

LABS / TUTORIALS FOR SEMESTER VIII

COMMUNICATION NETWORK LAB			
Branch : EE	**Sem: VIII**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	Study and simulation of various networking algorithms at various layers.		

ELECTIVE LAB II			
Branch : EE	**Sem: VIII**	**Practical Hrs: 2Hr**	**Credit: 2**

Sr. No	Detail Syllabus		
1	Study and simulation and research paper supporting the course elective II		

PROJECT			
Branch : ENC/EE	**Sem: VII AND VIII**		**Credit: 22**

Sr. No	Detail Syllabus		
1	Undertaking the development of projects based on latest technology related to the course covered in previous semesters leading to development of new product/concept/idea which can be published in referred journals/conferences		