Sri Chandrasekharendra Saraswathi Viswa Mahavidyalaya
Department of Electronics and Communication Engineering

Curriculum for Full Time BE, Regulations 2017 (R-17)
Applicable for the Students admitted from 2017-18 onwards
SEMESTER - I

S.No	SUB.CODE	SUBJECT	L	T	P	D	C	IA	EA	TM
1	EN1T1	English -I	3	-	-	-	3	40	60	100
2	MA1T2	Basic Mathematics for Engineering - I	2	2	-	-	3	40	60	100
3	PH1T3	Engineering Physics	3	-	-	-	3	40	60	100
4	EE1T4	Basic Electrical and Electronics Engg	2	2	-	-	3	40	60	100
5	CS1T5	Computer Programming	3	-	-	-	3	40	60	100
6	SA1T1	Sanskrit and Indian Culture – I	2	-	-	-	1	100	-	-
7	ME1P6	Engineering Graphics (Practical)	2	-	-	2	3	40	60	100
8	PH1P7	Physics Lab	-	-	3	-	2	40	60	100
9	CS1P8	Computer Programming Lab	-	-	3	-	2	40	60	100
10	EE1P9	Basic Electrical Workshop	-	-	3	-	2	40	60	100
		TOTAL	**17**	**04**	**09**	**03**	**25**	**460**	**540**	**900**

***** Not considered for CGPA **TOTAL CREDITS FOR CGPA: 25**

SEMESTER - II

S.No	SUB.CODE	SUBJECT	L	T	P	C	IA	EA	TM
1	EN2T1	English -II	3	-	-	3	40	60	100
2	MA2T2	Basic Mathematics for Engineering - II	2	2	-	3	40	60	100
3	CH2T3	Engineering Chemistry	3	-	-	3	40	60	100
4	ME2T4	Basic Civil and Mechanical Engineering	2	2	-	3	40	60	100
5	EE2T5	Electric Circuit Theory	2	2	-	3	40	60	100
6	CH2T6	Environmental Science and Engineering	3	-	-	3	40	60	100
7	SA2T2	Sanskrit and Indian Culture – II	2	-	-	1	100	-	-
8	CH2P7	Chemistry Lab	-	-	3	2	40	60	100
9	EE2P8	Circuit Theory Lab	-	-	3	2	40	60	100
10	ME2P9	Basic Mechanical Workshop	-	-	3	2	40	60	100
		TOTAL	**17**	**06**	**09**	**25**	**460**	**540**	**900**

***** Not considered for CGPA **TOTAL CREDITS FOR CGPA: 25**

SEMESTER – III

S.No	SUB.CODE	SUBJECT	L	T	P	C	IA	EA	TM
1		Mathematics -III	3	1	-	3	40	60	100
2		Measurements and Instrumentation	3	1	-	3	40	60	100
3		Electrical Engineering	3	1	-	3	40	60	100
4		Electronic Devices and Circuits	3	1	-	3	40	60	100
5		Digital System Design	3	1	-	3	40	60	100
6		Electromagnetic Fields	4	1	-	4	40	60	100
7		Sanskrit & Indian Culture – III	1	-	-	1	-	-	-
8		Electrical Engineering Laboratory	-	-	3	2	40	60	100
9		Electronic Devices and Circuits Laboratory	-	-	3	2	40	60	100
10		Digital System Design Laboratory	-	-	3	2	40	60	100
11		Soft Skills – I			1	1	-	-	-
		Total	**2**	**6**	**1**	**2**			**900**

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SEMESTER – IV

S.No	SUB.CODE	SUBJECT	L	T	P	C	IA	EA	TM
1		Mathematics – IV	3	1	-	3	40	60	100
2		Signals and Systems	4	1	-	4	40	60	100
3		Analog Electronics	3	-	-	3	40	60	100
4		Analog Communication	3	1	-	3	40	60	100
5		Transmission Lines and Wave Guides	3	1	-	3	40	60	100
6		Object Programming using C++	3	1	-	3	40	60	100
7		Sanskrit & Indian Culture - IV	1	-	-	1	-	-	-
8		Analog Electronics Laboratory	-	-	3	2	40	60	100
9		Analog Communication Laboratory	-	-	3	2	40	60	100
10		Object Oriented Programming Laboratory using C++	-	-	3	2	40	60	100
11		Soft Skills– II	-	-	1	1*	-	-	-
12		Industrial Training and Practice - I	-	-	1	1*	-	-	-
		Total	**20**	**5**	**11**	**28**			**900**

***** Not considered for CGPA **TOTAL CREDITS FOR CGPA: 28**

SEMESTER – V

S.No	SUB.CODE	SUBJECT	L	T	P	C	IA	EA	TM
1		Mathematics - V	3	1	-	3	40	60	100
2		Microprocessors and Microcontrollers	3	1	-	3	40	60	100
3		Digital Signal Processing	3	1	-	3	40	60	100
4		Digital Communication	3	1	-	3	40	60	100
5		Control System Engineering	4	1	-	4	40	60	100
6		Antenna and Wave Propagation	3	1	-	3	40	60	100
7		Sanskrit & Indian Culture - V	1	-	-	1	-	-	-
8		Microprocessor and Microcontroller Laboratory	-	-	3	2	40	60	100
9		Digital Signal Processing Laboratory	-	-	3	2	40	60	100
10		Digital Communication Laboratory	-	-	3	2	40	60	100
11		Aptitude Skills – I	-	-	1	1*	-	-	-
12		Open Elective	1	-	-	1*	-	-	-
		Total	**21**	**6**	**10**	**28**			**900**

***** Not considered for CGPA **TOTAL CREDITS FOR CGPA: 28**

SEMESTER – VI

S.N	SUB.CODE	SUBJECT	L	T	P	C	IA	EA	TM
1		Principles of Management & Professional Ethics	3	1	-	3	40	60	100
2		Embedded System Design	3	1	-	3	40	60	100
3		Computer Aided System Design	3	1	-	3	40	60	100
4		Microwave Engineering	3	1	-	3	40	60	100
5		Optical Communication	3	1	-	3	40	60	100
6		Elective – I (Inter-disciplinary)	3	1	-	3	40	60	100
7		Sanskrit & Indian Culture - VI	1	-	-	1	-	-	-
8		Embedded System Design Laboratory	-	-	3	2	40	60	100
9		Computer Aided System Design	-	-	3	2	40	60	100
10		Microwave & Optics Laboratory	-	-	3	2	40	60	100
11		Aptitude Skills – II	-	-	1	1*	-	-	-
12		Industrial Training and Practice - II	-	-	1	1*	-	-	-
		Total	**19**	**6**	**11**	**27**			**900**

***** **Not** considered for CGPA **TOTAL CREDITS FOR CGPA: 27**

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SEMESTER – VII

S.No.	SUB.CODE	SUBJECT	L	T	P	C	I	E	TM
1		VLSI Design	3	1	-	3	40	60	100
2		Data Communication Networks	3	1	-	3	40	60	100
3		Digital Image Processing	3	1	-	3	40	60	100
4		Mobile Communication	3	1	-	3	40	60	100
5		Elective –II	3	1	-	3	40	60	100
6		Elective –III	3	1	-	3	40	60	100
7		VLSI Design Laboratory	-	-	3	2	40	60	100
8		Networking Laboratory	-	-	3	2	40	60	100
9		Project Work Phase - I	-	-	-	2	40	60	100
		Total	**18**	**6**	**9**	**24**			**900**

TOTAL CREDITS FOR CGPA: 24

SEMESTER – VIII

S.No	SUB.CODE	SUBJECT	L	T	P	C	I	E	TM
1		Neural Networks and Fuzzy Logic	3	1	-	3	40	60	100
2		Satellite Communication	3	1	-	3	40	60	100
3		Elective - IV	3	1	-	3	40	60	100
4		Elective - V	3	1	-	3	40	60	100
5		Project Work Phase – II	-	-	-	6	40	60	100
		Total	**15**	**5**	**-**	**18**			**500**

TOTAL CREDITS FOR CGPA: 18

L- Lecture **T-** Tutorial **P –** Practical **IA -** Internal Assessment

EA – External Assessment **TM – Total Marks**

SUMMARY OF CREDITS FOR CGPA

Semester	Credits
I Semester	25
II Semester	25
III Semester	27
IV Semester	28
V Semester	28
VI Semester	27
VII Semester	24
VIII Semester	18
Total Credits	**202**

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LIST OF ELECTIVES

Electives	Sub Code	Subjects	Credits
Elective – I (Inter-disciplinary) (For VI Semester)		Disaster Management	3
		Remote Sensing and GIS	
		Computer Control of Processes	
		Sensor & Actuators	
		IOT Architecture and Protocols	
		Big Data Analytics	
		Nano science	
		Computer Integrated Manufacturing	
		Machine Vision	
		Modern Power Generation Systems	
		Non-Conventional Energy Systems	
		Operational Research	
Elective – II (for VII Semester)		Robotics & Automation	3
		Micro Electro Mechanical Systems	
		Radar and Navigational Aids	
		Advanced Microcontrollers	
		Information Theory and Coding	
		RF Design	
Elective – III (for VII Semester)		Bio-Medical Signal processing	3
		Speech Processing	
		Cloud Computing	
		Global Positioning Systems	
		Wireless Sensor Networks	
		Cryptography and Network Security	
		3D Printers and Applications	
Elective – IV (for VIII Semester)		VLSI Signal Processing	3
		High Performance Communication Networks	
		CMOS IC Design	
		Adhoc Networks	
		VLSI Testing	
		Computer Organization	
		Artificial Intelligence	
Elective – V (for VIII Semester)		ASIC Design	3
		Low Power VLSI	
		Broadband Wireless Technologies	
		Multimedia Compression Techniques	
		Advanced Wireless Communication	
		Augmented and Virtual Reality	
		4G LTE Cellular systems	

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LIST OF OPEN ELECTIVES

S.NO.	SUBJECT CODE	SUBJECT NAME
01		Astro-physics
02		Bioinformatics
03		Business Administration
04		Communication Skills
05		Finance for Non Finance Managers
06		French Primer
07		Fuel Cell & Batteries
08		German Primer
09		Hindi Literature
10		HR Management
11		Instrumental Methods of Chemical Analysis
12		Japanese
13		Keyboard
14		Logistics and Supply Chain
15		Nano Technology
16		Nuclear and Particle Physics
17		Psychology
18		Panini Grammar
19		Statistical Methods with EXCEL
20		Violin
21		Vocal Music

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SYLLABUS FOR

FULL TIME B.E

ELECTRONICS AND COMMUNICATION ENGINEERING

EN1T1 ENGLISH – I I-Semester

L	T	P	C
3	0	0	3

Unit I Technical Words, Phobia Words and Mania Words {List Enclosed}

Unit II FUNCTIONAL GRAMMAR

Parts of Speech, Articles, Prepositions, Verbs, Adverbs, Sentence Analysis, Tenses, Basic Patterns, Prefixes and Suffixes, Syllabification and Spelling

Unit III ESSAYS

1. Spoken English and Broken English – G.B. Shaw
2. Arguing - Robert Lynd
3. The Verger - Somerset Maugham
4. The Beauty Industry – Aldous Huxley

Unit IV Paragraph writing relating to Charts, Tables and graphs and Acronyms.

Unit V Dialogue Writing, Advertisement.

VOCABULARY

Technical Words:		**Mania - Words:**
Collateral	Sanctuary	1. Bibliomania
Amalgamation	Repository	2. Dipsomania
Permeability	Panorama	3. Egomania
Volatile	Heritage	4. Kleptomania
Defy	Innovation	5. Megalomania
Paradox	Nuances	6. Pyromania
Plague	Vicissitudes	
Douse	Nodal	
Fantasy	Viable	**Phobia - Words**
Malevolent	Deluge	1. Acrophobia
Benevolent	Amphibian	2. Gynophobia
Myth	Ornithologist	3. Hydrophobia
Crux	Pulmonary	4. Claustrophobia
Vagaries	Retard	5. Ergophobia
Ballast	Impediment	6. Zoophobia
	Rapport	7.Agoraphobia
		8. Arachnophobia
		9. Triskaidekaphobia
		10. Xenophobia

MA1T2 BASIC MATHEMATICS FOR ENGINEERING – I I-Semester

L	T	P	C
2	2	0	3

Unit I- NUMERICAL SOLUTION OF ALGEBRAIC, TRANSCENDENTAL EQUATION

Solution of algebraic and transcendental equations - Bisection method – Method of successive approximation-Method of false position (Regula-Falsi Method) - Newton-Raphson method-Honer's method-Secant method. Matlab applications.

Unit II- EIGEN VALUES, EIGEN VECTORS

Rank of matrix – Elementary transformation – Elementary matrices-solution of linear system of equations-Cramer's rule-Matrix inversion method-Consistency of linear system of equations; Linear Transformations – Linear dependence of vectors – Eigen values and Eigen vectors – Properties of Eigenvalues – Cayley Hamilton theorem (without proof). Matlab applications

Unit III - DIFFERENTIAL CALCULUS AND DIFFERENT IAL EQUATION

Function of two or more variables – Partial derivatives – Total derivative – Taylor's expansion – Maxima and Minima of functions of two variables – Jacobians –Homogenous functions - Euler's theorem for homogeneous function Operator D – Rules for finding Complementary function – Inverse operator – Rules for finding particular Integral – Working procedure to solve the equation. - Method of undetermined coefficients

Unit-IV - LINEAR DIFFERENTIAL EQUATIONS

Method of variation of parameters- Equations reducible to linear equations with constant coefficients: Cauchy's homogeneous linear equation , Legendre's linear equation - Linear dependence of solutions - Simultaneous linear equations with constant coefficients

Unit V - VECTOR DIFFERENTIATION

Differentiation of vectors - Curves in space - Velocity and acceleration - Scalar and vector point functions –vector operator Del- Del applied to scalar point functions : Gradient - Del applied to vector point functions : Divergence and curl - Physical interpretation of divergence and curl-irrotational and solenoidal vectors – Del applied twice to point functions - Del applied to products of point functions-Conservative vector field.

TEXT BOOK:

1. Grewal B.S, Higher Engineering Mathematics, 41st Edition, Khanna Publishers, New Delhi, 2011.

REFERENCE BOOK

1. Alan Jeffrey, Advanced Engineering Mathematics, Academic Press
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons
3. Gerald C.F and Wheatley P.O, Applied Numerical Analysis, Addison-Wesley Publishing Company

PH1T3 ENGINEERING PHYSICS I-Semester

L	T	P	C
3	0	0	3

Unit I – PROPERTIES OF MATTER

Elasticity Stress – Strain – Hooke's law – Elastic Behavior of Material – Factors affecting elasticity – Young's modulus by cantilever depression – Non-uniform bending - Application -I-shaped girders. Torsional Pendulum – Couple per unit twist of a wire-Time period-Application- Determination of Rigidity Modulus.

Unit II – TECHNICAL ACOUSTICS

Acoustics Acoustics of buildings – Reverberation- Weber Fechner law- Factors affecting acoustics of a building and remedies – Noise Pollution – Noise control in machines –Sabine's formula for standard reverberation time- Absorption coefficient.

Ultrasonics Generation – Piezoelectric method – Magnetostriction method – Application of Ultrasonics in industries – NDT.

Unit III – PHOTONICS

LASER Properties- Population inversion- Einstein's theory of stimulated emission of radiation - Different types of Lasers – Nd:YAG laser, CO_2 laser – Application of Lasers in holography.

Fiber Optics Types of Optical Fibers (material, mode, index) – Fiber losses – acceptance angle – Numerical aperture – applications in engineering (communication).

Unit IV – CRYSTAL PHYSICS (9 Hours)

Crystalline and amorphous solids – lattice and unit cell – seven crystal systems and Bravais lattices - crystal planes and directions- Miller indices-Expression for interplanar distance – Atomic radius, Coordination number and packing factor for simple structures: SC, BCC, FCC and HCP.

Unit V – PHYSICS OF MATERIALS (9 Hours)

Dielectric materials Definition – Dielectric Breakdown – Dielectric loss – Internal field – Claussius Mossotti relation.

Superconducting materials Introduction – Meissner effect – Type I & Type II superconductors – BCS theory-Applications.

NanomaterialsIntroduction – Synthesis of nano materials – Top down and Bottom up approach- Ball milling- PVD method- Applications.

TEXT BOOKS

1. Applied Physics for Engineers – K.Venkatramanan, R.Raja, M.Sundarrajan (Scitech)
2. Applied Engineering Physics – Rajendran & Marikani (Tata McGraw Hill)
3. Modern Engineering Physics – R.K.Gaur & S.L.Gupta, Dhanpat Rai publications.
4. Modern Engineering Physics – A.S.Vasudeva – S.Chand & Company Ltd.
5. Engineering Physics – Bhattacharya, Bhaskaran – Oxford Publications.
6. Engineering Physics I & II – G.Senthilkumar, VRB publications.

REFERENCE BOOKS

1. Properties of Matter - D.S.Mathur (Unit I)
2. Sound - Brijilal & Subramanian (Unit II)
3. Engineering Physics - M.N.Avadhanulu (Unit III)
4. Fiber Optics - R.Agarwal (Unit III)
5. Solid state Physics – C.Kittal (Unit IV)
6. Modern Physics - R.Murugesan (Unit IV, V)
7. Fundamentals of Physics, 6th Edition, D. Halliday, R. Resnick and J. Walker, John Wiley and Sons, New York.

EE1T4 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING I-Semester

L	T	P	C
2	2	0	3

Unit -I - ELECTRICITY AND MAGNETISM:

Electric current –Ohms law –Temperature coefficient of resistance-Kirchhoff's laws Electromagnetic induction: Relation between magnetism and electricity –Production of induced E.M.F and current – Faraday's laws of electromagnetic induction –Direction of induced E.M.F and current-Fleming's Right rule-Lenz's law-Induced E.M.F –Dynamically induced E.M.F-Statically induced E.M.F-Self inductance-Coefficient of self inductance (L)-Mutual inductance Coefficient of mutual inductance(M) -Coefficient of magnetic coupling-Inductances in series.

Unit –II – COMPLEX ALGEBRA AND A.C CIRCUITS:

Mathematical representation of vectors –Symbolic notation –Significance of operator j –Conjugate complex numbers –Trigonometrical form of vector representation –Exponential form of vector representation –Polar form of representation –Addition and subtraction of complex quantities –Multiplication and division of complex quantities –Powers and roots of vectors –Complex algebra applied to series circuits –Complex algebra applied to parallel circuits –Series –Parallel circuits.

Units – III – THREE PHASE CIRCUITS:

Generation of three phase voltages –Phase sequence –Numbering of phases-Inter connection of three phases –Star or wye(Y) connections –Voltages and currents in Y-connection –Neutral current in unbalanced star-connection –Delta(Δ) or mesh connection –Balanced Y/Δ and ΔY conversions –Comparison: star and delta connections –Comparison between single and three phase supply system -Power factor improvement – Power factor correction equipment –Power measurement in three phase circuits –Three wattmeter method – Two wattmeter method –(Balanced and unbalanced load) –Two wattmeter method –Balanced load – Reactive power –One wattmeter method.

Unit –IV – DIGITAL ELECTRONICS:

Binary number system –Logic gates –Boolean algebra –Half and Full adders –Flip –Flops –Registers and counters –A/D and D/A conversion – Basics only, Junction diodes basic types, transistors basic types.

Unit –V – FUNDAMENTALS OF COMMUNICATION ENGINEERING:

Types of signals: Analog and digital signals –Modulation and demodulation: Principles of amplitude and frequency modulation. Communication systems: Radio, T.V, Fax, Microwave, Satellite and Optical fiber (Block diagram approach only).

TEXT BOOKS:

1. B.L.Theraja-Fundamentals of Electrical Engineering and Electronics -2012 Edition, S.Chand Publishers.
2. T.L.Thygarajan-Fundamentals of Electrical Engineering and Electronics - 2012 Edition, Scitech Publishers.
3. V.K.Mehta – Principle of Electronics - 2012 Edition S.Chand Publishers.

CS1T5 COMPUTER PROGRAMMING I-Semester

L	T	P	C
3	0	0	3

Unit – I

Introduction to digital computer – ALU – Memory Unit, Control Unit-Types of Computers-Number Systems-Conversion Problems. DOS commands – Computer Languages – High Level, machine Level and Assembly Level language – Algorithm Flow Chart.

Unit – II

Introduction to C – Character set, Constants, Variables, Data Types –Operators – Expression. Decision Making statement –Looping statements, break continue, goto functions.

Unit – III

Arrays and its types – Functions – call by reference – storage classes in C – Auto, Register, Static Extern – Recursive function.

Unit – IV

Structures and Unions, Introduction to Pointer, Pointer arithmetic, String operations.

Unit – V

User defined data types – Introduction to Preprocessor, Macros, Files, Command line arguments

TEXT BOOKS

1. Let Us 'C' - Yashawant Kanetkar, (Unit 2 to 5), BPB publications, 10 Edition, 2010.
2. Ashok N Kamthane, "Computer Programming", Pearson education, Second Impression, 2008.
3. Venugopal.K and Kavichithra.C, "Computer Programming", New Age International Publishers, First Edition, 2007.

REFERENCE BOOKS

1. Kernighan B.W and Ritchie,D.M , The C programming language: second edition, Pearson education,2006
2. Fundamentals of Computing and Programming- V.Ramesh Babu, R.Samyuktha, M.Muniratham by VRB Publishers 2012 edition.
3. Balagurusamy. E, "Programming in ANSI C", Tata McGraw Hill, Third edition, 2006

SA1T1 SANSKRIT and INDIAN CULTURE – I I-Semester

L	T	P	C
2	0	0	1

Unit – I

1. Introduction to Vedāṅgas
2. Introduction to Śikśā, Vyākaraṇa, Chandas
3. Introduction to Nituktam, Jyotiṣa, Kalpa

Unit – II

4. Introduction to classical literature
5. Introduction to Epics
6. Introduction to Purānas

Unit - III

7. Introduction to Sanskrit poets any five
8. Introduction to Kāvyas and their classifications, Pañcamahākāvyas and their significance in Sanskrit literature
9. Significance of Kālidasa and his contribution

Unit - IV

10. Introduction to Dramas
11. Introduction to Subhāṣitas
12. Tales and fables

Unit - V

13. Introduction to System of Indian philosophy, Six Darśanas and their profounder, principles of Nyāya and Vaiśeṣika schools
14. Valid means of Sāṅkya philosophy and its significance, Yoga and Patañjali, Aṣṭāṅgayoga and its application
15. Introduction to (Manu and Yāgñyavalkya)

Reference Texts

1. A history of Sanskrit literature by A. B. Keith New Delhi 1993
2. Samskruta Sahitya Ka Itihas - by Baladev Upadyaya
3. A short history of Sanskrit Literature by T.K. Balachandra Iyer, Palaghat 1998

ME1P6 ENGINEERING GRAPHICS (PRACTICAL) I-Semester

L	T	P	C
2	0	0	3

UNIT – 0 (Not included for the examination)
BASICS OF DRAWING
Use of Drawing instruments - BIS conventions and specifications - size layout and folding of drawings sheets - lettering and dimensioning - studying the method of drawing ellipse, Parabola and Cycloids.
VISUALIZATION CONCEPTS AND FREE HAND SKETCHING: Visualization principles – Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT – I PROJECTION OF POINTS
Introduction to orthographic projections - Projection of points
PROJECTION OF LINES
Projection of straight lines in the first quadrant, lines parallel to both planes - inclined to one plane and parallel to other - inclined to both planes.

UNIT – II PROJECTION OF SOLIDS
Projection of Simple solids like prism, pyramid, cylinder, cone and sphere - Auxiliary projections.

UNIT – III SECTION OF SOLIDS
Section of solids like prism, pyramid, cylinder, cone and sphere in simple position - True shape of sections for the above. **DEVELOPMENT OF SURFACES** Surfaces like - Prism, Pyramid, Cylinder, Cone and Cut solids.

UNIT – IV
ORTHOGRAPHIC PROJECTION
Conversion of pictorial views to orthographic views of simple machine members.
INTERPENETRATION OF SOLIDS
Interpenetration of solids - Cylinder and cylinder, cone and cylinder

UNIT - V ISOMETRIC PROJECTIONS

Isometric Projections of solids.
PERSPECTIVE PROJECTIONS
Perspective projections of solids

UNIT - VI (Not for examination)

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY)
Introduction to drafting packages and demonstration of their use.

TEXT BOOKS

1. Engineering Drawing - K. Venugopal, Wiley Eastern Ltd., 1922.
2. A text book of Engineering Drawing - K.V. Natarajan.

REFERENCE BOOKS

1. Elementary Engineering Drawing (First Angle Projection) N.D. Bhatt, Charotar publishing Co., Anand.
2. Engineering Drawing - S.M. Sekkilar & S. Tamarai Selvi, Anuradha Agencies, Kumbakonam.
3. Engineering Drawing and Graphics - Prof. K.Venkataraman.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

PH1P7 PHYSICS LABORATORY I-Semester

L	T	P	C
0	0	3	2

Any SIX

1. Determination of Rigidity Modulus & Moment of Inertia using Torsional Pendulum.
2. Determination of Young's Modulus.
3. (a) Determination of Wavelength of Laser light using transmission grating.
   (b) Measurement of numerical aperture of an optical fiber.
4. Determination of refractive index of material of prism using i-d curve.
5. Determination of radius of curvature of the given lens using Newton's Rings.
6. Determination of Velocity of sound waves in liquid using Ultrasonic interferometer.
7. Determination of wavelength of prominent colours of mercury spectrum using Spectrometer and grating.
8. Determination of emissivity of the surface of a black body.
9. Determination of number of lines per meter of the grating using normal incidence method.
10. Basic logic gates- Verification of truth tables

REFERENCE BOOKS FOR PHYSICS PRACTICALS

1. Practical Physics - Ouseph and Rangarajan.
2. Engineering Practical Physics-K. Srinivasan.
3. Engineering Practical Physics - M.N. Avadhanulu.
4. Experimental Physics – K.Venkatramanan, R.Raja, M.Sundarrajan (Scitech)

CS1P8 COMPUTER PROGRAMMING LAB I-Semester

L	T	P	C
0	0	3	2

1. Evaluate Expressions using library Function.

   a. Πr^2
   b. $(A+B+(2C/3A)+A^2+2B)$
   c. $\sqrt{S(S-A)\ (S-B)\ (S-C)}$
   d. $LOG(X^3+Y^3+Z^3)$

2. Find Sum & Average of 'N" numbers.

3. Find the Biggest among 3 numbers.

4. Find the factorial of given number.

5. Check whether the number is prime or not.

6. Find the sum of digits using (i) For loop (ii) While loop

7. Program to add the first N odd numbers and even numbers.

8. Generate the Fibonacci series and Evaluate Sine series.

9. Arithmetic operations using Switch - Case Statements.

10. Find the biggest & smallest among "N" numbers.

11. Sort "N" numbers in ascending order.

12. Matrix addition and Multiplication.

13. Display the student information & marks using Structure & Unions.

14. Evaluate the Binomial coefficient.

15. Swapping of numbers using call by value, call by reference.

16. Number system Conversions

17. Basic File Operations

18. Preprocessor directives usage.

19. Pointer Arithmetic and Array access using Pointers.

20. Introduction to graphics.

Sri Chandrasekharendra Saraswathi Viswa Mahavidyalaya
Department of Electronics and Communication Engineering

EE1P9 BASIC ELECTRICAL WORKSHOP I-Semester

L	T	P	C
0	0	3	2

Course objectives:

- To understand the concepts of industrial & domestic wiring
- To train students on logic gates.

LIST OF EXPERIMENTS:

1. House Wiring – Series, Parallel, 3 Pin Plug Socket, etc.
2. Staircase Wiring.
3. Tube Light / CFLWiring.
4. Circuit Tester.
5. Single Phase & Three Phase Energy meters.
6. To Study the use of Megger.
7. To Study The Applications Of CRO.
8. Logic Gate Trainer.
9. Soldering Practice for fabrication of DC power Supply.
10. Different faults in Domestic Electrical equipments.
11. Power wiring for three phase induction motor.
12. Power wiring for single phase induction motor.
13. To Study the use of Multimeter, Tong- tester.

Course Outcomes:

- Learners should be familiar with the concepts of Domestic & Industrial Wiring.
- Should be able to do simple exercise and measurements using CRO.
- Should able to do PCB Fabrication and measurements using Multimet

EN2T1 ENGLISH – II II-Semester

L	T	P	C
3	0	0	3

UNIT I **Words for Social Interaction** {List Enclosed}

UNIT II **Functional Grammar** Noun Group, Verbal Group, Modal Verbs, Conditionals, Connectives, Passivity, Gerund and Infinitives, Reported Speech, Synonyms and Antonyms, Concord and Error detection

UNIT III ESSAYS

1. On Habits – A.G. Gardiner
2. How to Make a Speech - Edgar Baker
3. Springtime - O.Henry
4. Dangers of Drug Abuse – Hardin Jones

UNIT IV Letter Writing, Report Writing, Essay Writing (Essays on Sports Social Issues, Science and Technology and Proverb Expansions) and Comprehension.

UNIT V British English and American English With Emphasis on Vocabulary and Spelling (From Reader's Digest's Publication)

REFERENCE BOOKS:

Bikaram K. Das : Functional Grammar and Spoken and Written communication in English (Orient Blackswan Chennai - 600002)

1. T. M.Farhathullah : English Practice Book (Emerald Publishers)

The prescribed Essays will be compiled and edited by the staff of the Department of English.

Words for Social Interaction

1. Euthanasia
2. Bier
3. Charlatan
4. Cynosure
5. dejà vu
6. Myopia
7. Epicentre
8. Oedipus complex
9. Electra complex
10. Halitosis
11. Imbroglio
12. Impasse
13. Paranoia
14. Id
15. Ego
16. Super Ego
17. Psychopath
18. Guarantee
19. Warranty
20. Neologism
21. Nepotism
22. Oligarchy
23. Anarchy
24. Utopia
25. Dystopia
26. Philanthropy
27. Plagiarism
28. Euphemism
29. Autarky
30. White Paper
31. Theocracy
32. Ombudsman
33. Anthology
34. Dialectic
35. Asphyxiation
36. Doggy bag
37. Somnambulism
38. Dermatitis
39. Biopsy
40. Anti-biotic
41. Vendetta
42. Virago
43. Prefixes – pseudo, quasi, bi, mono, poly, semi, retro, circum, intro, intra and inter

MA2T2 BASIC MATHEMATICS FOR ENGINEERING –II II-Semester

L	T	P	C
2	2	0	3

Unit I- NUMERICAL SOLUTION OF SIMULTANEOUS EQUATIONS

Solution of linear simultaneous equations - Direct methods of solution: Gauss elimination method , Inversion of a matrix using Gauss –Elimination method- Gauss – Jordan method –Method of Factorization-Crout's method, Iterative methods of solution : Jacobi's method , Gauss – Seidel method.

Unit II - ORTHOGONAL REDUCTION

Orthogonal transformation-Reduction to diagonal form – Similarity matrices – Powers of a matrix - Reduction of quadratic form to canonical form – Nature of a quadratic form – Hermitian, Skew Hermitian and Unitary matrices – Outline of applications of Eigen values and Eigen vectors in engineering

Unit III - INTEGRAL CALCULUS AND ITS APPLICATIONS

Reduction formulae – reduction formulae [without proof]nd Bernoulli's formula.Definite integrals , length of the curve. Double integrals - Change of order of integration - Double integrals in polar coordinates -Areas enclosed by plane curves - Triple integrals – Volume as double integrals - Volume as triple integral

Unit IV - BETA AND GAMMA FUNCTIONS

Change of variables in double integrals and Triple integrals – Area of a curved surface Beta function - Gamma function –Reduction formula for $\Gamma(n)$ - Relation between Beta and Gamma functions – Outline of applications of multiple integrals

Unit V - VECTOR INTEGRATION

Integration of vectors - Line integral-circulation-work - Surface integral - Green's theorem in the plane (without proof) - Stoke's theorem (without proof) - Volume integral - Gauss divergence theorem (without proof) - Irrotational fields – Outline of applications of vector calculus in engineering.

Note: Questions are to be set on problem solving and not on the theoretical aspects.

TEXT BOOK:

Grewal B.S, Higher Engineering Mathematics, 41st Edition, Khanna Publishers, New Delhi, 2011.

REFERENCES

1. Alan Jeffrey, Advanced Engineering Mathematics, Academic Press.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons
3. Gerald C.F and Wheatley P.O, Applied Numerical Analysis, Addison-Wesley Publishing Company

CH2T3 ENGINEERING CHEMISTRY II-Semester

L	T	P	C
3	0	0	3

UNIT-I: CHEMICAL THERMODYNAMICS

Introduction - Limitations of first law – different statements of second law (Clausius and Kelvin) – Entropy – entropy change for a reversible process – entropy change for an isothermal expansion of an ideal gas – problems – Free energy - Work function – Gibbs Helmholtz equation and its applications - Van't hoff isotherm and isochore – applications.

UNIT-II: CHEMICAL KINETICS AND CATALYSIS

Kinetics of second order reactions –half life period – saponification of ester – kinetics of opposing, parallel –reactions and its examples - effect of temperature on reaction rate – theory of absolute reaction rate. Classification and characteristics of catalysts – autocatalysis – steady state principle - enzyme catalysis – Michaelis menton equation (derivation) – types of acid base catalysis

UNIT-III: THERMAL AND SPECTROSCOPIC TECHNIQUES

Thermogravimetry (TGA) – schematic and block diagram – characteristics of thermo-balance design – methods expressing TG results – applications in qualitative analysis, composition of alloys and mixtures, study of polymers. Differential thermal analysis (DTA) - schematic and block diagram – representation of DTA data – qualitative application (calcium oxalate monohydrate only). Electromagnetic spectrum – Beer Lambert's law (Derivation) – principle, theory, instrumentation and simple applications of: Flame photometry – UV-visible spectroscopy - IR spectroscopy.

UNIT IV: CORROSION - THEORY & PROTECTION

Standard electrode potential - electrochemical series - Electrochemical cells – principles of corrosion - chemical and electrochemical corrosion - galvanic corrosion - differential aeration corrosion - stress corrosion – factors influencing corrosion – corrosion control - cathodic protection and sacrificial anode – corrosion inhibitors - protective coatings - constituents, functions and uses of paints and varnishes.

UNIT-V: POLYMERS AND NANOMATERIALS

Polymer Chemistry: Monomers – functionality – polymers - degree of polymerization – effect of polymer structure on properties – addition, condensation, co-polymerization - mechanism of addition polymerization (free radical polymerization only). Nanomaterials: Introduction - synthesis of nano materials by physical and chemical methods - ball milling - chemical vapour deposition -sol-gel method - applications of nano materials.

Text Book

1. Engineering Chemistry, P.C. Jain and Monika Jain, Dhanpat Rai Publishing Co Pvt. Ltd., New Delhi, 2008.

Reference Books

1. Principles of Physical Chemistry, B.R. Puri, L.R. Sharma and Madan S. Pathania, Shoban Lal Nagin Chand & Co., Jalandhar, 2000.
2. Physical Chemistry for Engineers, P.C. Jain and Renuka Jain, Dhanpat Rai & sons, New Delhi
3. Applied Chemistry, K. Sivakumar, Anuradha Publications, Chennai, 2009.
4. Chemistry in Engineering & Technology, J.C. Kuriacose and J. Rajaram, Vol. 1, Tata McGraw-Hill, New Delhi, 1996.

ME2T4 BASIC CIVIL AND MECHANICAL ENGINEERING II-Semester

L	T	P	C
2	2	0	3

PART A - CIVIL ENGINEERING

UNIT - I BUILDING MATERIALS: Construction Materials and foundation Properties and uses of construction materials such as stone, bricks, cement, concrete, steel.

BUILDING COMPONENTS: Selection of site - simple foundations such as well footing- isolated footing. Combined footing. Pile foundation - foundations of machinery. Superstructure Brick and stone masonry - beams. Columns and lintel RCC roofing - simple steel roof trusses and AC roofing - Flooring types such as granolithic. Concrete, mosaic, tile, terrazzo, marble etc., - plastering.
VALUATION: Valuation by plinth area method -simple problems.

UNIT - II MECHANICS Units - Simple stresses and stains for uniform section - Moduli of elasticity - Factory of safety - centre of gravity and moment of inertia - simple problems.
DAMS Selection of site - Brief idea of different types of dams - their purpose.

BRIDGES Components of bridge - classification - slab bridge I - bean bridge.

UNIT - III SURVEYING - Different types of surveying - chain survey - calculation of area by Simpson's rule and trapezoidal rule - compass - conversion on bearings - simple leveling - reduction of levels - simple problems. ROAD Classification - brief description of earthen road. Water bound macadam. Bituminous. Concrete roads - traffic signs and signals**.**

ENVIONMENTAL ENGINEERING Protected water supply - sewage treatment - septic tanks.

PART B - MECHANICAL ENGINEERING

Unit - I

BOILERS Classification - Principles of Low pressure steam generators – simple Vertical Boiler, Cochran Boiler, Locomotive Boiler, Lancasier Boiler, Bop-cock Wilcox Boiler

POWER PLANTS Layout of Steam, Gas Turbine, Diesel, Nuclear and Hydropower Plants.

NEW SOURCES OF ENERGY Study of different types of alternative energy sources - Solar, Wind, Wave, Tidal and Geo - thermal.

Unit - II

INTERNAL COMBUSTION ENGINES- Working principles of Petrol and Diesel Engines - Two stroke and Four stroke cycles-Function of main components - single jet carburetion - ignition. Cooling and lubrication systems - fuel pump and injector.

METAL CASTING PROCESS Patterns - Types of patterns - Pattern materials - pattern allowances - Molding sand - Properties of molding sand - types of molding - preparation of Green sand mould for casting - melting of cast iron in cupola furnace only - casting defects.

Unit - III

METAL FORMING PROCESS- Principles of Forging. Rolling, Drawing and Extrusion.

METAL JOINING PROCESS Principles of welding - fundamental of Arc welding. Gas welding and gas cutting - Brazing and soldering.

METAL MACHINING PROCESS Types of lathes - Main components and the functions of a centre lathe - operations - cutting tools - Drilling machines.

TEXT BOOKS

1 Basic Civil Engineering- V. Ramesh Babu, Anuradha Agencies, Kumbakonam.
2 Basic Civil Engineering- K.V. Natarajan, Madras.
3 Basic Mechanical Engineering- K.Venugopal, Anuradha gencies,Kumbakonam.

REFERENCE BOOKS

1 Basic Civil Engineering - N. Arunachalam, Pratheeba Pub. Coimbatore.
2 Basic Civil and Mechanical Engineering - G. Shanmugam and M.S. Palanichamy, Tata McGraw Hill Publishing Co., 1993.

EE2T5 ELECTRIC CIRCUIT THEORY II-Semester

L	T	P	C
2	2	0	3

UNIT - I

BASIC CIRCUIT CONCEPTS Lumped circuits – Kirchhoff's Laws – V-I-relationships of R, L and C – Independent sources – Dependent sources – Simple resistive circuits – Network reduction – voltage division – current division – source transformation.

UNIT - II

SINUSOIDAL STEADY STATE ANALYSIS Phasor – sinusoidal steady state response – concepts of impedance and admittance- analysis of simple circuits – power and power factor – series resonance and parallel resonance – bandwidth and Q factor. Solution of three-phase balanced circuits – power measurements by two-wattmeter methods – solution of three-phase unbalanced circuits.

UNIT - III

MESH-CURRENT AND NODE-VOLTAGE METHODS Formation of matrix equations and analysis of complex circuits using mesh-current and nodal-voltage methods – mutual inductance – coefficient of coupling – Ideal transformer.

UNIT - IV

NETWORK THEOREMS AND APPLICATIONS Superposition theorem – Reciprocity theorem – Compensation theorem – Substitution theorem – Maximum Power transfer theorem – Thevenin's theorem – Norton's theorem and Millman's theorem with applications.

UNIT - V TRANSIENT ANALYSIS Forced and free response of RL, RC and RLC circuits with D.C. and sinusoidal excitations.

TEXT BOOK:

1. Paranjothi S.R.,"Electric Circuit Analysis", New Age International Ltd., Delhi, 2nd Edition.
2. Hyatt W.H. and Kemmerly, "Engineering Circuits Analysis", McGraw- Hill International Editions, 1993.

REFERENCES:

1. Edminister J.A., "Theory and Problems of Electric Circuits", Schaum's outline series McGraw Hill Book Company, 2nd Edition, 1983.
2. Sudhakar A and Shyam Mohan S.P., "Circuits and Network Analysis and Synthesis", Tata McGraw-Hill Publishing Ltd., New Delhi, 1994.

CH2T6 ENVIRONMENTAL SCIENCE AND ENGINEERING II-Semester

L	T	P	C
3	0	0	3

UNIT - I: Introduction to environment and environmental studies

Introduction to environment – components – nature of environment - need of awareness –reasons for environmental problems – anthropocentric and eco centric views.

Environmental studies - multidisciplinary nature – scope and aim – sustainable development-principles – RRR concept-Indian environmental movements – environmental calendar.

UNIT – II: Ecosystem and Biodiversity

Ecosystem – structure – functions – simplified ecosystem models (food chain and food webs and their types, energy flow) - forest – grassland – pond –ecosystems – ecological succession - ecological pyramids – Bio-geochemical cycles of water – oxygen-carbon-phosphorous and sulphur.

Biodiversity – definition – types – species – genetic and ecosystem diversities- values of biodiversity – threats to biodiversity – conservation of biodiversity – endemism – biodiversity hotspots – Indian biodiversity– endemic species of India – IUCN lists -red-green and blue data books.

UNIT – III: Natural resources

Natural resources – definition – types – forest resources – uses –deforestation- reasons - effects – water resources – dams – effects of dams - food resources – modern agriculture– ill effects -energy resources-types – hydel –nuclear – solar –wind and biomass energy - world scenario – Indian scenario.

Population and environment – reasons for over exploitation of resources – population – demography – population curves – population explosion – effects – consumerism – effects – urbanization – reasons and effects- role of an individual.

UNIT – IV: Environmental Pollution

Pollution – definition – types – air pollution – causes and effects – effects of CO_2 – CO – NOx –SOx – particulates – control of air pollution – water pollution – causes – effects – remedies – soil pollution – solid waste management – e waste – ill effects of e-waste – proper recycling- Noise pollution – reasons – effects – control – nuclear pollution – cases – effects and control –thermal pollution causes – effects and remedies.

Legal provisions for protecting environment – article 48 A – 51 A (g) – Environment act 1986 – Air act 1981 – Water act 1974 – wild life protection act – Forest act 1980- problems in implementation–reasons.

UNIT – V: Social issues and environmental ethics

Present environmental scenario – green house effect – climate change – The Kyoto Protocol – ozone layer depletion-The Montreal Protocol - acid rain – causes – effects - disparity among the nations – The Copenhagen UNFCCC summit – carbon currency- virtual water- genetically modified organisms, Disaster management.

Environmental ethics – introduction – people getting affected - resettlement and rehabilitation – issues involved –Sardhar Sarovar project – Tawa Matsya sang - Melting icebergs of Arctic.

TEXT BOOKS:

Anubha Kaushik and C.P. Kaushik, ”Prospects of Environmental Science”, New Age International publishers, 2013.

REFERENCE BOOKS:

1. Environmental Studies, N. Nandini, N. Sunitha and Sucharita Tandon,Sapna Book House,2007
2. Text book of Environmental Science, Ragavan Nambiar, Scitech Publications, 2009.
3. Text book of Environmental Chemistry and Pollution Control, S.S.Dara, S.Chand and Co., 2002.
4. Environmental Chemistry, Colin Baird, W.H.Freeman and company, New York, 1999.
5. Environmental Chemistry, Gary W. VanLoon and Stephen J.Duffy, Oxford University Press, 2000.
6. New Trends in Green Chemistry, V.K. Ahluwalia and M. Kidwai, Anamaya Publishers, 2006.

SA2T2 SANSKRIT AND INDIAN CULTURE – II II-Semester

L	T	P	C
2	0	0	1

Unit - I

1. Introduction to Vedāṅgas
2. Introduction to Śikśā, Vyākaraṇa, Chandas
3. Introduction to Nituktam, Jyotiṣa, Kalpa

Unit - II

4. Introduction to classical literature
5. Introduction to Epics
6. Introduction to Purānas

Unit - III

7. Introduction to Sanskrit poets any five
8. Introduction to Kāvyas and their classifications, Pañcamahākāvyas and their significance in Sanskrit literature
9. Significance of Kālidasa and his contribution

Unit - IV

10. Introduction to Dramas
11. Introduction to Subhāṣitas
12. Tales and fables

Unit - V

13. Introduction to System of Indian philosophy, Six Darśanas and their profounder, principles of Nyāya and Vaiśeṣika schools
14. Valid means of Sāṅkya philosophy and its significance, Yoga and Patañjali, Aṣṭāṅgayoga and its application
15. Introduction to (Manu and Yāgñyavalkya)

Reference Texts

1. A history of Sanskrit literature by A. B. Keith New Delhi 1993
2. Samskruta Sahitya Ka Itihas - by Baladev Upadyaya
3. A short history of Sanskrit Literature by T.K. Balachandra Iyer, Palaghat 1998

CH2P7 CHEMISTRY LABORATORY II-Semester

L	T	P	C
0	0	3	2

LIST OF EXPERIMENTS (ANY SIX OF THE FOLLOWING)

1. Estimation of Na_2CO_3 present in washing soda sample.
2. Estimation of alkalinity of the given water sample.
3. Estimation of total hardness of the given water sample- EDTA method
4. Conductometric titration – Weak acid Vs Strong base.
5. Conductometric titration – Strong base Vs mixture of acids
6. Potentiometric titration - Strong acid Vs Strong base.
7. Potentiometric titration – Fe^{2+} Vs $KMnO_4$.
8. Determination of K_{SP} of a sparingly soluble salt – concentration cell method
9. Construction of phase diagram for a simple eutectic system.
10. Rate and order of reaction between $K_2S_2O_8$ and KI – Clock reaction method.

EE2P8 CIRCUIT THEORY LAB II-Semester

L	T	P	C
0	0	3	2

LIST OF THE EXPERIMENTS:

1. Verification of Kirchhoff's laws
2. Verification of Superposition theorem.
3. Verification of Thevenin's Theorem.
4. Verification of Norton's Theorem.
5. Verification of Maximum Power Transfer theorem.
6. Verification of Reciprocity theorem.
7. Verification of Compensation theorem.
8. Verification of Millman's theorem.
9. Three phase power and power factor Measurement by two wattmeter method.
10. Plotting of B- H curve of a magnetic material.
11. Series and Parallel resonance in RLC Circuits.
12. Verification of theorems using Digital simulation.
13. Circuit Transients by Digital simulation.

ME2P9 BASIC MECHANICAL WORKSHOP II-Semester

L	T	P	C
0	0	3	2

CARPENTRY

Names and uses of tools used in carpentry - Handling of the tools. Practice in marking, sawing, planning and chiseling to size. Making simple joints such a half lap, mortises and Tenon joints.

FITTING

Name and uses of tools like files, chisels, hammer, tri square, calipers, hacksaw, etc., and handling of these tools. Practice in marking, chipping, fitting to size and drilling marking of simple mating, profiles such as Vee, Square.

WELDING

Study of Arc & Gas Welding, Tools and Equipments – Simple welding exercises – Butt welding and Lap Welding.

TURNING

Study of Centre Lathe, Accessories and tools – Simple turning exercises – Facing and Step turning - use of measuring Instruments for lathe work.

DRILLING

Study of drilling machines – Drills, Taps, and reamers – Demonstration of Drilling and Tapping operations.

Demonstration of the following (not included for the examination)

1. Preparation of green sand mould.
2. Study of tool in smithy shop and making a square section from circular section.
3. Gas welding and cutting.
4. Brazing and soldering.
5. Sheet Metal Work

ENGINEERING MATHEMATICS III III-Semester

L	T	P	C
3	1	0	3

OBJECTIVE:

- To enable the students in applying mathematical methods in various engineering fields by making them to understand the method of Fourier series and Fourier Transform and Z-Transform.

UNIT – I INTERPOLATION AND NIMUERICAL SOLUTION OF ORDINARY IFFERENTIAL EQUATIONS

Interpolation with equal intervals – Newton's forward interpolation formula – Newton's backward interpolation formula - Interpolation with unequal intervals: Lagrange's interpolation formula, Newton's divided difference formula. Picard's method – Taylor series method - Modified Euler's method – Runge's method – Runge-Kutta method – Predictor-corrector methods: Milne's method, Outline of applications of numerical solutions of ordinary differential equations in engineering.

UNIT – II FOURIER SERIES

Euler's Formulae (Without Proof) – Condition for Fourier expansion – Functions having points of discontinuity – Change of interval – Expansions of even and odd functions – Half Range series – Parseval's formula (without proof) – Root mean square value (without proof) – Typical waveforms (Definition Only): Square wave form, Saw toothed waveform, Modified saw toothed waveform, Triangular waveform, Half wave rectifier, Full wave rectifier - Outline of applications of Fourier series in engineering

UNIT – III LAPLACE TRANSFORMS AND ITS APPLICATIONS

Transforms of elementary functions : 1,t^n , e^{at} , sin *at*, cos *at*, sinh *at*, cosh *at* - Properties of Laplace transforms: Linearity Property, First shifting property, Change of scale property – Transforms of derivatives - Transforms of integrals - Multiplication by t^n - Division by t - Evaluation of integrals by Laplace transform - Inverse transforms: Method of partial fractions – Other methods of finding inverse - Convolution theorem (Without proof) - Unit step function – Unit Impulse Function - Application to differential equations – Outline of applications of Laplace transforms in engineering.

UNIT-IV Z – TRANSFORM AND ITS APPLICATIONS

Standard z-transforms of 1, a^n, n^n– Linearity property – Damping rule – Shifting rules – Multiplication by n - Initial and final value theorems (without proof) – inverse z –transforms – Convolution theorem (without proof) – Convergence of z-transforms – Two sided z-transform – Evaluation of inverse z-transforms: Power series method, Partial fraction method, inversion integral method – Application to difference equations – Outline of applications of z-transform in engineering

UNIT –V FOURIER TRANSFORMS AND ITS APPLICATIONS

Fourier integral theorem (without proof) - Fourier Sine and Cosine integrals – Complex form of Fourier integral - Fourier integral representation of a function - Fourier transform – Fourier sine and Cosine transforms – Properties of Fourier Transforms: Linear property, Change of scale property, Shifting property - Parseval's identity for Fourier transforms (without proof) – Application of transforms to boundary value problems: Heat conduction, Vibrations of a string, Transmission lines.

Note: Questions are to be set on problem solving and not on the theoretical aspects.

PRESCRIBED TEXT BOOK:

Grewal B.S, Higher Engineering Mathematics, 41st Edition, Khanna Publishers, New Delhi, 2011.

REFERENCES

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 9th Edition,2006
2. Gerald C.F and Wheatley P.O, Applied Numerical Analysis, Addison-Wesley Publishing Company, 7th Edition,2003
3. Ramana.B.V. Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th reprint, 2010.

MEASUREMENTS AND INSTRUMENTATION III-Semester

Pre-requisite: Basic knowledge of Electrical and Electronics Engineering

L	T	P	C
3	1	0	3

OBJECTIVES:

- To introduce the basic functional elements of Instrumentation
- To introduce the fundamentals of Electrical and Electronic Instruments

UNIT- I MEASUREMENT ERRORS:

Types of Errors, Accuracy, Precision, Reproducibility, Repeatability and Noise, Analog Instruments – Galvano Meter, D'Arsonaval Galvanometer, Moving Coil Instruments, PMMC Ammeter, Voltmeter, Ohm Meter, Moving Iron Instruments, Introduction and Electrodynamometer.

UNIT- II SENSORS AND TRANSDUCERS:

Classification of Transducers- Resistance – Potmeter, Strain gauges, Resistance Thermometers, Thermistor. Inductive Transducers: LVDT, RVDT. Capacitive Transducers: Piezoelectric, Photoelectric transducers, Digital Transducers – Encoder, Shaft Encoder, Optical Encoder.

UNIT – III DIGITAL INSTRUMENTS:

Digital Voltmeter system, Digital Multi meter, Digital Frequency Meter System (Ch VI Text Book 2) SIGNAL GENERATORS**:** LF Signal Generators, Function Generators, Pulse Generators, RF Signal Generators, Sweep Signal Generators, Sweep Frequency Generators, Frequency Synthesizers (Cha VII Text Book 2)

UNIT - IV DATA DISPLAY AND RECORDING SYSTEM:

Oscilloscope: CRO – CRT, Deflection System, Specifications, Controls, Storage Oscilloscope, Digital Storage, Sampling Oscilloscope. (Ch8 of Text Book 3) Graphic Recording Instruments: Strip Chart Recorders, X_Y Recorder, Plotters. (Ch 13 of Text Book2)

UNIT - V WAVEFORM ANALYSING INSTRUMENTS:

Distortion Meter, Spectrum Analyzer, Digital Spectrum Analyzer, (Ch 14 of Text Book 2) Radio Receiver Measurement: Receiver Basics and Parameters, Measuring Sensitivity, Selectivity and Image Response

OUTCOMES:

At the end of the course, the students should be able to:

- Use various types of Electrical Instruments
- Use various types of Electronic Instruments

TEXT BOOKS:

1. Copper D: Electronic Instrumentation and Measurement Techniques, PHI.
2. A.K. Sawhney: A Course in Electrical and Electronic Measurements and Instrumentation.

REFERENCES:

1. Doeblin: Measurement Systems - Application and Design.
2. Jones L.D. and Foster Chin A.: "Electronic Instruments and Measurements", John Wiley and Sons.
3. David A Bell, "Electronic Instrumentation and Measurements", PHI, II Edn, 2003.
4. Joseph J Carr, ""Elements of Electronic Instrumentation and Measurements, LPE, III Edn, 2003

ELECTRICAL ENGINEERING

III-Semester

Pre-requisite: Basic knowledge of Electrical Engineering

L	T	P	C
3	1	0	3

OBJECTIVES:

- To expose the concepts of both AC and DC Machines
- To high light the application of Induction Machine in Industries.

UNIT-I D.C. MACHINES

Construction, principle of operation of D.C. motor and D.C. Generator, Various types of D.C. Motors and generators. Performance, characteristics of D.C. motors and D.C. Generators. Starting and speed control.

UNIT-II TRANSFORMERS:

Construction details and principles of operation of single phase transformers - losses and efficiency. Special types of transformers - Servo stabilizer, pulse transformer, Isolation transformer

UNIT-III INDUCTION MACHINE

Constructional features - Operating principle of 3-phase induction motor [squirrel cage and slip ring] and single phase induction motor, Slip - Torque .characteristics - Starters - Speed control methods.

UNIT-IV SYNCHRONOUS MACHINES

Constructional features - operating principle of 3-phase alternator and synchronous motor principle and operation of synchronous motor

UNIT- V SPECIAL MACHINES:

Tachogenerator - A.C and D.C. Servo motor, Stepper motor, synchronous- PWM Methods. Linear induction motor - switched reluctance motor, Brushless motors.

OUTCOMES:

At the end of the course, the students should be able to:

- Understand the concepts and working principles of DC Machines and Transformers
- Understand the concepts and working principles of AC and DC Servo motors

TEXT BOOKS:

1. B.L.Theraja: Electrical Technology, Vol.II, 1993
2. Rajput: Electrical Machines, 2004, Laxmi Publications

REFERENCES:

1. M.G. Say and Taylor: D.C. Machines, ELBS 1980.
2. M.G. Say: Alternating Current Machines, ELBS 1980.
3. E.V. Armensky and G.B. Falk: Fractional Horsepower Electrical Machines.
4. B.R. Sharma: Utilization of Electrical Energy, Satyaprakashan Publications, 1992
5. B. Ravindranath and M. Chander: Power system Protection and Switchgear, Wiley Eastern Ltd.
6. C.R. Paul, S.A. Nasar and L.E. Unnewehr: Introduction to Electrical Engineering, McGraw Hill, 1992

ELECTRONIC DEVICES AND CIRCUITS

III-Semester

Pre-requisite: Basic knowledge of Electronic Components and KCL & KVL Laws.

L	T	P	C
3	1	0	3

OBJECTIVES: To know the structure, operation and applications of the Basic Electronic Devices

UNIT I – JUNCTION DIODES
Energy Band diagram - Formation of PN junction – Junction diode - VI characteristics – Ratings – Diode current equation – Transition and Diffusion capacitance – Voltage breakdown in diodes - Principle of Operation and Characteristics of Zener diode, Tunnel Diode, Varactor Diode, Schottky Barrier Diode, Semiconductor photo devices - LDR, LED, Photo diodes & Photo transistors - Silicon Control Rectifier, Diac, Triac & Uni-Junction Transistor (UJT)

UNIT II – TRANSISTORS AND FET: Transistor operation – Current components – CB, CE, CC configuration and characteristics – Early effect – Eber-Moll model of transistor – h-parameters of CE, CB, CC configurations. Construction and characteristics of JFET – Relation between pinch off voltage and drain current – JFET as voltage variable resistor – MOSFET – Depletion and enhancement types

UNIT III - BIASING AND STABILIZATION - DC Load line, operating point, various biasing methods for BJT-Design-Stability-Bias compensation, Thermal stability, Design of biasing for JFET, Design of biasing for MOSFET.

UNIT IV - BJT AND FET AMPLIFIERS Small signal Analysis of Common Emitter-AC Load line, Voltage swing limitations, Common collector and Common base amplifiers – Differential amplifiers- CMRR-Darlington Amplifier- Bootstrap technique - Cascaded stages - signal Analysis of MOSFET and JFET Amplifiers., Common source amplifier, Cascode Amplifier.

UNIT V - DC POWER SUPPLIES
Rectifiers and Filters : Block schematic of a typical DC power supply, single phase HWR, FWR, full-wave bridge rectifier, power supply filters (ripple factor and efficiency analysis), bleeder resistor, voltage dividers. Capacitor Filter L- section filter, π- section filter, Diode clipping, Clamping
Voltage regulators: voltage regulation, Zener diode shunt regulator, transistor series regulator, transistor shunt regulator, switching regulators, design of complete DC power supply circuit.

OUTCOMES:
At the end of the course, the students should be able to:
- Learn electrical model for various semiconductor devices and the practical applications of the semiconductor devices
- Analyze the frequency response of the BJT amplifiers at low and high frequencies

TEXT BOOKS:
1. David A. Bell,"Electronic devices and circuits", Prentice Hall of India, 2004.
2. Sedra and smith, "Microelectronic circuits " Oxford University Press, 2004

REFERENCES:
1. Rashid, "Micro- electronic circuits" Thomson publications, 1999.
2. Floyd, "Electron devices" Pearson Asia 5th Edition, 2001.
3. Donald A Neamen, "Electronic Circuit Analysis and Design" Tata McGraw Hill, 3rd Edition, 2003.
4. Robert L. Boylestad, "Electronic devices and circuit theory", 2002.
5. Robert B. Northrop, "Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation", CRC Press, 2004.

DIGITAL SYSTEM DESIGN

III-Semester

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Binary Mathematics and Electronics.

OBJECTIVES:

- To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions
- To introduce the methods for simplifying Boolean expressions
- To outline the formal procedures for the analysis and design of combinational circuits & sequential circuits

UNIT I MINIMIZATION TECHNIQUES AND LOGIC GATES

Minimization Techniques: Boolean postulates and laws – De-Morgan's Theorem - Principle of Duality - Boolean expression - Minimization of Boolean expressions — Minterm – Maxterm – Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions – Quine-McCluskey method of minimization.

Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NOR Implementations of Logic Functions using gates, NAND–NOR implementations – Multilevel gate implementations- Multi output gate implementations. TTL and CMOS Logic and their characteristics – Tristate gates

UNIT II COMBINATIONAL CIRCUITS

Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor – Parallel binary adder, parallel binary Subtractor – Fast Adder - Carry Look Ahead adder – Serial Adder/Subtractor - BCD adder – Binary Multiplier – Binary Divider - Multiplexer/ Demultiplexer – decoder - encoder – parity checker – parity generators – code converters - Magnitude Comparator.

UNIT III SEQUENTIAL CIRCUITS

Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation – Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/subtractor- Asynchronous Ripple or serial counter – Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters – Design of Synchronous counters: state diagram- State table –State minimization –State assignment - Excitation table and maps-Circuit implementation - Modulo–n counter, Registers – shift registers - Universal shift registers – Shift register counters – Ring counter – Shift counters - Sequence generators.

UNIT IV SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS

Synchronous Sequential Circuits**:** General Model – Classification – Design – Use of Algorithmic State Machine – Analysis of Synchronous Sequential Circuits Asynchronous Sequential Circuits**:** Design of fundamental mode and pulse mode circuits – Incompletely specified State Machines – Problems in Asynchronous Circuits – Races and Cycles- Design of Hazard Free Switching circuits.

UNIT V MEMORY DEVICES

Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM – EAPROM, RAM – RAM organization – Write operation – Read operation – Memory cycle - Timing wave forms – Memory decoding – memory expansion – Static RAM Cell- Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell –Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL

OUTCOMES:

At the end of the course, the students should be able to:

- Analyze different methods used for simplification of Boolean expressions.
- Design and implement Combinational circuits.
- Design and implement synchronous and asynchronous sequential circuits**.**

TEXT BOOKS:

1. M. Morris Mano, "Digital Design", 4e, Prentice Hall of India Pvt. Ltd., 2008
2. Floyd, "Digital Fundamentals", Universal Book Stall, New Delhi**.**

REFERENCES:

1. John F.Wakerly, "Digital Design", Fourth Edition, Pearson/PHI, 2008
2. John Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.
3. Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013.
4. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 6th Edition, TMH,
5. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011
6. Donald D.Givone, "Digital Principles and Design", TMH, 2003.

ELECTROMAGNETIC FIELDS

III-Semester

L	T	P	C
4	1	0	4

Pre-requisite: Basic knowledge of Physics and Mathematics

OBJECTIVES:

- To impart knowledge on the basics of static Electric and Magnetic field and the associated laws.
- To give insight into the propagation of EM waves and also to introduce the methods in computational electromagnetic.
- To make students have depth understanding of antennas, electronic devices & waveguides.

UNIT I STATIC ELECTRIC FIELD

Vector Algebra, Coordinate Systems, Vector differential operator, Gradient, Divergence, Curl, Divergence theorem, Stokes theorem, Coulombs law, Electric field intensity, Point, Line, Surface and Volume charge distributions, Electric flux density, Gauss law and its applications, Gauss divergence theorem, Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density.

UNIT II CONDUCTORS AND DIELECTRICS

Conductors and dielectrics in Static Electric Field, Current and current density, Continuity equation, Polarization, Boundary conditions, Method of images, Resistance of a conductor, Capacitance, Parallel plate, Coaxial and Spherical capacitors, Boundary conditions for perfect dielectric materials, Poisson's equation, Laplace's equation, Solution of Laplace equation, Application of Poisson's and Laplace's equations.

UNIT III STATIC MAGNETIC FIELDS

Biot-Savart Law, Magnetic field Intensity, Estimation of Magnetic field Intensity for straight and circular conductors, Ampere's Circuital Law, Point form of Ampere's Circuital Law, Stokes theorem, Magnetic flux and magnetic flux density, The Scalar and Vector Magnetic potentials, Derivation of Steady magnetic field Laws.

UNIT IV MAGNETIC FORCES AND MATERIALS

Force on a moving charge, Force on a differential current element, Force between current elements, Force and torque on a closed circuit, The nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions involving magnetic fields, The magnetic circuit, Potential energy and forces on magnetic materials, Inductance, Basic expressions for self and mutual inductances, Inductance evaluation for solenoid, toroid, coaxial cables and transmission lines, Energy stored in Magnetic fields.

UNIT V TIME VARYING FIELDS AND MAXWELL'S EQUATIONS

Fundamental relations for Electrostatic and Magneto static fields, Faraday's law for Electromagnetic induction, Transformers, Motional Electromotive forces, Differential form of Maxwell"s equations, Integral form of Maxwell's equations, Potential functions, Electromagnetic boundary conditions, Wave equations and their solutions, Poynting"s theorem, Time harmonic fields, Electromagnetic Spectrum.

OUTCOMES:

At the end of the course, the students should be able to:

- Analyze field potentials due to static changes and static magnetic fields.
- Explain how materials affect electric and magnetic fields.
- Analyze the relation between the fields under time varying situations.
- Discuss the principles of propagation of uniform plane waves.

TEXT BOOKS:

1. William H Hayt and Jr John A Buck, "Engineering Electromagnetics", Tata Mc Graw-Hill Publishing Company Ltd,
2. Sadiku MH, "Principles of Electromagnetics", Oxford University Press Inc, New Delhi, 2009

REFERENCES:

1. David K Cheng, "Field and Wave Electromagnetics", Pearson Education Inc, Delhi, 2004
2. John D Kraus and Daniel A Fleisch, "Electromagnetics with Applications", Mc Graw Hill Book Co, 2005
3. Karl E Longman and Sava V Savov, "Fundamentals of Electromagnetics", Prentice Hall of India, New Delhi, 2006
4. Ashutosh Pramanic, "Electromagnetism", Prentice Hall of India, New Delhi, 2006

SANSKRIT & INDIAN CULTURE-III

III-Semester

L	T	P	C
1	0	0	1

UNIT - I (Gītā)

1. Introduction to Jñāna yoga
2. Introduction to Bhakti yoga
3. Introduction to Karma yoga

UNIT - II (Upaniṣadic principles)

4. Introduction to Śaṅkara's Philosophy
5. Introduction to Rāmānuja's Philosophy
6. Introduction to Madhva's Philosophy

UNIT - III

7. Amazing creations in Sanskrit (Varnacitras, Sthānacitras and Svaracitras, Gaticitras, Citra bandanas)
8. Intercity verses in Sanskrit, some intercity discoveries, Sanskrit and artificial intelligence beauty and charm of Sanskrit Poetry.
9. Stotrakāvyas and its relevance

UNIT - IV

10. Introduction to Mathematics
11. Introduction to Physics and Chemistry
12. Introduction to Environmental science

UNIT - V

13. Introduction to Yoga
14. Introduction to Botany & Zoology
15. Introduction to Agriculture

TEXTBOOKS:

1. The wonder that was India by Arthur Llewellyn Basham - 1971
2. The wonder that is Sanskrit by Sampadananda Misra - 2002
3. Vedic Science & Technology by Sadasiva Biswal and Bidyut Lata Ray - 2009

ELECTRICAL ENGINEERING LABORATORY III-Semester

L	T	P	C
0	0	3	2

OBJECTIVES:

- To explore the students to shunt and series motors, shunt generator and stepper motor
- To load DC series and shunt motor
- To understand the basic knowledge of measurement of power

1. Series and parallel resonance
2. Measurement of Active power, Reactive power, PF using Wattmeter.
3. Measurement of R, L, C Using Bridge.
4. Load test on DC shunt motor
5. Load test on DC series motor
6. Speed control of DC shunt motor
7. Load test on DC shunt generator
8. Load test on 3 phase squirrel cage Induction motor
9. Load test on single phase transformer
10. Control of servomotor. (AC/DC)
11. Control of Stepper Motor
12. Load test on Synchronous Generator.

OUTCOMES:

At the end of the course, the students should be able to:

- Design and test series and parallel resonance
- Measure active & reactive power and perform load tests on DC shunt motor, DC series motor, induction motor and transformer Control of servo and stepper motor

ELECTRONIC DEVICES AND CIRCUITS LABORATORY

III-Semester

L	T	P	C
0	0	3	2

OBJECTIVES:

The students will be exposed to:

- ❖ V_I characteristics of all semiconductor devices
- ❖ The practical applications of the devices.
- ❖ The design of amplifiers
- ❖ Concepts of feedback and frequency response of the small signal amplifier
- ❖ Design and simulate digital logic circuits using tools such as Labview or PSPICE or Multisim.

LIST OF EXPERIMENTS:

1. Study of ELVIS
2. Study of LabView
3. P-N Junction Diode Characteristics (Forward bias & Reverse bias)
4. Zener Diode Characteristics

   Part A: V-I Characteristics

   Part B: Zener Diode act as a Voltage Regulator
5. Rectifiers (without and with c-filter)

   Part A: Half-wave Rectifier

   Part B: Full-wave Rectifier
6. BJT Characteristics (CE Configuration)

   Part A: Input Characteristics

   Part B: Output Characteristics
7. FET Characteristics (CS Configuration)

   Part A: Drain (Output) Characteristics

   Part B: Transfer Characteristics
8. SCR Characteristics
9. UJT Characteristics
10. CRO Operation and its Measurements
11. Clipper circuits using ELVIS
    a. Study the operation of positive, negative, biased and combinational clippers
12. Transistor Biasing using ELVIS
13. BJT-CE Amplifier using Multisim / Labview
14. Emitter Follower-CC Amplifier using Multisim / Labview
15. FET-CS Amplifier using Multisim / Labview

OUTCOME:

At the end of the course, the students should be able to:

- ❖ Learn electrical model for various semiconductor devices and learns the practical applications of the semiconductor devices
- ❖ Design amplifier circuit and learns the design of frequency response of the small signal amplifier

DIGITAL SYSTEM DESIGN LABORATORY

III-Semester

L	T	P	C
0	0	3	2

OBJECTIVES:

- To understand, the logical behaviors of digital circuits and apply them in appropriate applications.
- To verify operation of logic gates and flip-flops.
- To design and construct digital circuits

LIST OF EXPERIMENTS

1. Study of Multisim
2. Study of Gates & Flip-flops.
3. Half Adder and Full Adder.
4. Magnitude Comparator (2-Bit).
5. Encoders and Decoders.
6. Multiplexer and De-multiplexer.
7. Code Converter.
8. Synchronous Counters.
9. Ripple Counter.
10. Mod – N Counter.
11. Shift Register – SISO & SIPO.

OUTCOMES:

At the end of the course, the students should be able to:

- Verify the truth table for logic gates and Flip-flops
- Design half-adder and full-adder circuits
- Test the operation of Synchronous, Ripple and Mod-N counters

SOFT SKILLS – I

III-Semester

L	T	P	C
0	0	1	1*

English as a subject is being introduced for second year B.E/B.Tech students from 2014-2015.The objective is to impart intensive teaching to enable them to communicate in English both at spoken and written levels. The expectations of the campus recruiters and other agencies are taken into consideration.

1. Words Misused
2. Homonyms and Homophones
3. One word substitution
4. Phrases and Clauses
5. Rearrangement of Sentences
6. Spotting Errors

REFERENCES:

1. Objective General English – Dr.R.S.Agarwal (S.Chand and Co., Pvt. Ltd, New Delhi 110 055)
2. Essential English – A.P.Bharadwaj (S.Chand and Co., Pvt. Ltd, New Delhi 110 055)
3. English Grammer and Composition – Wren and Martin
4. English for Engineering Students – Dr.Sumant (Vijay Nicholas Publication)

(Relevant portions in the syllabus will be selected from the books prescribed and given in a Consolidated form to students)

Assessment:

1. Examination for both III & IV semesters will be through Internal Assessment only. This will be 100 marks each. A candidate has to secure 50% for a pass.
2. Internal Assessment will comprise of both oral and written examination for 40 Marks.
3. End Semester Examination is of Practical Mode for 100 Marks and this will be converted to 60 marks.

ENGINEERING MATHEMATICS IV

IV-Semester

L	T	P	C
3	1	0	3

OBJECTIVE:

- To provide a definite idea about complex functions and their applications. To solve series solution of differential equation, higher order partial differential equations and difference equation.

UNIT – I ANALYTIC FUNCTIONS

Limit and continuity of a complex function - Derivative of a complex function: Cauchy Riemann equations – Analytic functions – Harmonic functions - Orthogonal system – Applications to flow problems – Geometric representation of a complex function - Standard transformations: Translation, Magnification and rotation, Inversion and reflection, Bilinear transformation - Conformal transformation – Special conformal transformations : $e^z, z^2, z + \frac{1}{z}$ Outline of applications of analytic functions in engineering

UNIT- II COMPLEX INTEGRATION

Integration of complex functions – Cauchy's theorem (without proof) – Cauchy's integral formula (without proof) – Taylor's series (without proof)– Laurent's series (without proof) – Zeros and Singularities of an analytic function – Residues – Residue theorem (without proof) – Calculation of residues – Evaluation of real definite integrals: Integration around the unit circle, Integration around a small semi-circle, Integration around rectangular contours, Indenting the contours having poles on the real axis – Outline of applications of complex integration in engineering.

UNIT – III SERIES SOLUTION OF DIFFERENTIAL EQUATIONS

Validity of series solution - Series solution when x=0 is an ordinary point - Frobenius method (Series solution when x=0 is a regular singularity) - Bessel's equation (Bessels functions of the first and second kind) - Recurrence formulae for $J_n(x)$ - Expansions for J_0 and J_1 : Value of $J_{1/2}$ - Generating function for $J_n(x)$ - Equations reducible to Bessel's equation – Orthogonality of Bessel functions – Outline of applications of Bessel's functions in engineering.

UNIT – IV PARTIAL DIFFERENTIAL EQUATIONS

Formation of partial differential equations – Solution of a partial differential equation – Equations solvable by direct integration – Linear equations of first order – Non-linear equations of the first order – Charpit's method - Homogeneous linear equations with constant coefficients –Rules for finding complementary functions – Rules for finding particular integral – Solution of homogeneous linear equation of any order.

UNIT –V DIFFERENCE EQUATIONS AND ITS APPLICATIONS

Formation of difference equations – Linear difference equations – Rules for finding the complementary function – Rules for finding the particular integral – Simultaneous difference equations with constant coefficients – Outline of other applications of difference equations in

PRESCRIBED TEXT BOOK:

Grewal B.S, Higher Engineering Mathematics, 41st Edition, Khanna Publishers, New Delhi, 2011.

REFERENCES

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 9th Edition,2006
2. N.P.Bali, Manish Goyal, A Text Book of Engineering Mathematics, Laksmi Publications, 2010 reprint.
3. Ramana.B.V. Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th reprint, 2010.

SIGNALS AND SYSTEMS

IV-Semester

Pre-requisite: Basic knowledge of Z-transformation and Fourier series

L	T	P	C
4	0	0	4

OBJECTIVES:

- To study the properties and representation of discrete and continuous signals
- To study the sampling process and analysis of discrete systems using z-transforms
- To study the analysis and synthesis of discrete time systems

UNIT-I CLASSIFICATION OF SIGNALS AND SYSTEMS

Continuous Time Signals(CT signals) , Discrete time signals (DT signals) step, ramp, pulse, impulse, exponential, Classification of CT and DT signals - periodic, aperiodic, random signals - CT systems and DT systems, Basic properties of systems - Linear Time invariant systems and properties

UNIT-II ANALYSIS OF CONTINUOUS TIME SIGNALS

Fourier Series Analysis- Representation of periodic signals in trigonometric and exponential form, Spectrum of CT signals-Fourier Transform and Laplace Transform in signal analysis

UNIT-III LINEAR TIME INVARIANT – CONTINUOUS TIME SYSTEMS

Differential Equation - Block diagram Representation, Impulse response, Convolution Integral- Frequency response, Fourier and Laplace Transforms in analysis, State variable equations and Matrix representation of systems

UNIT-IV ANALYSIS OF DISCRETE TIME SYSTEMS

Sampling of CT signals and aliasing, DTFT and properties, Z-transform and properties of Z-transform

UNIT-V LINEAR TIME INVARIANT – DISCRETE TIME SYSTEMS

Difference equations, Block Diagram representation, Impulse response, Convolution sum, LTI systems analysis using DTFT and Z-transforms, State variable equations and matrix representation of systems

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the properties and representation of continuous and discrete time signals.
- Analyze the discrete time systems using z-transforms.

TEXTBOOKS:

1. Allam V. Oppenheim, S.Wilsky and S.H.Nawab, Signals and systems, Pearson Education, 2007
2. Edward W Kamen & Bonnie's Heck, "Fundamentals of Signals and Systems", Pearson Education 2007

REFERENCES:

1. Robert A.Gabel and Richard A.Roberts, Signals & Linear Systems, John Wiley & Sons 2004
2. Simon Haykins and Barry Van Veen, Signals and Systems, John Wiley & Sons, 2004

ANALOG ELECTRONICS

IV-Semester

Pre-requisite: Basic knowledge of Electronic Devices and Circuits

L	T	P	C
3	0	0	3

OBJECTIVES:

- To construct Wide band amplifiers and Oscillators for Radio frequencies
- To design linear and non-linear applications of Op-amp
- To design ADC and DAC using Op-amp

UNIT-I DIFFERENTIAL AMPLIFIERS AND OP-AMPS: Differential amplifiers - CMRR, Transfer characteristics. Differential amplifier with constant current source. Differential amplifier using FETs – Op-amps-electrical characteristics of Op-amp-Specification of Op-amp-Linear operations using Op-amp, summer, Scaler, sample-and-hold circuits, I to V, V to I Converters, Clipper, Clamper

UNIT-II APPLICATIONS OF OP-AMP AND IC 555: Integrator and Differentiator, Schmitt Trigger, Astable and Monostable Multivibrators, Triangular wave generator, Sine wave Generator. D/A converter – specifications - R-2R Ladder type, A/D Converters –- Successive Approximation type -PLL – Frequency Translation, Detection, Multiplication - IC 555 – Astable and Monostable Multivibrators.

UNIT – III POWER AND TUNED AMPLIFIERS: Classification of Power Amplifiers -Class A, B, C - Direct coupled, transformer coupled and push pull complementary symmetry amplifiers - Class AB and Class C amplifier- Single tuned amplifiers-Impedance matching to improve gain, Double tuned amplifiers – Synchronously Tuned amplifiers

UNIT – IV FEEDBACK AMPLIFIERS: Concept of feedback, Effect of feedback on gain, stability, distortion and bandwidth – Input and output impedance - Basic feedback amplifier Topologies – Practical feedback amplifier circuits and their analysis - Multistage feedback amplifiers.

UNIT – V OSCILLATORS: Barkhausen Criteria for oscillation, RC Oscillators, Phase shift and Wein bridge oscillators, Hartley, Colpitts and Clapps oscillators, Tuned oscillators and Crystal oscillator – Frequency Stability

.

OUTCOMES:

At the end of the course, the student should be able to:

- Design linear & non- linear applications of op-amps
- Design ADC and DAC using Op-amps
- Design Power & Feedback Amplifiers using BJT
- Design various types of Oscillators

TEXT BOOKS:

1. Donald L. Schilling and C. Belove, “Electronic Circuits – Discrete and Integrated”, III Edition, McGraw Hill.
2. Millman and Halkias, “Integrated Electronics”, McGraw Hill, International Student Edition, 1993.
3. “Linear Integrated Circuits” by Rai Chowdry and Jain, 1999, Wilsey Eastern.
4. Ramakant A. Gayakwad, “OP-AMP and Linear ICs”, 4 thEdition, Prentice Hall / Pearson Education, 2001.

REFERENCES:

1. Millman and Grabel: “Microelectronics”, McGraw Hill International Edition.
2. G. K. Mithal, “Electronic Devices and Circuits”, Khanna Publishers, Vol.1, 1997.

ANALOG COMMUNICATION

IV-Semester

L	T	P	C
3	0	0	3

Pre-requisite: Basic Knowledge of Electronic Devices and Circuits

OBJECTIVES:

- To introduce the concepts of various analog modulations & their spectral characteristics.
- To understand the properties of Radio Receivers.
- To know the effect of noise on communication systems.
- To study the limits set by Information Theory.

UNIT I AMPLITUDE MODULATION Generation and detection of AM wave-spectra-DSBSC, Hilbert Transform, Modulation Techniques – Square Law – Collector Modulation, Demodulation – Square Law Detector, Pre-envelope & complex envelope - SSB and VSB –comparison.

UNIT II ANGLE MODULATION Phase and frequency modulation-Narrow Band and Wind band FM - Spectrum - FM modulation and demodulation – FM Discriminator- PLL as FM Demodulator - Transmission bandwidth.

UNIT III RECEIVER: Tuned Radio Frequency, Super Heterodyne Receiver, sensitivity, selectivity, Double Spotting, Tracking, Image Frequency Rejection, IF, Choice of IF, IF Amplifier. AGC, Delayed AGC. SSB Receiver, FM Receiver.

UNIT IV NOISE CHARACTERIZATION Noise sources and types – Noise figure and noise temperature – Noise in cascaded systems. Narrow band noise – PSD of in-phase and quadrature noise –Noise performance in AM systems – Noise performance in FM systems – Pre-emphasis and de-emphasis – Capture effect, threshold effect

UNIT V INFORMATION THEORY Entropy - Discrete Memory less channels - Channel Capacity -Hartley - Shannon law - Source coding theorem - Huffman & Shannon-Fano codes

OUTCOMES:

At the end of the course, the student should be able to:

- Design AM Communication Systems
- Design Angle modulated systems
- Apply the concepts of Random Process to the design of communication systems

TEXT BOOKS:

1. J.G. Proakis, M. Salehi, “Fundamentals of Communication Systems”, Pearson education 2006.
2. S. Haykin, “Digital Communications”, John Wiley, 2005.
3. B. Sklar, “Digital Communications Fundamentals and Applications”, 2nd Edition Pearson Education 2007

REFERENCES:

1. B.P. Lathi, “Modern Digital and Analog Communication Systems”, 3 rd Edition, Oxford University Press, 2007.
2. H P Hsu, Schaum Outline Series - “Analog and Digital Communications” TMH 2006
3. Couch. L."Modern Communication Systems", Pearson, 2001
4. Millman and Grabel: “Microelectronics”, McGraw Hill International Edition
5. G. K. Mithal, “Electronic Devices and Circuits”, Khanna Publishers, Vol.1, 1997.
6. .

TRANSMISSION LINES AND WAVEGUIDES IV-Semester

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Electromagnetic fields

OBJECTIVES:

- To introduce the various types of transmission lines and to discuss the losses associated.
- To give thorough understanding about impedance transformation and matching.
- To use the Smith chart in problem solving.
- To impart knowledge on filter theories and waveguide theories

UNIT I TRANSMISSION LINE THEORY & PARAMETERS

Introduction to different types of transmission lines , Transmission line Equation – Solution – Characteristic impedance-Infinite line concept - Distortion less line – loading –input impedance, Losses in Transmission lines– Reflection loss, Insertion loss, return loss, Introduction to planar transmission lines. Numerical examples.

UNIT II IMPEDENCE MATCHING AND TRANSFORMATION

Reflection Phenomena – Standing waves – λ/8, λ/4 & λ/2 lines – λ/4 Impedance transformers, Stub Matching – Single and Double Stub – Smith Chart and Applications. Numerical examples

UNIT III NETWORK COMPONENTS

Filter fundamentals, Filter design- lumped element and distributed element approach to filter design –Design of Attenuators and Equalizers – Lattice type, Concept of inverse Networks– Transients in transmission lines, Lattice diagram. Numerical examples

UNIT IV RECTANGULAR WAVE GUIDES

Waves between Parallel Planes – characteristic of TE, TM and TEM waves , Velocities of propagation ,Solution of wave Equation in Rectangular guides ,TE and TM modes , Dominant Mode, Attenuation, Mode Excitation, Dielectric slab wave guides, Numerical examples.

UNIT V CYLINDRICAL WAVE GUIDES

Solution of wave equation in circular guides, TE and TM wave in circular guides, Wave Impedance, attenuation, mode excitation, formation of cylindrical cavity, Application, cavity resonator and Q for dominant mode, Numerical examples

OUTCOMES:

At the end of the course, the student should be able to:

- Discuss the propagation of signals through transmission lines.
- Analyze signal propagation at Radio frequencies.
- Explain radio propagation in guided systems.

TEXT BOOKS:

1. John D Ryder, “Networks lines and fields”, Prentice Hall of India, New Delhi, 2005
2. Edward C. Jordan ,” Electromagnetic Waves and Radiating Systems”, Asia Publishing House
3. Sudhakar & Shyam Mohan SP, “Circuits and Networks – Analysis and Synthesis,” TMGH,1995

REFERENCES:

1. William H Hayt and Jr John A Buck, “Engineering Electromagnetics” Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2008
2. David K Cheng, “Field and Wave Electromagnetics”, Pearson Education Inc, Delhi, 2004
3. John D Kraus and Daniel A Fleisch, “Electromagnetics with Applications”, McGraw Hill Book Co, 2005
4. GSN Raju, “Electromagnetic Field Theory and Transmission Lines”, Pearson Education, 2005
5. Bhag Singh Guru and HR Hiziroglu, “Electromagnetic Field Theory Fundamentals”, Vikas Publishing House, New Delhi, 2001.

OBJECT ORIENTED PROGRAMMING USING C++ IV-Semester

Pre-requisite: Basic knowledge of Computer Programming

L	T	P	C
3	1	0	3

OBJECTIVES

- To understand the characteristics of object oriented language
- To understand the various classes, objects and member functions
- To understand Arrays and functions

UNIT – I NEED FOR OBJECT ORIENTED PROGRAMMING

Characteristics of object oriented language -objects, classes, Inheritance, Reusability, creating new data types, Polymorphism and overloading. C++ programming basis – Data types, Manipulators, Cin, Cout, Type conversion, arithmetic operators, Loops and decisions.

UNIT – II CLASS AND OBJECTS:

A simple class, C++ Objects as physical Objects, C++ Objects as Data Types, Constructors, destructors, objects as function arguments, overloaded constructors, member functions defined outside the class, inline functions, and Returning objects from Functions.

UNIT – III ARRAYS:

Defining & accessing Array elements, arrays as class member data, array of Objects. Operator Overloading: Overloading Unary Operators, Operator Arguments, Return Values, nameless Temporary objects, postfix notations. Overloading Binary Operators - Arithmetic operators, Concatenating Strings, Multiple overloading Comparison operators, Arithmetic Assignment Operators.

UNIT – IV INHERITANCE-DERIVED CLASS AND BASE CLASS

Derived class constructors, overriding member functions, Class Hierarchies, Abstract base class, Public and private inheritance, Levels of inheritance, Multiple inheritance. Memory management – new and delete operator, a string class using new, Pointers to Objects – Referring to Members, another Approach to new, An array of pointers to Objects.

UNIT –V VIRTUAL FUNCTIONS

Pure virtual functions, Late Binding, Abstract Classes, Virtual base classes. Friend Functions – Friend Classes, Friends for functional Notation. Static Functions investigating destructors. Assignment and copy – initialization-overloading the assignment operator, the copy constructor, the this pointer. Templates, function templates, class template.

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the concept of object oriented programming
- Understand the concept of inheritance and virtual classes

TEXT BOOKS:

1. Object Oriented Programming in Microsoft C++ - Robert Lafore, Galgotia Publication Pvt Ltd.1998
2. Let us C++ - Yaswant Kanitkar (used for templates), BPB Publication

REFERENCES:

1. Object Oriented Programming in C++ - C. Balagurusamy, Tata McGraw Hill.2/e 2001
2. Teach yourself C++ - Herbertsehildt, OSBORNE/MH

SANSKRIT & INDIAN CULTURE –IV

IV-Semester

L	T	P	C
1	0	0	1

UNIT - I INTRODUCTION TO SINDH VEDIC CULTURES

Significance & how it is different from the other cultures. Why we have to follow? Important features. Chronology of Indian Cultures; origin & spread; general features.

UNIT - II LITERARY HERITAGE OF INDIA

Significance of Indian Literature; chronology of Indian literature; Literature in Sanskrit and other languages;

UNIT - III EARLY INDIAN EDUCATION

Significance & advantages. Gurukulas and Guru-sishya parampara. Learning methods. Evolution of script and languages; important early scripts and writing materials; important early educational centers (*ghattikas,* universities) & their unique features.

UNIT - IV DUTIES & RESPONSIBILITIES OF HUMAN

Gruhya sutras, smrities & sruties - significance in day to day life.

UNIT - V SCIENTIFIC THOUGHTS OF EARLY INDIAN SAGES

REFERENCES:

1. Joshi,K. 1992(rp). The Veda and Indian Culture. Rastriya Veda Vidya Pratishthana.
2. Majumdar, R.C. 1994 (rp). Ancient India. Motilal Banarsidas Publishers. Delhi.
3. Patel, I.S. (ed). 1984. Science and the Vedas. Bombay.
4. Sri Chandrasekarendra Sarasvati Swamii. 1991. The Guru Tradition. Bharatiya Vidya Bhavan. Bombay.
5. Sri Jayendra Saraswatiji Maharaj. 1951. The Vedas and Vedangas. Prakashan Kendra. Lucknow.
6. Vartak, P.V. 1986. Scientific Knowledge in the Vedas. Delhi.
7. Winternize, M. 1996(rp). History of Indian Literature. Delhi.

ANALOG ELECTRONICS LABORATORY IV-Semester

L	T	P	C
0	0	3	2

OBJECTIVES:

- To understand the basics of linear integrated circuits and available ICs
- To understand characteristics of operational amplifier.
- To apply operational amplifiers in linear and nonlinear applications.
- To acquire the basic knowledge of special function IC.
- To use PICE software for circuit design

LIST OF EXPERIMENTS:

DESIGN AND TESTING OF

1. Study of ELVIS
2. Study of LabView
3. Study of MultiSim
4. Characteristics of Op amp – IC 741
5. Inverting and Non-inverting amplifier using IC 741 / ELVIS
6. Integrator and Differentiator using IC 741 / ELVIS
7. Schmitt Trigger using IC 741
8. ADC / DAC using IC 741
9. Astable & Monostable Multivibrator using IC 555
10. RC Phase shift oscillator using BJT
11. Hartley & Colpitts oscillator using BJT
12. Frequency Response of Class B Push Pull Amplifier using BJT
13. Frequency Response of Voltage Series Feedback Amplifier using BJT
14. Wien bridge oscillator using Multisim / Labview
15. Differential Amplifier using Multisim / Labview
16. Phase Locked Loop (PLL) using Multisim / Labview

OUTCOMES:

At the end of the course, the students should be able to:

- Design oscillators and amplifiers using operational amplifiers.
- Design filters using Op-amp and perform experiment on frequency response.
- Analyze the working of PLL and use PLL as frequency multiplier.
- Design DC power supply using ICs.
- Analyze the performance of oscillators and multivibrators using SPICE

ANALOG COMMUNICATION LABORATORY

IV-Semester

L	T	P	C
0	0	3	2

OBJECTIVE:

- To design and setup circuits for Analog Communication

LIST OF EXPERIMENTS

1. Study of Simulink
2. AM generation using JFET/ BJT
3. AM generation and demodulation using op-amps / IC multipliers
2. Balanced modulator for DSB-SC signal.
3. PAM generation and demodulation
4. Implementation of intermediate frequency (IF) tuned amplifier
5. Mixer using JFET/BJT
6. PWM - Generation and demodulation
7. PPM - Generation and demodulation
8. AM detection with simple and delayed AGC
9. SSB generation and demodulation using integrated circuits
10. FM generation (Reactance modulator)
11. FM demodulation
12. PLL characteristics and demodulation using PLL

OUTCOMES:

At the end of the course, the students should be able to:

- Construct and test AM generation using BJT and JFET
- Understand modulation and demodulation of PAM, PPM and PWM
- Modulation and Demodulation of FM
- Functioning of Phase-Locked Loop

OBJECT ORIENTED PROGRAMMING LABORATORY USING C++ IV-Semester

L	T	P	C
0	0	3	2

OBJECTIVE:

- To demonstrate the use of switch, constructor, destructor and pointer
- To illustrate the use of inline functions, copy constructor and operator overloading
- To demonstrate the use of inheritance, pure virtual functions, unary operator, binary operator and friend function

LIST OF EXPERIMENTS

1. Illustrate class & objects
2. To demonstrate the use of Switch –Case statement and to perform arithmetic operations.
3. To demonstrate the use of constructor and destructor.
4. To demonstrate the use of this pointer
5. To enter the records of n number of students and then display them using nested structure.
6. Illustrate the use of inline functions
7. Illustrate the use of Copy Constructor
8. Illustrate operator overloading
9. To demonstrate the concept of polymorphism applied to the member functions.
10. To demonstrate the use of Inheritance.
11. To demonstrate the use of Demonstration of New & Delete Operator
12. To demonstrate the Pure Virtual Function
13. To demonstrate the use of unary operator
14. To demonstrate the use of Binary operator
15. To demonstrate the use of Friend Function.
16. To demonstrate the use of class template

OUTCOMES:

At the end of the course, the students should be able to:

- Understand case statement and perform arithmetic operations
- Illustrate operator overloading ,demonstrate unary and binary operator

SOFT SKILLS – II

IV-Semester

L	T	P	C
0	0	1	1*

1. Idioms and Phrasal Verbs (Reference No.4 Prescribed)
2. Synthesis of Sentence
3. Sentence completion
4. Paragraph Coherence
5. Same Theme Sentence – Selection of Preferable Sentence
6. Comprehension (True/False, Inference, MCQ)

REFERENCES:

1. Objective General English – Dr.R.S.Agarwal (S.Chand and Co.,Pvt. Ltd,New Delhi 110 055)

2. Essential English – A.P.Bharadwaj (S.Chand and Co., Pvt. Ltd, New Delhi 110 055)

3. English Grammer and Composition – Wren and Martin

4. English for Engineering Students – Dr.Sumant (Vijay Nicholas Publication)

Assessment:

i. Examination for both III & IV semesters will be through Internal Assessment only. This will be 100

ii.End Semester Examination is of Practical Mode for 100 Marks and this will be converted to 60 marks. A candidate has to secure 50% for a pass.

iii. Internal Assessment will comprise of both oral and written examination for 40 Marks.

ENGINEERING MATHEMATICS V

V- Semester

L	T	P	C
3	1	0	3

OBJECTIVE:

- To acquire the basic concepts of probabilities and Random process techniques for solving different kinds of engineering problems.

UNIT –I PROBABILITY THEORY

Random experiment – Mathematical, statistical and axiomatic definitions of probability – Conditional probability – Independent events - Theorem of total probability – Theorem of probability of causes: Baye's theorem – Bernoulli's trials – De Moivre-Laplace approximation – Generalization of Bernoulli's theorem multinomial distribution – Outline of applications of probability theory in engineering.

UNIT – II PROBABILITY DISTRIBUTIONS

Binomial distribution: Properties and constants of Binomial distribution – Fitting a Binomial distribution - The multinomial distribution – Negative Binomial distribution – Poisson distribution: Properties and constants of Poisson distribution – Fitting a Poisson distribution – Hyper-geometric distribution – Normal distribution: Properties and constants of Normal distribution – Fitting a normal curve – Outline of applications of theoretical distributions in engineering.

UNIT-III RANDOM PROCESSES

Classification of random processes – Methods of description of a random process –Special classes of random processes – Average values of random processes – Analytical representation of a random processes – Autocorrelation function and its properties – Cross correlation function and its properties - Outline of applications of random processes in engineering.

UNIT – IV ERGODIC PROCESS

Ergodicity – Mean Ergodic process – Correlation Ergodic process – Distribution Ergodic process – Power spectral density function and its properties – System in the form of convolution – Unit impulse response of the system – Outline of applications of ergodic process in engineering.

UNIT –V SPECIAL RANDOM PROCESSES

Poisson process – Probability law for the Poisson Process – Second order probability function of a homogeneous Poisson process – Mean and autocorrelation of the Poisson process – Properties of Poisson process - Markov process – Markov chain – Chapman Kolmogorov theorem (without proof) – Classification of states of a Markov chain - Outline of applications of Poisson and Markov processes in engineering.

Note: Questions are to be set on problem solving and not on the theoretical aspects.

TEXT BOOK

1. Grewal B.S, Higher Engineering Mathematics, 41st Edition, Khanna Publishers, New Delhi, 2011.
2. Veerarajan. T., Probability, Statistics and Random Processes, Third Edition, Tata McGraw-Hill Publishers, New Delhi 2008.

REFERENCE BOOKS

1.Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 9th Edition,2006
2. Ramana.B.V. Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th reprint, 2010.
3. Gupta S.P, Statistical Methods, 28th Edition, Sultan Chand &Sons., New Delhi, 1997.
4. Stochastic Processses, J.Medhi, New Age International Publishers, 3rd Edition, 2009

MICROPROCESSOR AND MICROCONTROLLERS

V-Semester

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Digital System Design.

OBJECTIVES:

- To Study the Architecture of 8086 microprocessor.
- To learn the design aspects of I/O and Memory Interfacing circuits.
- To Study about communication and bus interfacing.
- To Study the Architecture of 8051 microcontroller.

UNIT I 8086 MICROPROCESSOR

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming – Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT II 8086 SYSTEM BUS STRUCTURE

8086 signals – Basic configurations – System bus timing –System design using 8086 – IO programming – Introduction to Multiprogramming – System Bus Structure – Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.

UNIT III I/O INTERFACING

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller.

UNIT IV MICROCONTROLLER

Architecture of 8051 –Special Function Registers (SFRs) - I/O Pins Ports and Circuits – Instruction set-Addressing modes - Assembly language programming.

UNIT V INTERFACING MICROCONTROLLER

Programming 8051 Timers, Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation.

OUTCOMES:

At the end of the course, the student should be able to:

- Design and implement programs on 8086 microprocessor.
- Design I/O circuits.
- Design Memory Interfacing circuits.

TEXT BOOKS:

1. Yu-Cheng Liu, Glenn A. Gibson, “Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design”, Second Edition, Prentice Hall of India, 2011.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Second Edition, Pearson education, 2011.

REFERENCES:

1. Doughlas V. Hall, “Microprocessors and Interfacing, Programming and Hardware”, TMH, 2012

DIGITAL SIGNAL PROCESSING

V-Semester

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Signals and Systems

OBJECTIVES:

- To introduce discrete Fourier transform and its application
- To teach the design of infinite and finite impulse response filters for filtering undesired signals
- To introduce signal processing concepts in systems having more than one sampling frequency

UNIT – I DISCRETE FOURIER TRANSFORM Review of discrete-time signals & systems – DFT and its properties, FFT algorithms & its applications, Overlap-add & overlap-save methods

UNIT – II DESIGN OF INFINITE IMPULSE RESPONSE FILTERS

Analog filters – Butterworth filters, Chebyshev Type – I Filters (upto 3rd order), Analog Transformation of prototype LPF to BPF/BSF/HPF, Transformation of analog filters into equivalent digital filters using Impulse invariant method and Bilinear Z-transform method-Realization structures for IIR filters – direct, cascade, parallel forms

UNIT – III DESIGN OF FINITE IMPULSE RESPONSE FILTERS

Design of linear phase FIR filters windowing and frequency sampling methods – Realization structures for FIR filters – Transversal and Linear phase structures – comparison of FIR & IIR

UNIT-IV FINITE WORD LENGTH EFFECTS

Representation of numbers – ADC Quantization noise – Coefficient Quantization Error – Product Quantization error quantization error-truncation & rounding errors – Limit cycle due to product round-off error-Round-off noise power-limit cycle oscillation due to overflow in digital filters – Principle of scaling

UNIT- V MULTIRATE SIGNAL PROCESSING Introduction to Multirate Signal Processing – Decimation – Interpolation- Polyphase decomposition of FIR filter – Multistage implementation of sampling rate conversion – Design of narrow band filters – Applications of Multirate Signal Processing

OUTCOMES:

At the end of the course the students will be able to

- Understand discrete Transform and its application
- Design of infinite and finite impulse response filters for various applications
- Apply signal processing concepts in systems having more than one sampling frequency

TEXTBOOKS:

1. John G.Proakis and Manolakis, "Digital Signal Processing Principles, Applications and Algorithms and Applications", Pearson, Fourth Edition, 2007.
2. A.V.Oppenheim, R.W.Schafer and J.R.Buck, Discrete-Time Signal Processing, 8th Indian Reprint, Pearson, 2015

REFERENCES:

1. S.K.Mithra, Digital Signal Processing, A Computer Based Approach, Tata McGraw-Hill, 4th Edition 2013.
2. M.H.Hayes, Digital Signal Processing, Schaum's outlines, Tata McGraw Hill, 2nd Edition 2009
3. I.C.Ifeachor and B.W.Jervis, Digital Signal Processing – A Practical Approach, Pearson

DIGITAL COMMUNICATION

V-Semester

Pre-requisite: Basic knowledge of Signals and Systems & Digital System Design

L	T	P	C
3	1	0	3

OBJECTIVES:

- To know the principles of sampling & quantization
- To study the various waveform coding schemes
- To learn the various baseband transmission schemes
- To understand the various Band pass signalling schemes

UNIT I SAMPLING & QUANTIZATION Low pass sampling – Aliasing- Signal Reconstruction- Quantization - Uniform & Non-uniform quantization - quantization noise - Logarithmic Companding of speech signal- PCM -TDM

UNIT II WAVEFORM CODING Prediction filtering and DPCM-Delta Modulation-ADPCM & ADM principles-Linear Predictive Coding

UNIT III BASEBAND TRANSMISSION Properties of Line codes- Power Spectral Density of Unipolar / Polar RZ & NRZ – Bipolar NRZ -Manchester- ISI – Nyquist criterion for distortion less transmission – Pulse shaping – Correlative coding - Mary schemes – Eye pattern - Equalization

UNIT IV DIGITAL MODULATION SCHEME Geometric Representation of signals - Generation, detection, PSD & BER of Coherent BPSK,BFSK & QPSK - QAM - Carrier Synchronization - structure of Non-coherent Receivers – Principle of DPSK.

UNIT V ERROR CONTROL CODING Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes – Convolutional code - Vitterbi Decoder

OUTCOMES:

At the end of the course, the students should be able to:

- Design PCM systems
- Design and implement base band transmission schemes
- Design and implement band pass signalling schemes
- Analyse the spectral characteristics of band pass signalling schemes and their noise performance
- Design error control coding schemes

TEXT BOOKS:

1. S. Haykin, “Digital Communications”, John Wiley, 2014

REFERENCES:

1. B. Sklar, “Digital Communication Fundamentals and Applications”, 2nd Edition, Pearson Education, 2009
2. B.P.Lathi, “Modern Digital and Analog Communication Systems”, Oxford University Press 2010.
3. H P Hsu, Schaum’s Outline Series - “Analog and Digital Communications”, TMH 2006
4. J.G Proakis,“Digital Communication”,5th Edition, Tata McGrawHill Company, 2007.
5. H P Hsu, Schaum’s Outline Series - “Analog and Digital Communications”, TMH 2006
6. J.G Proakis,“Digital Communication”,4th Edition, Tata McGrawHill Company, 2001.

CONTROL SYSTEM ENGINEERING V-Semester

L	T	P	C
4	1	0	4

Prerequisites: Basic knowledge of Circuit Theory

OBJECTIVES:

- To perform time domain and frequency domain analysis of control system
- To design compensation techniques that can be used to stabilize control systems
- To design of various control system techniques in MATLAB

UNIT I SYSTEM AND THEIR REPRESENTATION

Basic elements of control systems- open and close loop systems - Differential equation – Transfer function - Modeling of Electrical systems, translational and rotational mechanical systems – Block diagram reduction techniques - Signal flow graphs.

UNIT-II TIME RESPONSE

Time response - Time domain specifications - types of input - I and II order system response – Error coefficients - Generalized error series - Steady state error -Effect of P ,PI,PD and PID modes of feedback control ,Analysis using MAT LAB

UNIT-III FREQUENCY RESPONSE

Frequency response - Bode plot - Polar plot - Nyquist plot - Frequency domain specifications from plots - Constant M and N circles - Nichol's chart- Analysis using MATLAB.

UNIT-IV STABILITY AND COMPENSATOR DESIGN

Characteristic equation - BIBO stability - Routh Hurwitz Construction of Root locus - Nyquist stability criterion - compensation on frequency response, Analysis using MATLAB.

UNIT-V STATE VARIABLE ANALYSIS

Criterion - Root locus technique Effect of Lag, Lead and lag-lead Concept of state variables – State models for linear and time invariant systems - solution of state and output equation in controllable canonical form - concept of controllability and observability - Effect of state feedback.

OUTCOMES:

At the end of the course, the student should be able to:

- Able to understand the time response for Zero, First and second order time response
- Understand time response and frequency response
- Perform calculations on stability and compensation

TEXTBOOKS:

1. M. Gopal,"Control System - Principle and Design," Tata McGraw Hill, second edition, 2008.

2. K. Ogata,"Modem Control Engineering, "fifth edition, PHI, 2012.

REFERENCES:

1. Benjamin C.Kuo, "Automatic Control Systems," Ninth Edition, PHI, 20l0

2. Nagrath & Gopal,"Control System Engineering," fifth edition, New Age International, 2012

ANTENNA AND WAVE PROPAGATION V-Semester

Pre-requisite: Basic knowledge of Electromagnetic Field and Wave guides

L	T	P	C
3	1	0	3

OBJECTIVES:

- To give insight of radiation phenomena.
- To give a thorough understanding of the radiation characteristics of different types of antenna
- To create awareness about the different types of propagation of radio waves at different Frequencies

UNIT I FUNDAMENTALS OF RADIATION

Definition of antenna parameters – Gain, Directivity, Effective aperture, Radiation Resistance, Band width, Beam width, I n p u t Impedance. Matching Baluns, Polarization mismatch, Antenna noise temperature, Radiation from oscillating dipole, half wave dipole. Folded dipole.

UNIT II ANTENNA ARRAYS

N element linear array, Pattern multiplication, Broadside and End fire array – Concept of Phased arrays, Adaptive array, Basic principle of antenna Synthesis-Binomial array, Yagi Arrays.

UNIT III APERTURE AND SLOT ANTENNAS

Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna , Reflector antenna , Aperture blockage , Feeding structures , Slot antennas ,Micro strip antennas – Radiation mechanism – Application ,Numerical tool for antenna analysis

UNIT IV SPECIAL ANTENNAS

Principle of frequency, independent antennas –Spiral antenna, helical antenna, Log periodic. Modern antennas-Reconfigurable antenna, Active antenna, Dielectric antennas, Electronic band gap structure and applications, Antenna Measurements-Test Ranges, Measurement of Gain, Radiation pattern, Polarization, VSWR

UNIT V PROPAGATION OF RADIO WAVES

Modes of propagation , Structure of atmosphere , Ground wave propagation, Tropospheric propagation , Duct propagation, Troposcatter propagation , Flat earth and Curved earth concept Sky wave propagation – Virtual height, critical frequency , Maximum usable frequency – Skip distance, Fading , Multi hop propagation

OUTCOMES:

At the end of the course, the students should be able to:

- Explain the various types of antennas and wave propagation
- Write about the radiation from a current element
- Analyse the antenna arrays, aperture antenna and special antenna

TEXT BOOK:

1. John D Kraus," Antennas for all Applications", 4th Edition, McGraw Hill, 2010.

REFERENCES:

1. Edward C. Jordan and Keith G. Balmain" Electromagnetic Waves and Radiating Systems" Prentice Hall of India, 2nd Edition 2011.
2. R.E. Collin," Antennas and Radio wave Propagation", McGraw Hill 1985.
3. Constantine.A. Balanis "Antenna Theory Analysis and Design", Wiley Student Edition, 4th Edition 2016.
4. Rajeswari Chatterjee, "Antenna Theory and Practice" Revised Second Edition New Age International Publishers, 2006.
5. S. Drabowitch, "Modern Antennas" Second Edition, Springer Publications, 2007
6. Robert S. Elliott "Antenna Theory and Design" Wiley Student Edition, 2006.
7. H. Sizun "Radio Wave Propagation for Telecommunication Applications", First Indian Reprint, Springer Publications, 2007.

MICROPROCESSOR AND MICROCONTROLLER LABORATORY V-Semester

L	T	P	C
0	0	3	2

OBJECTIVES:

- To introduce ALP concepts and features
- To write ALP for arithmetic and logical operations in 8086 and 8051
- To differentiate Serial and Parallel Interface
- To interface different I/Os with Microprocessors
- To be familiar with MASM

LIST OF EXPERIMENTS

8086 Programs using kits and MASM

1. Study of MASM
2. Basic arithmetic and Logical operations
3. Move a data block without overlap
4. Code conversion, decimal arithmetic and Matrix operations.
5. Floating point operations, string manipulations, sorting and searching
6. Password checking, Print RAM size and system date
7. Counters and Time Delay

Peripherals and Interfacing Experiments

8. Traffic light control
9. Stepper motor control
10. Digital clock
11. Key board and Display
12. Printer status
13. Serial interface and Parallel interface
14. A/D and D/A interface and Waveform Generation

8051 Experiments using kits and MASM

15. Basic arithmetic and Logical operations
16. Square and Cube program, Find 2"s complement of a number
17. Unpacked BCD to ASCII

OUTCOMES:

At the end of the course, the student should be able to:

- Write ALP Programmes for fixed and Floating Point and Arithmetic
- Interface different I/Os with processor, execute programs in 8051
- Generate waveforms using Microprocessors
- Explain the difference between simulator and Emulator

DIGITAL SIGNAL PROCESSING LABORATORY V-Semester

L	T	P	C
0	0	3	2

OBJECTIVES:

- To implement Linear and Circular Convolution
- To implement FIR and IIR filters
- To study the architecture of DSP processor
- To demonstrate Finite word length effect

LIST OF EXPERIMENTS:

MATLAB / EQUIVALENT SOFTWARE PACKAGE

1. Study of Matlab
2. Generation of sequences (functional & random) & correlation
3. Linear and Circular Convolutions
4. Spectrum Analysis using DFT
5. FIR filter design
6. IIR filter design
7. Multirate Filters
8. Equalization

DSP PROCESSOR BASED IMPLEMENTATION

9. Study of architecture of Digital Signal Processor
10. MAC operation using various addressing modes
11. Linear Convolution
12. Circular Convolution
13. FFT Implementation
14. Waveform generation
15. IIR and FIR Implementation
16. Finite Word Length Effect

OUTCOMES:

At the end of the course, the student should be able to:

- Carry out simulation of DSP systems
- Analyse Finite word length effect on DSP systems
- Demonstrate the applications of FFT to DSP
- Implement adaptive filters for various applications of DSP

DIGITAL COMMUNICATION LABORATORY

V-Semester

L	T	P	C
0	0	3	2

OBJECTIVES:

- To visualize the effects of sampling and TDM
- To implement PCM & DM
- To implement FSK, PSK and DPSK schemes
- To implement Equalization algorithms
- To implement Error control coding schemes

LIST OF EXPERIMENTS:

1. Study of VisSim
2. Signal Sampling and reconstruction
3. Time Division Multiplexing
4. Pulse Code Modulation and Demodulation
5. Delta Modulation and Demodulation
6. Observation (simulation) of signal constellations of BPSK, QPSK and QAM
7. Line coding schemes
8. FSK, PSK and DPSK schemes (Simulation)
9. Error control coding schemes - Linear Block Codes (Simulation)
10. Communication link simulation
11. Equalization – Zero Forcing & LMS algorithms (simulation)
12. Inter symbol Interference
13. PN Generator.

OUTCOMES:

At the end of the course, the student should be able to:

- Simulate end-to-end Communication Link
- Demonstrate their knowledge in base band signalling schemes through implementation of FSK, PSK and DPSK
- Apply various channel coding schemes & demonstrate their capabilities towards the
- Improvement of the noise performance of communication system.
- Simulate & validate the various functional modules of a communication system

APTITUDE SKILLS-I

V-Semester

L	T	P	C
0	0	1	1*

OBJECTIVE: The course attempts to enhance the quantitative aptitude skills of the participants.

The course would cover the following topics:

S.No.	Topic	No. of Periods
1	Number Systems	02
2	Test- 1	01
3	Equations and Ratio Proportions	02
4	Test - 2	01
5	Percentages	02
6	Test - 3	01
7	Averages and Mixtures	02
8	Test – 4	01
9	Quadratic equations and Progressions	02
10	Test - 5	01
11	Time & Work and Pipes & Cisterns	02
12	Test - 6	01
13	Time & Distance	02
14	Test - 7	01
15	Geometry - Mensuration	02
16	Test - 8	01
17	Permutations and Combinations	02
18	Test - 9	01
19	Probability	02
20	Test - 10	01
21	Data Interpretation	02
22	Test - 11	01
23	Data Sufficiency	02
24	Test - 12	01
	Total	36

OUTCOMES:
The outcome of the course is to enable the participants to succeed in campus recruitment and other career development Examinations

REFERENCES:
1. Quantitative Aptitude, Dr.R.S.Aggarwal, S.Chand & Company Pvt. Ltd, New Delhi
2. Quantitative Aptitude for Competitive Examinations, Abhijit Gupta, Tata McGraw-Hill Education.

PRINCIPLES OF MANAGEMENT AND PROFESSIONAL ETHICS VI-Semester

L	T	P	C
3	1	0	3

OBJECTIVES:

- To develop knowledge on the principles of management essential for all kinds of people in all kinds of organizations.
- To have a clear understanding of the managerial functions like planning, organizing, leading and controlling.
- To understand global business and diversity.
- To gain some basic knowledge on international aspect of management.
- To understand the concepts of computer ethics in work environment.

UNIT- I INTRODUCTION TO MANAGEMENT Definition of Management, process of Management-Planning, Organizing, leading, Controlling Classical Approach-Contribution. and Limitation, Management Science Approach, Skills, Roles and Performance: Types of managers Managerial Skills,- Technical Skill, Analytical Skill Decision Making skill, Human Relation skill, Communication skill. Managerial Roles – Interpersonal Role, Informational Role, Decisional Role.

UNIT – II PLANNING FUNCTION Elements of Planning-Objectives, Action, Resource, Implementation. Managerial Decision Making: Types of Decision, Process of Decision Making, Decision Making-Certainty Condition, Uncertainty Condition, Selecting Alternative. Managing Information System; Need for Decision Support System, MIS and DSS Strategic Planning –Organizational Strategy, Business Portfolio Matrix.

UNIT –III ORGANIZING FUNCTION Organizational Structure- Job Design, Departmentation, Span of Control, Delegation of Authority, Decentralized authority, Chain of Command and Authority, Line and Staff concept Matrix organizational Design

UNIT –IV ENGINEERING ETHICS Senses of 'engineering ethics' – variety of moral issues – types of inquiry – moral dilemmas – moral autonomy – kohlberg's theory – Gilligan's theory – consensus and controversy – professions and professionalism – professional ideas and virtues – theories about right action – self-interest – customs and religion – uses of ethical theories

UNIT – V ENGINEER'S RESPONSIBILITY FOR SAFETY Safety and risk – Assessment of safety and risk – Risk benefit analysis – Reducing risk – The Three Mile Island and Chernobyl- case studies

OUTCOMES: At the end of the course the student should be able to:

- Examine situations and to internalize the need for applying ethics principles, values to tackle with various situations.
- Develop a responsible attitude towards the use of computer as well as the technology.
- Able to envision the societal impact on the products / projects they develop in their career.
- Understanding the code of ethics and standards of computer professionals.
- Analyze the professional responsibility and empowering access to information in the work place.

TEXT BOOKS

1. Mike Martin & Roland schinzinger "Ethics in engineering" McGraw Hill 2009.
2. Govindarajan M, Natarajan. S.Senthil kumar V.S, "Engineering Ethics", Prentice Hall of India, 2004

REFERENCE BOOKS

1. Charles D.Fleddermamm, "Engineering Ethics", Pearson Hall (2004)
2. Charles E.Haris, Michael S.Protchard & Michael J.Rabins, "Engineering Ethics- concepts and cases", Wadsworth Thompson Learning
3. Jhon R.Boartright, "Ethics and conduct of Business", Pearson Education (2003)
4. Edmund G.See Bauer & Robert L.Bany, "Fundamental of Ethics for Scientists and Engineering", Oxford University

EMBEDDED SYSTEM DESIGN

VI-Semester

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Microprocessors, Microcontrollers & Digital System Design.

OBJECTIVES:

- To learn the architecture and programming of ARM processor.
- To be familiar with the embedded computing platform design and analysis.
- To be exposed to the basic concepts of real time Operating system.
- To learn the system design techniques and networks for embedded systems

UNIT I INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS

Complex systems and micro processors– Embedded system design process –Design example: Model train controller- Instruction sets preliminaries - ARM Processor – CPU: programming input and output supervisor mode, exceptions and traps – Co-processors- Memory system mechanisms – CPU performance- CPU power consumption.

UNIT II EMBEDDED COMPUTING PLATFORM DESIGN

The CPU Bus-Memory devices and systems–Designing with computing platforms – consumer electronics architecture – platform-level performance analysis - Components for embedded programs- Models of programs-Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size- Program validation and testing.

UNIT III PROCESSES AND OPERATING SYSTEMS

Introduction – Multiple tasks and multiple processes – Multirate systems- Preemptive real-time operating systems- Priority based scheduling- Interprocess communication mechanisms – Evaluating operating system performance- power optimization strategies for processes – Example Real time operating systems-POSIX-Windows CE.

UNIT IV SYSTEM DESIGN TECHNIQUES AND NETWORKS

Design methodologies- Design flows - Requirement Analysis – Specifications-System analysis and architecture design – Quality Assurance techniques- Distributed embedded systems – MPSoCs and shared multiprocessors.

UNIT V CASE STUDY

Data compressor - Alarm Clock - Audio player - Software modem-Digital still camera - Telephone answering machine-Engine control unit – Video accelerator.

OUTCOMES:

At the end of the course, the student should be able to:

- Describe the architecture and programming of ARM processor.
- Outline the concepts of embedded systems
- Explain the basic concepts of real time Operating system design.
- Use the system design techniques to develop software for embedded systems
- Differentiate between the general purpose operating system and the real time OS

TEXT BOOK:

1. Marilyn Wolf, “Computers as Components - Principles of Embedded Computing System Design”, Third Edition “Morgan Kaufmann Publisher, 2012

REFERENCES:

1. Jonathan W.Valvano, “Embedded Microcomputer Systems Real Time Interfacing”, Third Edition Cengage Learning, 2012.
2. David. E. Simon, “An Embedded Software Primer”, 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007
3. Raymond J.A. Buhr, Donald L.Bailey, “An Introduction to Real-Time Systems- From Design to Networking with C/C++”, Prentice Hall, 1999.
4. C.M. Krishna, Kang G. Shin, “Real-Time Systems”, International Editions, McGraw Hill 1997
5. K.V.K.K.Prasad, “Embedded Real-Time Systems: Concepts, Design & Programming”, Dream Tech Press, 2005.
6. Sriram V Iyer, Pankaj Gupta, “Embedded Real Time Systems Programming”, Tata McGraw Hill, 2004.
7. Raj Kamal, “Embedded Systems: Architecture, Programming and Design”, Second Edition Tata McGraw-Hill Education, 2011

COMPUTER AIDED SYSTEM DESIGN VI-Semester

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Electronic Circuits, Digital System Design and Analog Integrated Circuits

OBJECTIVES:

- To enable the students to study the evolution of EDA front end and back end tools
- To enable the students to construct and testing using PSPICE and HDL

UNIT - I OVERVIEW OF EDA AND PSPICE: Evolution of EDA Tools, Typical Design Flow of VLSI IC circuits (ASIC Flow), Design Capture and Design Verification Tools. (Chapter 1, book 3) ANALOG CIRCUIT TECHNIQUES: Overview of PSPICE, Types of Simulation - DC, AC, Transient, Monte Carlo, Parametric and others, Simulation devices- Laplace devices, Energy sources, Passive components, Semi conductors, ICs Special devices – voltage markers, Initial conditions, etc. (Book1)

UNIT – II MODELING FOR SIMULATION IN PSPICE: Modeling of digital circuits in SPICE, Analog modeling in the frequency domain, Time domain, Models for RLC, Diode, BJT, JFET and MOSFET. (Book 1)

UNIT – III VHDL: Introduction to VHDL – Entities and Architectures, Behavioral Modeling – Concurrent & Sequential processing – if, case, loops, next, exit, wait, and assert statements. Structural modeling –Port Map, Components and Generics. Delay models –Inertial, Transport and Delta Delays. Data types- Variables, Signals, Constants, Arrays. VHDL Operators, Functions, Procedures, Packages, Libraries and Configurations. Simple programming examples of Combinational and Sequential circuits. (Book 2)

UNIT – IV VERILOG HDL: Introduction to Verilog - Modules and Module Instances, Design Blocks and Stimulus Blocks. Data types and Operators. Modeling - Gate-Level (Structural), and Dataflow modeling-continuous assignments. Behavioral Modeling- initial, always, blocking and Non-Blocking statements. Basic System Tasks -display, monitor, time and stop. Tasks and Functions. Simple Programming Examples of Combinational and Sequential Circuits. (Book3)

UNIT – V ADVANCED TOPICS IN VERILOG AND SYNTHESIS: Delay Modeling-Distributed, Lumped, and Pin-to-Pin, Rise/Fall/Turn-Off, Min/Typical/Max Delays. Basic Switch-level modeling – PMOS, NMOS, and CMOS. Simple programming examples of Switch level modeling- CMOS Inverter, NAND/NOR gates, Multiplexers, CMOS Latches. Introduction to Verilog Synthesis Flow: Definition of terms – Technology Mapping, Library Cells and Technology Libraries.

OUTCOMES:

At the end of the course, the student should be able to:

- Understand EDA front end and back end tools.
- Enable the students to construct and testing using PSPICE

TEXT BOOKS:

1. Introduction to Pspice using Orcad for circuits & Electronics, Muhammad Rashid, Third Edition, Pearson Education
2. Douglas L. Perry, "VHDL –Programming by Example", TMH, 2002
3. Samir Palnitkar, "Verilog HDL –A guide to Digital Design and Synthesis" Pearson Education, 2004

REFERENCES:

1. Neil Weste and Kamran Eshraghian "Principles of CMOS VLSI Design "-Addison Wesley, 1998.
2. Charles H Roth, Jr. "Digital Systems Design using VHDL"-Thomson Learning, 2001

MICROWAVE ENGINEERING VI-Semester

Pre-requisite: Basic Knowledge of Electromagnetic Fields, Antenna and Wave Propagation

L	T	P	C
3	1	0	3

OBJECTIVES:

- To inculcate understanding of the basics required for circuit representation of RF networks.
- To deal with the issues in the design of microwave amplifier.
- To introduce knowledge on the properties of various microwave components.
- To deal with the microwave generation and microwave measurement techniques

UNIT I TWO PORT NETWORK THEORY Review of Low frequency parameters: Impedance, Admittance, Hybrid and ABCD parameters, Different types of interconnection of Two port networks, High Frequency parameters, Formulation of S parameters, Properties of S parameters, Reciprocal and lossless Network, Transmission matrix, RF behavior of Resistors, Capacitors and Inductors.

UNIT II RF AMPLIFIERS AND MATCHING NETWORKS Characteristics of Amplifiers, Amplifier power relations, Stability considerations, Stabilization Methods, Noise Figure, Constant VSWR, Broadband, High power and Multistage Amplifiers, Impedance matching using discrete components, Two component matching Networks, Frequency response and quality factor, T and Pi Matching Networks, Microstrip Line Matching Networks.

UNIT III PASSIVE AND ACTIVE MICROWAVE DEVICES Terminations, Attenuators, Phase shifters, Directional couplers, Hybrid Junctions, Power dividers, Circulator, Isolator, Impedance matching devices: Tuning screw, Stub and quarter wave transformers. Crystal and Schottkey diode detector and mixers, PIN diode switch, Gunn diode oscillator, IMPATT diode oscillator and amplifier, Varactor diode, Introduction to MIC.

UNIT IV MICROWAVE GENERATION Review of conventional vacuum Triodes, Tetrodes and Pentodes, High frequency effects in vacuum Tubes, Theory and application of two cavity Klystron Amplifier, Reflex Klystron oscillator, Traveling wave tube amplifier, Magnetron oscillator using Cylindrical, Linear, Coaxial Voltage tunable Magnetrons, Backward wave Crossed field amplifier and oscillator.

UNIT V MICROWAVE MEASUREMENTS Measuring Instruments : Principle of operation and application of VSWR meter, Power meter, Spectrum analyzer, Network analyzer, Measurement of Impedance, Frequency, Power, VSWR, Q- factor, Dielectric constant, Scattering coefficients, Attenuation, S-parameters.

OUTCOMES:

At the end of the course, the students should be able to:

- Explain the active & passive microwave devices & components used in Microwave communication systems.
- Analyze the multi- port RF networks and RF transistor amplifiers.
- Generate Microwave signals and design microwave amplifiers.

TEXT BOOKS:

1. Reinhold Ludwig and Gene Bogdanov, "RF Circuit Design: Theory and Applications", Pearson Education Inc., 2011
2. Robert E Colin, "Foundations for Microwave Engineering", John Wiley & Sons Inc, 2005

REFERENCES:

1. David M. Pozar, "Microwave Engineering", Wiley India (P) Ltd, New Delhi, 2008.
2. Thomas H Lee, "Planar Microwave Engineering: A Practical Guide to Theory, Measurements and Circuits", Cambridge University Press, 2004.
3. Mathew M Radmanesh, "RF and Microwave Electronics", Prentice Hall, 2000.
4. Annapurna Das and Sisir K Das, "Microwave Engineering", Tata Mc Graw Hill Publishing Company Ltd, New Delhi, 2005.

OPTICAL COMMUNICATION

VI-Semester

Pre-requisite: Basic knowledge of Analog and Digital Communication

L	T	P	C
3	1	0	3

OBJECTIVES:

- To facilitate the knowledge about optical fiber sources and transmission techniques
- To enrich the idea of optical fiber networks algorithm such as SONET/SDH and optical CDMA.
- To explore the trends of optical fiber measurement systems.

UNIT I INTRODUCTION TO OPTICAL FIBERS Evolution of fiber optic system- Element of an Optical Fiber Transmission link—Total internal reflection-Acceptance angle –Numerical aperture – Skew rays Ray Optics-Optical Fiber Modes and Configurations -Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes -Single Mode Fibers-Graded Index fiber structure.

UNIT II SIGNAL DEGRADATION OPTICAL FIBERS Attenuation - Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides-Information Capacity determination –Group Delay Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers-Mode Coupling –Design Optimization of SM fibers-RI profile and cut-off wavelength.

UNIT III FIBER OPTICAL SOURCES AND COUPLING Direct and indirect Band gap materials-LED structures -Light source materials –Quantum efficiency and LED power, Modulation of a LED, lasers Diodes-Modes and Threshold condition Rate equations-External Quantum efficiency -Resonant frequencies -Laser Diodes, Temperature effects, Introduction to Quantum laser, Fiber amplifiers- Power Launching and coupling, Lencing schemes, Fiber -to- Fiber joints, Fiber splicing-Signal to Noise ratio , Detector response time.

UNIT IV FIBER OPTIC RECEIVER AND MEASUREMENTS Fundamental receiver operation, Pre-amplifiers, Error sources – Receiver Configuration– Probability of Error –Quantum limit. Fiber Attenuation measurements- Dispersion measurements – Fiber Refractive index profile measurements – Fiber cut- off Wave length Measurements – Fiber Numerical Aperture Measurements – Fiber diameter measurements.

UNIT V OPTICAL NETWORKS AND SYSTEM TRANSMISSION Basic Networks – SONET / SDH – Broadcast – and –select WDM Networks –Wavelength Routed Networks – Non linear effects on Network performance –-Link Power budget -Rise time budget Noise Effects on System Performance-Operational Principles of WDM Performance of WDM + EDFA system – Solutions – Optical CDMA – Ultra High Capacity Networks.

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the various types of optical fibers
- Understand signal transmission in various fibers
- Understand the LED and laser sources and various types of coupling

TEXT BOOKS:

1. Gerd Keiser, “Optical Fiber Communication" McGraw -Hill International, 4th Edition. 2010.
2. John M. Senior, “Optical Fiber Communication”, Second Edition, Pearson Education, 2007.

REFERENCES:

1. Ramaswami, Sivarajan and Sasaki “Optical Networks”, Morgan Kaufmann, 2009.
2. J.Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 3rd Edition, 2008.
3. J.Gower, "Optical Communication System", Prentice Hall of India, 2001.

EMBEDDED SYSTEM DESIGN LABORATORY

VI-Semester

L	T	P	C
0	0	3	2

OBJECTIVES:

- To learn the working of ARM processor
- To understand the Building Blocks of Embedded Systems
- To learn the concept of memory map and memory interface
- To know the characteristics of Real Time Systems
- To write programs to interface memory, I/Os with processor
- To study the interrupt performance

LIST OF EXPERIMENTS

1. Study of ARM evaluation system
2. Study of Keil C Compiler
3. Interfacing ADC and DAC.
4. Interfacing LED and PWM.
5. Interfacing real time clock and serial port.
6. Interfacing keyboard and LCD.
7. Interfacing EPROM and interrupt.
8. Mailbox.
9. Interrupt performance characteristics of ARM and FPGA.
10. Flashing of LEDS.
11. Interfacing stepper motor and temperature sensor.
12. Implementing zigbee protocol with ARM.

OUTCOMES:

At the end of the course, the student should be able to:

- Write programs in ARM for a specific Application
- Interface memory and Write programs related to memory operations
- Interface A/D and D/A convertors with ARM system
- Analyse the performance of interrupt
- Write programmes for interfacing keyboard, display, motor and sensor.
- Formulate a mini project using embedded system

COMPUTER AIDED SYSTEM DESIGN LABORATORY

VI-Semester

L	T	P	C
0	0	3	2

OBJECTIVES:

- To Construct RC circuits, OPAMPS, Combinational and Sequential circuits using PSICE
- To Simulate and Implement sequential and combinational digital circuits using HDL

PSPICE:
(Modeling, Design, Simulation and Analysis using Schematic / Circuit file / both)

1. Study of PSPICE
2. RC circuits – Transient and AC analysis
3. MOS Device Characterization and CMOS Inverter Characteristics – DC analysis
4. Diode based circuits (like, Rectifiers, Clampers, etc.,) – Transient, Worst-case, MC, Sensitivity, etc. analysis
5. Amplifiers and Current mirrors using BJT/MOSFET
6. Op-Amp based Wein Bridge Oscillator and DAC using sub-circuit and Analog behavioural modelling
7. Digital Circuits – Logic switches / Multiplexer / Counter

HDL:
(Logic Design and Simulation of Digital Circuits using VHDL / Verilog HDL / Both)

8. Study of VHDL and Verilog
9. Full Adder and Multiplexer using different Modelling / Descriptions and Concurrent and Sequential execution in VHDL
10. 8-bit Adder / Multiplier (min 4-bit) – Port Map, Generics, Technology Mapping in VHDL
11. 8-bit Counter – Bottom up approach design and Test vector generation in Verilog HDL
12. NAND / NOR / Transmission gates using Switch level modelling in Verilog HDL
13. Design of simple sequential and combinational circuits
14. Design of ALU
15. Design of FSM and Control Unit
16. FPGA real time programming and I/O Interfacing– Waveform generation / Traffic light controller

OUTCOMES:

Upon completion of the course, students will be able to:

- Construct Analog and Digital circuits and study their characteristics using PSPICE.
- Implement digital circuits using HDL
  Tools to be used: LTSPICE, Mentor Graphics, Xilinx / Equivalent

MICROWAVE AND OPTICS LABORATORY VI-Semester

L	T	P	C
0	0	3	2

OBJECTIVES:

- To understand the working principle of optical sources, detector, fibers and microwave components
- To develop understanding of simple optical communication link.
- To learn about the characteristics and measurements in optical fiber
- To know about the behaviour of microwave components.
- To practice microwave measurement procedures

LIST OF EXPERIMENTS

MICROWAVE EXPERIMENTS

1. Reflex klystron or Gunn diode characteristics and basic microwave parameter measurement such as VSWR, frequency, wavelength.
2. Directional Coupler Characteristics.
3. Radiation Pattern of Horn Antenna.
4. S-parameter Measurement of the following microwave components (Isolator, Circulator, E Plane Tee, H Plane Tee, Magic Tee)
5. Attenuation and Power Measurement

OPTICAL EXPERIMENTS

1. DC Characteristics of LED and PIN Photo diode
2. Mode Characteristics of Fibers
3. Measurement of connector and bending losses
4. Fiber optic Analog and Digital Link- frequency response (analog) and eye diagram (digital)
5. Numerical Aperture determination for Fibers
6. Attenuation Measurement in Fibers

OUTCOMES:

At the end of the course, the students should be able to:

- Understand the working principle of optical sources, detector, fibers and microwave components
- Develop understanding of simple optical communication link
- Know about the behaviour of microwave components
- Learn about the characteristics and measurements in optical fiber

APTITUDE SKILLS –II

VI-Semester

L	T	P	C
0	0	1	1*

OBJECTIVES: The course attempts to enhance the reasoning aptitude skills of the participants.

The course would cover the following topics:

S.No.	Topic	No. of Periods
1	Number & Letter Series – Analogies	02
2	Test- 1	01
3	Coding and Decoding – Odd Man Out	02
4	Test – 2	01
5	Blood Relation – Direction Sense	02
6	Test – 3	01
7	Symbols and Notations	02
8	Test – 4	01
9	Deductions	02
10	Test – 5	01
11	Connectives	02
12	Test – 6	01
13	Clocks & Calendars	02
14	Test – 7	01
15	Analytical Reasoning	02
16	Test – 8	01
17	Distribution – Binary Logic and Puzzles	02
18	Test – 9	01
19	Cubes and Venn Diagrams	02
20	Test – 10	01
21	Non-Verbal Reasoning	04
22	Test - 11	01
	Total	36

OUTCOMES:

The outcome of the course is to enable the participants to employ reason in all endeavor and excel in their chosen career.

REFERENCES:

1. Test of Reasoning, Edgar Thorpe, Tata McGraw-Hill Publishing Company Ltd.

2. The modern approach to verbal and non-verbal reasoning, Dr.R.S.Agarwal, S.Chand & Company Pvt. Ltd.

3. Mathematical Reasoning, K.K.Sinha, Neeraj Srivastava & Sarita Parik, USI Publications

VLSI DESIGN

VII-Semester

Pre-requisite: Basic knowledge of Electronic Circuits and Digital System Design

L	T	P	C
3	1	0	3

OBJECTIVES:

- To understand the principles of CMOS-VLSI technology and the design issues involved at circuit, logic, layout, system level and to learn programmable logics .

UNIT-I INTRODUCTION TO VLSI AND MOS TRANSISTOR THEORY:
Evolution of IC Technologies: SS1, MSI, LSI, VLSI, ULSI, and GLSI. The Moore's Law. MOS THEORY: The MOS as switch - nMOS and pMOS. CMOS logic and its features. The nMOS Enhancement Transistor - Working and Characteristics. Threshold voltage and Body effect of MOS. MOS device design equations (First order effects).MOS INVERTERS: The CMOS inverter Transfer characteristics, Noise margin. The nMOS and pseudo-nMOS inverter. Tile BiCMOS Inverter. Tile CMOS Transmission gate.

UNIT-II CMOS PROCESSING TECHNOLOGY AND LAYOUTS:
Silicon Semiconductor fabrication technology, Fabrication forms and CMOS (Basic n-WELL process). LAYOUTS AND DESIGN RULES: Layout based rules, Simple CMOS Stick Layout diagrams - Inverter, NAND, NOR gates and Multiplexer. Scaling: Constant Field, and Constant voltage.

UNIT-III MOS CIRCUIT PERFORMANCE AND CMOS LOGIC CIRCUITS:
Sheet Resistance definition, MOS device capacitances - model. Distributed RC effects. Switching characteristics - Rise time, fall time and Delay time. Stage ratio. Simple examples of Combinational and Sequential circuits using CMOS: NANDI NOR gates, and Compound gates, Latches, and Registers.

UNIT- IV SUB SYSTEM DESIGN AND TESTING:
General System Design-Design of ALU subsystems, Adder and Multipliers Memories - Static RAM, Control Logic Implementation using PLA's. Testing of VLSI circuits - Need for Testing, Fault models, and ATPG. Design for Testability (DFT) - Scan Based and Self-test approaches.

UNIT-V PROGRAMMABLE LOGICS: Basic ROM structures, PLAs, PALs, PLDs, Implementation of Traffic Light controller using PLD. FPGAs and CPLDs: XILINX and ALTERA series.

OUTCOMES:
At the end of the course, the student should be able to:

- Learn the evolution of IC Technologies
- Learn and analyze front end and back end of CMOS Circuits
- Analyze circuit performance and logic circuits of CMOS
- Understand design and testability for VLSI circuits

TEXTBOOKS:

1. Neil Weste and Kamran Eshraghian "Principles of CMOS VLSI Design "- Addison Wesley, 1998.
2. Charles H Roth, Jr. "Digital Systems Design using VHDL" - Thomson Learning, 2001

REFERENCES:

1. VLSI Design Principles- John P. Uyemura, John Wiley, 2002
2. E. Fabricious, Introduction to VLSI design, McGraw-Hill 1990
3. Wayne Wolf, Modern VLSI Design, Pearson Education 2003

DATA COMMUNICATION NETWORKS VII-Semester

Pre-requisite: Basic knowledge of Digital System Design, Signals & Systems and Digital Communication

L	T	P	C
3	1	0	3

OBJECTIVES:

- To facilitate the knowledge about network and layered architecture
- To enrich the idea of peer-to-peer and MAC protocol
- To enrich the idea of various types of routers

UNIT - I NETWORK AND LAYERED ARCHITECTURE

Data Communication Networks: Introduction to PSTN, LAN, PSDN, ISDN, MAN (Ch1- Text 1) Protocols, Services & Layered Architecture: HTTP, DNS, SMTP, TCP & UDP Transport Layer Services, OSI Reference Model. Layered Services: Pear to Peer Communication, Connection Oriented and Connectionless Services, Blocking and Unblocking, Multiplexing and De multiplexing, Overview of TCP/IP Architecture. (Ch 2 of Text 2). Data Link Layers:

UNIT - II PEER TO PEER PROTOCOLS

Service Models, ARQ Protocols & Reliable Data Transfer Service – Stop and Wait ARQ Protocol, Go Back N ARQ Protocol, Selective Repeat ARQ Protocol .Framing – Flag, Bit Stuffing, Byte Stuffing. Point to Point Protocol: HDLC Data Link Control. (Ch 5 of Text 2.)

UNIT – III MEDIUM ACCESS CONTROL PROTOCOL

Multiple Access Communications: Random Access – ALOHA, Slotted ALOHA, CSMA, CSMA – CD, Scheduling MAC – Reservation System, Polling, Token Passing Rings. Channelization: FDMA, TDMA, CDMA.LAN Protocol – LAN Structure, 803.3 LAN Standards. Token Ring: 802.5 LAN Standards.
Wireless LAN: 802.11 LAN Standards. (Ch 6 of Text 2)

UNIT – IV PACKET SWITCHING NETWORK

Packet Switching Network Topology. Datagrams, Virtual Circuits. Connectionless Packet Switching, Virtual Circuit Packet Switching, VCI Routing – Classification, Routing Tables – Hierarchical Routing, Specialized Routing, Shortest Path Routing.ATM Network. (Ch 7 of Text 2)

UNIT – V BAND WIDTH OF TELEPHONE CHANNEL, TRANSMISSION MEDIA

Open wire, UG cable, Co-axial Cable, Microwave, Satellite Electronic Switching: Multiplexing – FDM, TDM, WDM, SONET Multiplexing. Circuit switches – Space Division Switches, Time Division Switches, Time – Space – Time Switches. Telephone Networks – Digital Cross Connect, Stored Program Control Switches Traffic Engineering: Network Traffic Load & Parameters, Grade of Service, Blocking Probability.

OUTCOMES:

At the end of the course, the students should be able to:

- Understand the network and layered architecture, peer-to-peer and MAC protocols
- Understand the transmission media and bandwidth of various cables

TEXT BOOKS:

1. Data Communication, Computer Networks and Open Systems by Fred Halsal IV Edition, Pearson Education Asia.
2. Communication Networks by Alberto Leon Garcia, Indra Widjaja, II edn, TMGH
3. Telecommunication Switching Systems & Networks by Thiagarajan Viswanathan. PHI

REFERENCES:

1. Data and Computer Communication by William Stalling VI Edition Pearson Education Asia.
2. Computer Networks by Andrew Tanenbaum, 3e, PHI

DIGITAL IMAGE PROCESSING VII-Semester

Pre-requisite: Basic knowledge of Signals & Systems, Digital Signal Processing and Digital Design

L	T	P	C
4	1	0	4

OBJECTIVES:

- To learn digital image fundamentals.
- To be exposed to simple image processing techniques.
- To be familiar with image compression and segmentation techniques
- To represent image in form of features.

UNIT - I DIGITAL IMAGE FUNDAMENTALS

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - color models.

UNIT - II IMAGE ENHANCEMENT

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering–Smoothing and Sharpening Spatial Filtering – Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

UNIT - III IMAGE RESTORATION AND SEGMENTATION

Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering Segmentation: Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation- Morphological processing- erosion and dilation.

UNIT - IV WAVELETS AND IMAGE COMPRESSION

Wavelets – Sub band coding – Multi-resolution expansions - Compression: Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.

UNIT - V IMAGE REPRESENTATION AND RECOGNITION

Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the image enhancement techniques
- Understand wavelets and image compression

TEXT BOOK:

1. Rafael C. Gonzales, Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2010.

REFERENCES:

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, “Digital Image Processing Using MATLAB”, Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011.
2. Anil Jain K. “Fundamentals of Digital Image Processing”, PHI Learning Pvt. Ltd., 2011.
3. Willlliam K Pratt, “Digital Image Processing”, John Willey, 2002.
4. Malay K. Pakhira, “Digital Image Processing and Pattern Recognition”, First Edition, PHI Learning Pvt. Ltd., 2011

MOBILE COMMUNICATION

VII-Semester

Pre-requisite: Basic knowledge of Digital Communication, Antennas and Applied Random Processes

L	T	P	C
3	1	0	3

OBJECTIVES

- To understand the issues involved in mobile communication system design and analysis.
- To understand the concept of frequency reuse.
- To understand the characteristics of wireless channels.
- To acquire knowledge in different modulation schemes and its error probability in wireless system.
- To know the fundamental limits on the capacity of wireless channels.
- To understand the diversity concepts.

UNIT I THE WIRELESS CHANNEL

Overview of wireless systems – Physical modelling for wireless channels – Time and Frequency coherence – Statistical channel models – Capacity of wireless Channel- Capacity of Flat Fading Channel — Channel Distribution Information known – Channel Side Information at Receiver –Channel Side Information at Transmitter and Receiver – Capacity with Receiver diversity – Capacity comparisons – Capacity of Frequency Selective Fading channels.

UNIT II PERFORMANCE OF DIGITAL MODULATION OVER WIRELESS CHANNELS

Fading– Outage Probability– Average Probability of Error — Combined Outage and Average Error Probability – Doppler Spread – Inter-symbol Interference.

UNIT III MULTIANTENNA COMMUNICATION

Realization of Independent Fading Paths – Receiver Diversity – Selection Combing – Threshold Combing – Maximal-Ratio Combing – Equal - Gain Combing – Transmitter Diversity – Channel known at Transmitter – Channel unknown at Transmitter – The Alamouti Scheme– Transmit & Receive Diversity-MIMO Systems.

UNIT IV MULTICARRIER MODULATION

Data Transmission using Multiple Carriers – Multicarrier Modulation with Overlapping Sub channels – Mitigation of Subcarrier Fading – Discrete Implementation of Multicarrier Modulation – Peak to average Power Ratio- Frequency and Timing offset – Case study IEEE 802.11a

UNIT V CELLULAR CONCEPTS

Frequency Reuse – Channel Assignment Strategies – Hand off Strategies – Interference and system capacity- Co-Channel Interference- Adjacent Channel Interference – Trunking and Grade of service – Improving coverage & capacity in cellular systems-Cell Splitting- Sectoring-Repeaters for Range Extension-Microcell Zone Concept.

OUTCOMES:

At the end of the course, the students should be able to:

- Apply diversity techniques in wireless systems.
- Design cellular systems to achieve a given GoS (Grade of Service) in coverage and blocking probability.

TEXT BOOKS:

1. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press, 2005.

REFERENCES:

1. David Tse and Pramod Viswanath, “Fundamentals of Wireless Communication”, Wiley Series in Telecommunications, Cambridge University Press, 2005.
2. Theodore. S. Rappaport, “Wireless Communications: Principles and Practice", 2nd Edition, Pearson Education, India, 2009.
3. Arogyaswami Paulraj, Rokit Nabar, Dhananjay Gore, “Introduction to Space-Time Wireless Communication”, 1st Edition, Cambridge University Press, 2008.

VLSI DESIGN LABORATORY

VII-Semester

L	T	P	C
0	0	3	2

OBJECTIVES:

- To learn Hardware Descriptive Language (Verilog/VHDL)
- To learn the fundamental principles of VLSI circuit design in digital and analog domain
- To familiarize fusing of logical modules on FPGAs
- To provide hands on design experience with professional design (EDA) platforms.

List of Experiments:

(a) Study of IC design flow using EDA tools of different vendors

(b) Introduction to JTAG

FPGA Based experiments:

1. HDL based design entry, Test bench creation and simulation of BCD counters PRBS generators, Comparators (min 4-bit) / Bothe multiplier / Carry select adder.
2. Synthesis, Placement and Routing (P&R) and post P&R simulation of the components simulated in (Expt. No. 2) above
3. Critical paths and static timing analysis results to be identified. Identify and verify possible conditions under which the blocks will fail to work correctly.
4. Hardware fusing and testing of each of the blocks simulated in (Expt. 2). Use of either chip scope feature (Xilinx) or the signal tap feature (Altera) is a must.
5. Invoke the PLL and demonstrate the use of the PLL module for clock generation in FPGAs.

IC Design Experiments:

6. Design and PSPICE simulation of
   (a) Simple 5 transistor differential amplifier. Measure gain, BW, output impedance, ICMR, and CMRR.
   (b) Ring Oscillator
7. Layout generation, DRC and LVS Checking, Parasitic Extraction and Resimulation of CMOS Inverter.
8. Synthesis and Standard cell based design of a circuit simulated in (Expt. 7-b) above - Synthesis principles, Logical Effort, Interpreting Scripts, Constraints and Library preparation and generation, Boolean Optimization, Optimization for Area, Power.
9. For Expt. 7-b above, Floor Planning, Placement and Routing (P&R), Power and Clock Routing, and post P&R simulation
10. Static Timing analyses procedures and constraints. Critical path considerations.
11. DFT - Scan chain insertion / Clock Tree Synthesis / Stick diagrams.

Tools to be used: Based on Xilinx / Mentor Graphics / Cadence / Altera / MAGMA / Tanner / Microwind / LTSPICE / Equivalent

OUTCOMES:

At the end of the course, the students should be able to:

- Write HDL code for basic as well as advanced digital integrated circuits.
- Import the logic modules into FPGA Boards and carry out a series of validations of the design
- Synthesize, Place and Route the digital IPs.
- Design, Simulate and Extract the layouts of Analog IC Blocks using EDA tools.

NETWORKING LABORATORY VII-Semester

L	T	P	C
0	0	3	2

OBJECTIVES:

- To understand the functioning of various protocols in Wired and Wireless Environment.
- To perform real time experimentation using the existing infrastructure.
- To impart programming skill using NS2 / QUALNET / NS3 / OMNET / CISCO.
- To gain knowledge to construct LAN, WLAN, and VLAN in a real-time environment.

List of experiments:

1. a) Study of different types of Network cables and implement cross-wired cable and straight through cable using clamping tool
   b) Study of Network devices
   c) Study of Network IP
2. Configuration of Local Area Network (LAN)
3. Configuration of Virtual Local Area Network (VLAN - Tunnelling & Inter VLAN)
4. Configuration of Wireless Local Area Network (WLAN)
5. Configure a Network using Ad-hoc On-Demand Distance Vector routing (AODV) and Dynamic Source routing (DSR) and analyse performance
6. Configure a Network using Address Resolution protocol (ARP) and Routing Information Protocol (RIP) and analyse performance
7. Configure a Internet Protocol (IP) Network using Open Shortest Path First (OSPF) Algorithm and Enhanced Interior Gateway Routing Protocol (EIGRP) Algorithm and analyse performance
8. Configure a Network using Automatic Repeat Request (ARQ) Protocol: (a) Stop and Wait protocol, (b)) Token bus & Token ring protocol and (c) Go back N & Selective repeat protocols and analyse performance
9. Configure a Network using MAC Protocols: Carrier Sense Multiple Access – Collision detection (CSMA-CD) and Carrier Sense Multiple Access – Collision Avoidance (CSMA-CA) Protocols and analyse performance
10. Configure a Network using pure ALOHA & Slotted ALOHA protocols and analyse performance
11. Configure a Network using Telnet and Secure Shell (SSH) protocols and analyse performance
12. Analyse the Congestion and traffic flow in a network

OUTCOMES:

At the end of the course, the students should be able to:

- Ability to design MAC and routing protocols in Wired and Wireless Environment using NS2 / QUALNET / NS3 / OMNET / CISCO
- Acquire the technical competence to meet out the industry expectation on the state – of the art wired / wireless technologies.
- Acquire the ability to design WLAN/ LAN systems meeting out real time requirements

Tools to be used: Experiments using NS2/ QUALNET /NS3/ OMNET/ CISCO Packet Tracer

NEURAL NETWORKS & FUZZY LOGIC

VIII-Semester

Pre-requisite: Basic knowledge of Mathematics, Data Communication and Networks.

L	T	P	C
3	1	0	3

OBJECTIVES:

- To learn the various architectures of building an ANN and its applications
- To learn advanced methods of representing information in ANN like self-organizing networks, associative and competitive learning
- To learn the fundamentals of Crisp sets, Fuzzy sets and Fuzzy Relations

UNIT – I INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS

Neuro-physiology - General Processing Element - ADALINE - LMS learning rule – MADALINE – XOR Problem – MLP - Back Propagation Network - updation of output and hidden layer weights - application of BPN

UNIT – II ASSOCIATIVE MEMORY & CPN

Associative memory - Bi-directional Associative Memory – Hopfield memory - traveling sales man problem Annealing, Boltzmann machine - learning – application - Counter Propagation network – architecture – training – Applications.

UNIT – III SELF ORGANIZING MAP & ART

Self-organizing map - learning algorithm - feature map classifier – applications - architecture of Adaptive Resonance Theory - pattern matching in ART network.

UNIT – IV CRISP SETS AND FUZZY SETS

Introduction – crisp sets an overview – the notion of fuzzy sets –Basic concepts of fuzzy sets – classical logic and overview – Fuzzy logic- Operations on fuzzy sets - fuzzy complement – fuzzy union – fuzzy intersection combinations of operations – general aggregation operations

UNIT – V FUZZY RELATIONS

Crisp and fuzzy relations – binary relations – binary relations on a single set– equivalence and similarity relations – Compatibility or tolerance relations– orderings – morphisms-fuzzy relation equations.

OUTCOMES:

At the end of the course, the students should be able to:

- Learn the various architectures of building an ANN and its applications
- Learn the Fundamentals of Crisp sets, Fuzzy sets and Fuzzy Relations

TEXT BOOKS

1. Freeman J.A. and Skapura B.M., "Neural Networks, Algorithms Applications and Programming Techniques", Addison-Wesley, 1990.
2. George J Klir and Tina A Folger" Fuzzy sets, uncertainty and information", Prentice Hall of India

REFERENCES:

1. Laurene Fausett, "Fundamentals of Neural Networks: Architecture, Algorithms and Applications", Pearson Education, 1994.
2. H.J. Zimmerman, "Fuzzy set theory and its Applications", Allied Publishers Ltd.

SATELLITE COMMUNICATION

VIII-Semester

Pre-requisite: Basic knowledge of Antennas and Digital Communication

L	T	P	C
3	1	0	3

OBJECTIVES:

- To understand the basics of satellite orbits.
- To understand the satellite segment and earth segment.
- To analyze the various methods of satellite access.
- To understand the applications of satellites.

UNIT I SATELLITE ORBITS: Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits – Look Angle Determination- Limits of visibility –eclipse-Sub satellite point –Sun transit outage-Launching Procedures - launch vehicles and propulsion.

UNIT II SPACE SEGMENT AND SATELLITE LINK DESIGN: Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, Communication Payload and supporting subsystems, Telemetry, Tracking and command. Satellite Uplink and Downlink Analysis and Design, Link Power Budget, C/N calculation, G/T ratio-Performance Impairments-System noise, Intermodulation Noise, Noise Temperature, Propagation Factors, Rain and Ice effects, Polarization.

UNIT III EARTH SEGMENT: Introduction – Receive – Only home TV systems (TVRO) – Outdoor UNIT – Indoor UNIT for analog (FM) TV – Master antenna TV system (MATV) – Community Antenna TV system (CATV) – Transmit – Receive earth stations, Antennas, Terrestrial Interface, Equipment Measurements on G/T, C/N, EIRP, Antenna Gain.

UNIT IV SATELLITE ACCESS: Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, Assignment Methods, Spread Spectrum communication, compression – encryption.

UNIT V SATELLITE APPLICATIONS: INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- World space services, Business TV (BTV), GRAMSAT, Specialized services – E –mail, Video conferencing, Internet.

OUTCOMES:

At the end of the course, the students should be able to:

- Analyze the satellite orbits.
- Analyze the earth segment and space segment.
- Design various satellite applications

TEXT BOOK:

1. Dennis Roddy, "Satellite Communication", 4th Edition, McGraw Hill International, 2006.

REFERENCES:

1. Wilbur L.Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, "Satellite Communication Systems Engineering", Prentice Hall/Pearson, 2007.
2. N. Agarwal, "Design of Geosynchronous Space Craft", Prentice Hall, 1986.
3. Bruce R. Elbert, "Satellite Communication Applications", Hand Book, Artech House Bostan London, 1997.Tri T. Ha, "Digital Satellite Communication", II edition, 1990. ACC.NO: B133888
4. Emanuel Fthenakis, "Manual of Satellite Communications", McGraw Hill Book Co., 1984.
5. Robert G. Winch, "Telecommunication Transmission Systems", McGraw-Hill Book Co., 1983.
6. Brian Ackroyd, "World Satellite Communication and earth station Design", BSP professional Books, 1990.
7. G.B.Bleazard, "Introducing Satellite communications", NCC Publication, 1985.
8. M.Richharia, "Satellite Communication Systems-Design Principles", Macmillan 2003.

List of Electives

(Inter-Disciplinary)

DISASTER MANAGEMENT Elective – I (for VI Semester)

Pre - requisite: Basic Knowledge of Environmental Science

OBJECTIVES:

L	T	P	C
3	1	0	3

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity

UNIT I INTRODUCTION TO DISASTERS

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake-holders- Institutional Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

OUTCOMES:

At the end of the course, the student should be able to:

- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management

TEXTBOOKS:

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012.
3. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM,
4. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

REFERENCES:

1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy, 2009.

REMOTE SENSING AND GIS — Elective – I (for VI Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic Knowledge of Science & Engineering

OBJECTIVES:

- To provide students an exposure to Remote sensing
- To ensure that students begin to understand the geographic information system

UNIT – I REMOTE SENSING

Definition – Components of Remote Sensing – Energy, Sensor, Interacting Body - Active and Passive Remote Sensing – Platforms – Aerial and Space Platforms – Balloons, Helicopters, Aircraft and Satellites – Synoptivity and Repetivity – Electro Magnetic Radiation (EMR) – EMR spectrum – Visible, Infra Red (IR), Near IR, Middle IR , Thermal IR and Microwave – Black Body Radiation - Planck's law – Stefan-Boltzman law.

UNIT – II EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIALS

Atmospheric characteristics – Scattering of EMR – Raleigh, Mie, Nonselective and Raman Scattering – EMR Interaction with Water vapour and ozone – Atmospheric Windows – Significance of Atmospheric windows – EMR interaction with Earth Surface Materials – Radiance, Irradiance, Incident, Reflected, Absorbed and Transmitted Energy – Reflectance – Specular and Diffuse Reflection Surfaces- Spectral Signature – Spectral Signature curves – EMR interaction with water, soil and Earth Surface

UNIT – III OPTICAL AND MICROWAVE REMOTE SENSING

Satellites - Classification – Based on Orbits – Sun Synchronous and Geo Synchronous – Based on Purpose – Earth Resources Satellites, Communication Satellites, Weather Satellites, Spy Satellites – Satellite Sensors - Resolution – Spectral, Spatial, Radiometric and Temporal Resolution – Description of Multi Spectral Scanning – Along and Across Track Scanners – Description of Sensors in Landsat, SPOT, IRS series – Current Satellites - Radar – Speckle - Back Scattering – Side Looking Airborne Radar – Synthetic Aperture Radar – Radiometer – Geometrical characteristics

UNIT – IV GEOGRAPHIC INFORMATION SYSTEM

GIS – Components of GIS – Hardware, Software and Organizational Context – Data – Spatial and Non-Spatial – Maps – Types of Maps – Projection – Types of Projection - Data Input – Digitizer, Scanner – Editing – Raster and Vector data structures – Comparison of Raster and Vector data structure – Analysis using Raster and Vector data – Retrieval, Reclassification, Overlaying, Buffering – Data Output – Printers and Plotters 43

UNIT – V MISCELLANEOUS TOPICS

Visual Interpretation of Satellite Images – Elements of Interpretation - Interpretation Keys Characteristics of Digital Satellite Image – Image enhancement – Filtering – Classification - Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Urban Applications - Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Water resources – Urban Analysis – Watershed Management – Resources Information Systems .

OUT COMES:

At the end of the course, the students should be able to:

- Understand the concept of remote sensing
- Understand the different application of GIS

TEXT BOOKS:

1. Anji Reddy, Remote Sensing and Geographical Information Systems, BS Publications 2001
2. M.G. Srinivas (Edited by), Remote Sensing Applications, Narosa Publishing House, 2001.

REFERENCES:

1. Lillesand T.M. and Kiefer R.W. Remote Sensing and Image Interpretation, John Wiley and Sons, Inc, New York
2. Janza.F.J., Blue, H.M., and Johnston, J.E., "Manual of Remote Sensing Vol.I, American Society of Photogrammetry, Virginia, U.S.A, 1975.
3. Burrough P A, Principle of GIS for land resource assessment, Oxford,

COMPUTER CONTROL OF PROCESSES Elective – I (for VI Semester)

Pre requisite: Basic knowledge of Control systems.

L	T	P	C
3	1	0	3

OBJECTIVES

- To study the analysis of discrete data system
- To learn about the various digital control algorithm.
- To study the techniques of DAS, DDC, AI and SCADA.
- To learn about PLC and programming some basic applications.

UNIT-I ANALYSIS OF DISCRETE DATA SYSTEM

State-space representation of discrete data systems – Selection of sampling process – Selection of sampling period – Review of z-transform – Pulse transfer function – Modified z-transform - Stability of discrete data system – Jury's stability test.

UNIT-II DESIGN OF DIGITAL CONTROLLER

Digital PID – Position and velocity form – Deadbeat's algorithm – Dahlin's algorithm – Kalman's algorithm - Pole placement controller – Predictive controller.

UNIT-III COMPUTER AS A CONTROLLER

Basic building blocks of computer control system – Data acquisition systems – SCADA – Direct digital control – Introduction to AI and expert control system – Case study - Design of computerized multi loop controller.

UNIT-IV PROGRAMMABLE LOGIC CONTROLLER

Evolution of PLC's – Components of PLC – Advantages over relay logic - PLC programming languages – Ladder diagram – Programming timers and counters – Design of PLC.

UNIT-V APPLICATIONS OF PLC

Instructions in PLC – Program control instructions, math instructions, sequencer instructions – Use of PC as PLC – Application of PLC – Case study of bottle filling system.

OUTCOMES

At the end of the course, the students should be able to:

- Understand the analysis of discrete data system
- Understand about the various digital control algorithm.
- Learn the techniques of DAS, DDC, AI and SCADA.
- Understand about programming of PLC.

TEXT BOOKS

1. P.B. Deshpande, and R.H.Ash, 'Computer Process Control', ISA Publication, USA, 1995.
2. Petruzella, 'Programmable Controllers', McGraw Hill, 1989.

REFERENCE BOOKS

1. C.M.Houpis, G.B.Lamount, 'Digital Control Systems Theory, Hardware and Software', International Student Edition, McGraw Hill Book Co., 1985.
2. G. Stephanoupoulis, 'Chemical Process Control', Prentice Hall of India, New Delhi, 1990.
3. T.Hughes, 'Programmable Logic Controllers, 3rd Edition, ISA press.
4. Singh, 'Computer Aided Process Control', Prentice Hall of India, 2004.

SENSORS AND ACTUATORS Elective – I (for VI Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Measurement & Instrumentation

OBJECTIVES

- To understand the science of measurements and sensors
- To identify and avoid errors in measurements
- To select appropriate sensors for various applications.
- To understand the science of Micro actuators & Micro sensors

UNIT I- SENSORS AND ACTUATOR CHARACTERISTICS:

Measurement devices; Difference between sensor, transmitter and transducer - Primary measuring element selection and characteristics: Range; resolution, Sensitivity, error, repeatability, linearity and accuracy, impedance, backlash, Response time, Dead band. - System response- first order system response, undamped second order system response, frequency response. - Signal transmission: Types of signal: Pneumatic signal; Hydraulic signal; Electronic Signal. Standard signal ranges: Electronic transmitter adjusted range; Pneumatic transmitter adjusted range; Transmission system dynamics; transmission Lag; Transmitter Gain; Smart transmitters.

UNIT II- SENSORS

Classification of sensors, Principles and Applications of displacement sensor – position sensors, linear and angular – velocity sensors – Torque sensors. Principle and applications of pressure sensor, flow sensors, temperature sensors, acoustic sensor and vibration sensors. Application of sensors in Robotics

UNIT III- ACTUATORS

Definition, types and selection of Actuators; linear; Rotary; Logical and Continuous Actuators.- Fluid power actuators: Pneumatic actuator; Electro-Pneumatic actuator; cylinder, rotary actuators, Mechanical actuating system: Hydraulic actuator; Control valves; Construction; Valve coefficient or valve sizing; valve characteristics; types of valves; valve selection.

Electrical actuating systems: Solid-state switches, Solenoids, Electric Motors; D.C. motors, Classifications; Application; Brushless DC Motor; Working principle and its application; AC motors, Single phase Motor; 3 Phase Motor; Induction Motor; Synchronous Motor; Stepper motors; half stepper; full stepper; linear motor, Piezoelectric Actuator.

UNIT IV-MICRO SENSORS AND MICRO ACTUATORS

Micro Sensors: Principles and examples, Force and pressure micro sensors, position and speed micro sensors, acceleration micro sensors, chemical sensors, biosensors, temperature micro sensors and flow micro sensors. Micro Actuators: Actuation principle, shape memory effects-one way, two way and pseudo elasticity. Types of micro actuators- Electrostatic, Magnetic, Fluidic, Inverse piezo effect, other principles. Microbotics: Drive principle, classification, application, micro assembly with the help of microbots, flexible microbots, automated desktop station using micromanipulation robots.

UNIT V-SENSOR MATERIALS AND PROCESSING TECHNIQUES:

Materials for sensors: Silicon, Plastics, metals, ceramics, glasses, nano materials Processing techniques: Vacuum deposition, sputtering, chemical vapour deposition, electro plating, photolithography, silicon micro machining, LIGA process.

OUTCOME:

At the end of the course, the students will be able to:

- Understand the characteristics of sensors and actuators
- Know well about Micro actuators & Micro sensors
- Analyze various sensors and actuators.

TEXT BOOKS:

1. Patranabis.D, Sensors and Transducers, Wheeler publisher, 1994.
2. Sergej Fatikow and Ulrich Rembold, Microsystem Technology and Microbotics First edition, Springer –Verlag Newyork, Inc, 1997.
3. Jacob Fraden, “Hand Book of Modern Sensors: Physics, Designs and Application” Fourth edition, Springer, 2010.

REFERENCES:

1. Robert H Bishop, “The Mechatronics Hand Book”, CRC Press, 2002.
2. Thomas. G. Bekwith and Lewis Buck.N, Mechanical Measurements, Oxford and IBH publishing Co. Pvt. Ltd.,
3. Massood Tabib and Azar, Micro actuators Electrical, Magnetic, thermal, optical, mechanical, chemical and smart structures , First edition, Kluwer academic publishers, Springer,1997.
4. Manfred Kohl, Shape Memory Actuators, first edition, Springer.

IOT ARCHITECTURE AND PROTOCOLS — Elective – I (for VI Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Data Communication

OBJECTIVES

- To Understand the Architectural Overview of IoT
- To Understand the IoT Reference Architecture and Real World Design Constraints
- To Understand the various IoT Protocols (Datalink, Network, Transport, Session, Service)

UNIT I – OVERVIEW IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. 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

UNIT II – REFERENCE ARCHITECTURE IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

UNIT III – IOT DATA LINK LAYER & NETWORK LAYER PROTOCOLS

PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), Wireless HART, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP

UNIT IV – TRANSPORT & SESSION LAYER PROTOCOLS Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT

UNIT V – SERVICE LAYER PROTOCOLS & SECURITY Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4 , 6LoWPAN, RPL, Application Layer

OUTCOMES:

At the end of the course, the student should be able to:

- Understand the Architectural Overview of IoT
- Understand the IoT Reference Architecture and Real World Design Constraints
- Understand the various IoT Protocols (Datalink, Network, Transport, Session, Service)

TEXT BOOKS:

1. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1 st Edition, Academic Press, 2014.
2. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI

REFERENCES:

1. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
2. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118- 47347-4, Willy Publications

BIG DATA ANALYTICS Elective – I (for VI Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic Knowledge on Data bases, Data mining and Data Structures.

OBJECTIVES: The main objective of this course

- To understand Big Data models and structure
- Introduction to Analytic Tool –R
- Mining Data streams for Analytics
- Understanding Map Reduce Framework
- Advanced Analytic Tools and Techniques

UNIT - I INTRODUCTION TO ANALYTIC TOOL -R Using R for Initial Analysis of the Data - Introduction to R programming, initial exploration - analysis of the data using R - basic visualization using R –Basic Scripting-Data Set Analysis

UNIT-II OVERVIEW OF DATA ANALYTICS Introduction to Big Data Analytics -definition -overview of big data - Characteristics– Importance of Big Data - data preparation -model planning,-Use cases-critical activities in each phase of the lifecycle.

UNIT –III MINING DATA STREAMS The Stream Data Model .-Sampling Data in a Stream -Filtering Streams - Counting Distinct Elements in a Stream -Estimating Moments .- Counting Ones in a Window Link Analysis : PageRank -Topic-Sensitive PageRank -Link Spam -Hubs and Authorities .

UNIT –IV MAPREDUCE AND THE NEW SOFTWARE STACK

Distributed File Systems-MapReduce Algorithms Using MapReduce-Extensions to MapReduce the Communication Cost Model-Complexity Theory for MapReduce.

UNIT –V BIG DATA FROM THE TECHNOLOGY PERSPECTIVE

Introuduction to Hadoop –Components of Hadoop –Application Development in Hadoop –PigHive-Jaql. Getting Data in Hadoop-copy Data-Flume, Other Hadoop Components-ZooKeeperHBase-Oozie.

OUTCOMES:

At the end of the course, the students should be able to:

- Have Strong Foundations on Data Analytics Models and structure
- Understand the Role of Big Data and its importance
- Data modeling and Link stream Analysis
- Able to setup Analytical Environment using R-Studio
- Able to perform simple analysis application and programs using R –Scripts.

TEXT BOOKS:

1. Jure Leskovec, Anand Rajaraman, Jeffrey D.Ullman, “Mining of Massive Datasets” ,Second Edition, Cambridge University Press, 2014.
2. Paul Zikopoulos, “Understanding Big Data”, First Edition, McGraw Hill Corporations-2012.

REFERENCES:

1. Garrett Grolemund,” Introduction to Data Science with R “, O’Reilly media, 2014.
2. Garrett Grolemund,”Hands-On Programming with R: Write Your Own Functions and Simulations Paperback”, O'Reilly media, 2014.

NANO SCIENCE — Elective – I (for VI Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Material Science & Electronics

OBJECTIVES:

- To Understand carbon nano structures
- To Understand carbon nano tubes for data processing
- To Understand mass storage device
- To Understand data transmission interfaces and displays

UNIT I TECHNOLOGY AND ANALYSIS:

Film Deposition Methods, Lithography, Material Removing Technologies, Etching and Chemical, Mechanical Processing, Scanning Probe Techniques. Carbon Nano Structures: Carbon Clusters, Carbon Nano tubes, Fabrication, Electrical, Mechanical and Vibrational Properties, Applications of Carbon Nano Tubes.

UNIT II LOGIC DEVICES: Silicon MOSFETS,

Novel Materials and Alternative Concepts, Ferro Electric Filed Effect Transistors, Super Conductor Digital Electronics, Carbon Nano Tubes for Data Processing.

UNIT III RANDOM ACCESS MEMORIES:

High Permittivity Materials for DRAMs, Ferro Electric Random Access Memories, Magneto-Resistive RAM.

UNIT IV MASS STORAGE DEVICES:

Hard Disk Drives, Magneto Optical Disks, Rewriteable DVDs based on Phase Change Materials, Holographic Data Storage.

UNIT V DATA TRANSIMISSION, INTERFACES AND DISPLAYS:

Photonic Networks, Microwave Communication Systems, Liquid Crystal Displays, Organic Light Emitting Diodes.

OUTCOMES:

At the end of the course, the students should be able to:

- Understand the basic structure and functioning of carbon nano tube
- Super conductors in digital electronics
- Materials and material processing for DRAMs,
- Technique for mass storage devices
- Data transmission interfaces and displays

TEXTBOOKS:

1. Rainer Waser, “Nano Electronics and Information Technology”, Wiley VCH, April 2003.
2. Charles Poole, “Introduction to Nano Technology”, Wiley Interscience, May 2003

COMPUTER INTEGRATED MANUFACTURING Elective – I (for VI Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic Knowledge of CAD & CAM

OBJECTIVES:

- To know about the CIM.
- To know about the Group technology and process planning.

UNIT I : Introduction to Automation -Production system Facilities, Manufacturing Support Systems, Automation in Production Systems, Automated Manufacturing Systems, Types of Automation, Computerized manufacturing Support System, Reasons for Automating, Manufacturing Industries and Products, Manufacturing operations, Product / Production Relationships, Production Concepts and Mathematical Models. Basic elements of an Automated System, Advanced Automation Functions, Levels of Automation. Industrial Control Systems-Process Industries versus Discrete Manufacturing Industries, Continuous versus Discrete Control, Computer Process Control, Forms of Computer Process Control

UNIT II Fundamentals of CAD, CAM and CAE, CIM Definition, CIM Wheel, CIM components, Evolution of CIM - Development of computers - Needs of CIM, Benefits of CIM. CIM Hardware & Software, CIM Models. DBMS and Network system - Data base and DBMS- requirement, features and architecture of DBMS. CIM Communications (Network) System, Communication Matrix, Network Architectures, Tools and Techniques.

UNIT III Group Technology – Introduction - coding and classification system, Production Flow Analysis, Coding System - OPTIZ, MICLASS, Benefits of Group Technology, Machine cell design. Process Planning- Structure of a Process Planning, Process Planning function, CAPP - Types of CAPP, Retrieval and Generative type CAPP, Concurrent engineering, Design for Manufacturing and Assembly, Advanced Manufacturing Planning.

UNIT IV Fundamentals of NC Technology – Basic components of an NC System, NC Coordinate and Motion Control systems, Computer Numerical Control, Features of CNC, Machine Control Unit for CNC, CNC Software, DNC Machines, Application of NC machine tools Applications, Structure of CNC Machines, , CNC Controllers, NC Part Programming, Computer-Assisted Part Programming. Features and Applications of CNC Turning Centre, CNC Milling Machine, CNC Turn-Mill Centre, CNC machining Centre, CNC Tooling system and Automatic Tool Changing System, Computer Aided Quality Control-contact, non contact inspection methods, Coordinate Measuring Machine CMM - Integration of CAQC with CAD / CAM.

UNIT V FMS -Components of FMS, Computer control and function, FMS planning, scheduling and control, Knowledge Based Scheduling, FMS operation control, Hierarchy of computer control, supervisory control, types of software used in FMS, Applications and Benefits. Production Support Machines and Systems -Industrial Robots, Automated Material Handling, Automatic Guided Vehicles, Automated Storage and Retrieval system. Developments in Manufacturing Technologies- AI and Expert System, Agile manufacturing, Lean Manufacturing, Virtual Manufacturing, Simulation in Manufacturing – Factories of Future.

OUTCOMES:

At the end of the course the students should be able to:

- Develop through basic knowledge about CIM.
- Acquire knowledge on the applications of CIM.
- Learn the usage of group technology and process planning.

TEXT BOOKS:

1. Kant Vajpayee.S, “Principles of Computer- Integrated Manufacturing”; 1st ed. PHI 2006.
2. Mikell p. Groover, “Automation, Production Systems & CIM”, 2nd ed. PHI 2001.
3. James A.Rehg, Henry W.Kraebber, “Computer- Integrated Manufacturing”, second Edition, Pearson Education.
4. P.N. Rao, “CAD/CAM Principles and Applications”, Second Edition, TMH 2006.

REFERENCES:

1. Radhakrishnan.P, Subramanyan. S, Raju.V, “CAD/CAM/CIM”, Second Edition, New Age International publishers, 2000
2. Daniel Hunt.V., “Computer Integrated Manufacturing Hand Book”, Chapman & Hall, 1989
3. Groover M.P, “Computer Aided Design and Manufacturing”, Prentice Hall of India, 1987
4. Yorem Koren, “Computer Control of Manufacturing System”, McGraw Hill, 1986
5. Ranky Paul. G., “Computer Integrated Manufacturing”, Prentice Hall International, 1986.
6. Roger Mannam, “Computer Integrated Manufacturing from Concepts of Realization” 1st ed. Addison Wiley, 1997.
7. P. N. Rao, “Computer Aided Manufacturing”, TMH, 2007, 12th Edition.

MACHINE VISION Elective – I (for VI Semester)

Pre-requisite: Basic Knowledge of Digital Signal Processing

L	T	P	C
3	1	0	3

OBJECTIVES

- To know the Machine vision and image acquisition.
- To know image processing and analysis.

UNIT I INTRODUCTION

Human visual system – Active vision system – Machine vision and Computer vision – Benefits of machine vision – Machine vision components – Block diagram and function of machine vision system – Frame Grabber – Sensing and Digitizing Image Data – Signal Conversion – Image Storage – Lighting Techniques – implementation of industrial machine vision system – Refraction at a spherical surface – Thin Lens Equation – image function and characteristics – image formation – image sensing frequency space analysis

UNIT II IMAGE ACQUISITION

Physics of Light – Interactions of light – Lighting parameters – Lighting sources – Lighting Techniques – Scene constraints – Types and Setups – Machine Vision Lenses – Optical Filters – Imaging Sensors – General problem in capturing the image – selection of camera – optics in camera – CCD and CMOS Specifications – Interface Architectures – Analog and Digital Cameras – Digital Camera Interfaces – Camera Computer Interfaces – Geometrical Image formation models – Camera Calibration

UNIT III IMAGE PROCESSING

Machine Vision Software – Fundamentals of Digital Image – Image formation – Filtering technique - Image Acquisition - Image Processing in Spatial and Frequency Domain – Sampling and quantization – Segmentation- Thresholding - Grayscale Stretching – Image Smoothing and Sharpening – Edge Detection – Binary Morphology – Color image processing.

UNIT IV IMAGE ANALYSIS

Feature extraction –Decision Making – Geometry of curves – Shape identification – Edge detection techniques –Normalization – Gray scale correction – Template techniques – Texture and texture Analysis – Image resolution – Depth and volume – Color image processing – Pattern recognition – Image data compression – Template Matching and Classification – 3D Machine Vision Techniques

UNIT V MACHINE VISION APPLICATIONS

Machine vision applications in Manufacturing, Electronics, Printing, Pharmaceutical, Textile – Applications in Non-visible spectrum – Metrology and Gauging – OCR and OCV– Inspection part identification – Vision guided robotics: Industrial robot control – Mobile robots – Field and Service Applications – Agricultural and Bio medical field - Vision system calibration – Case studies

OUTCOMES:

At the end of the course the students should be able to:

- Develop through basic knowledge about Machine vision.
- Acquire knowledge on the applications of image processing and analysis.
- Learn the usage of image processing and analysis

TEXT BOOKS:

1. K.S.Fu, R.C.Gonzalez, C.S.G.Lee, "Robotics: Sensing, Vision & Intelligence", Tata McGraw- Hill Publication, 1987.
2. Janakiraman.P.A., “Robotics and Image Processing”, Tata McGraw-Hill, 1995
3. A.K. Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India

REFERENCES:

1. Fu.K.S. Gonzalz.R.C., and Lee C.S.G., “Robotics Control, Sensing, Vision and Intelligence”, McGraw-Hill Bookco.,1987
2. Alexander Hornberg, “Handbok of Machine Vision”, First Editon, 2006
3. Milan Sonka, Vaclav Hlavac, Roger Boyle, “Image Processing Analysis & machine”, vision publisher, 1995.
4. Rafael C.Gonzales, Richard.E.Woods, “Digital Image Processing”, Publishers, 1992.
5. Ramesh Jain, Rangachari Kasturi, Brain G.Schunck, “Machine Vision”, Tata McGraw Hill, 1991.

MODERN POWER GENERATION SYSTEMS Elective – I (for VI Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Basic Electrical Engineering

OBJECTIVES:

- To study about the power generation theory. To study about the power measurements.
- To study about the analyses used in power plants. To study about the boiler control loops.
- To study about the boiler control turbine.

UNIT I RENEWABLE ENERGY POLICY AND LEGISLATION

Rural Energy - Biogas plants - Improved biomass cooking stoves - Biomass production and utilization – briquetting and gasifiers - Integrated Rural Energy Programme

UNIT II SOLAR ENERGY

Solar Photovoltaic systems - Solar thermal systems - Solar Energy Centre

UNIT III POWER GENERATION

Biomass Power - Wind Power - Small Hydro Power - Solar photovoltaic Power – Solar Thermal Power - Energy from Urban, Municipal and Industrial Wastes.

UNIT IV NEW TECHNOLOGY

Geothermal energy - ocean energy - alternate fuel for surface transport including electric vehicles - chemical sources of energy including fuel cells and hydrogen energy

UNIT V R&D- INDIAN CONTEXT

Indian Renewable Energy Development Agency Ltd - Information and Public Awareness - International Relations - Integrated Finance – Planning - co-ordination and administration.

OUTCOMES:

At the end of the course, the students should be able to:

- Understand the analysis of the instruments synthesis power plant
- Understand about boiler control turbine

TEXT BOOKS:

1. Non-Conventional Energy Sources, by G. D. Rai, ISBN: 8174090738, Khanna Publishers
2. The Homeowner's Guide to Renewable Energy, By Dan Chiras, New Society Publishers, ISBN: 9780865715363
3. Renewable energy engineering and technology, TERI Press
4. TERI Energy Data Directory & Yearbook (TEDDY) 2005/06
5. National Energy Map for India, ISBN: 81-7993-064-5

NON CONVENTIONAL ENERGY RESOURCES Elective – I (for VI Semester)

L	T	P	C
3	1	0	3

Pre -requisite: Basic knowledge of Electrical Engineering

OBJECTIVES:

- It introduces solar energy its radiation, collection, storage and application.
- It also introduces the Wind energy, Biomass energy, Geothermal energy and ocean energy as alternative energy sources.

UNIT I PRINCIPLES OF SOLAR RADIATION Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors. Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT II WIND ENERGY Source and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria.

UNIT III BIO-MASS

Principles of Bio-Conversion, Anaerobic aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I. C. Engine operation & economic aspects.

UNIT IV OCEAN ENERGY

OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT V DIRECT ENERGY CONVERSION

Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, seebeck, peltier and joul Thomson effects, figure of merit, materials, applications, MHO generators, principles, dissociation and ionization, hall effect, magnetic flux, MHO accelerator, MHO Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, faradays law's, thermodynamic aspects, selection fuels and operating conditions.

OUTCOMES:

At the end of the course, the students should be able to:

- Explain different types of non–Conventional energy resources.

TEXT BOOKS:

1. Renewable energy resources/ Tiwari and Ghosal / Narosa. Alpha Science International, 2005
2. Non-Conventional Energy Sources/G.D.Rai. – 1992

REFERENCES:

1. Renewable Energy Sources / Twidell & Weir- 2015
2. Solar Energy/ Sukhame.tata McGraw-Hill 2008
3. Splar Power Engineering I B.S Magal Frank Kreith & J.F Kreith.
4. Principles 01 Solar Energy I Frank Krieth & John F Kreider.
5. Non-Conventional Energy I AshokV Desai/Wiley Eastern.
6. Non-Convention Energy Systems/KMittal/Wheeler
7. Renewable Enerily Technologies/Ramesh & Kumar /Narosa

OPERATIONAL RESEARCH Elective – I (for VI Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Mathematics

OBJECTIVE:

To improve a quantitative decision making procedure.

UNIT -I LINEAR PROGRAMMING AND SIMPLEX METHOD

Mathematical formulation of the problem - Graphical solution method - Exceptional cases – General Linear programming problem - Canonical and standard forms of linear programming problem - The simplex method - Computational procedure: The simplex algorithm - Artificial variable techniques: Big M method, Two phase method - problem of degeneracy.

UNIT -II TRANSPORTATION, ASSIGNMENT AND ROUTING PROBLEMS

Mathematical formulation of the transportation problem - Triangular basis - Loops in a transportation table - Finding initial basic feasible solution (NWC, IBM and VAM methods) - Moving towards optimality- Degeneracy in transportation problems- Transportation algorithm (MODI method) – Unbalanced transportation problems - Mathematical formulation of the assignment problem - Assignment algorithm Hungarian assignment method - Routing problems : Travelling salesman problem.

UNIT –III GAME THEORY AND SEQUENCING PROBLEMS

Two person zero sum games - Maxmin Minmax principle - Games without saddle points (Mixed strategies) - Solution of 2 X 2 rectangular games - Graphical method - Dominance property - Algebraic method for m x n games - Matrix oddments method for m x n games - Problem of sequencing - Problems with n jobs and 2 machines - Problems with n jobs and k machines - Problems with 2 jobs and k machines.

UNIT -IV INTEGER PROGRAMMING AND INVENTORY CONTROL

Gomory's All I.P.P method - Gomory's mixed integer method - Branch and bound method - Reasons for carrying inventory - Types of inventory - Inventory decisions - Economic order quantity - Deterministic inventory problem - EOQ problem with price breaks - Multi item deterministic problem.

UNIT- V REPLACEMENT PROBLEMS AND PERT/CPM

Replacement of equipment or asset that deteriorates gradually - Replacement of equipment that fails suddenly - Recruitment and promotion problem - Network and basic components - Rules of network construction - Time calculations in networks - Critical path method (CPM) - PERT - PERT calculations - Negative float and negative Slack - Advantages of network (PERT/CPM).

OUTCOMES:

At the end of the course, the students should be able to:

- Understand the Concept of Routing Problems
- Understand the Integer Programming and Replacement Problems

TEXT BOOK:

1. Kanti Swarup, P.K.Gupta and Man Mohan, Operations Research, Eighth Edition, Sultan Chand & Sons, New Delhi, 1999.

REFERENCES:

1. H.A.Taha, Operations Research, Sixth Edition, MacMillen.
2. Richard Bronson, Operations Research, (Schaum's Outline Series, McGraw Hill Company, 1982.
3. J.K.Sharma, Operation Research (Theory and Applications), Mac Millen Ltd., 1997.

List of Core Electives

ROBOTICS AND AUTOMATION

Elective – II (for VII Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Physics, Instrumentation and Control Systems.

OBJECTIVES:

- To study the various parts of robots and fields of robotics.
- To study the various kinematics and inverse kinematics of robots.
- To study the Euler, Lagrangian formulation of Robot dynamics.
- To study the trajectory planning for robot.
- To study the control of robots for some specific applications.

UNIT I BASIC CONCEPTS

Definition and origin of robotics – different types of robotics – various generations of robots – degrees of freedom – Asimov"s laws of robotics – dynamic stabilization of robots.

UNIT II POWER SOURCES AND SENSORS

Hydraulic, pneumatic and electric drives – 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.

UNIT III MANIPULATORS, ACTUATORS AND GRIPPERS

Construction of manipulators – manipulator dynamics and force control – electronic and pneumatic manipulator control circuits – end effectors – U various types of grippers – design considerations.

UNIT IV KINEMATICS AND PATH PLANNING

Solution of inverse kinematics problem – multiple solution jacobian work envelop – hill Climbing Techniques – robot programming languages

UNIT V CASE STUDIES

Multiple robots – machine interface – robots in manufacturing and non- manufacturing applications – robot cell design – selection of robot.

OUTCOMES:

At the end of the course, the students should be able to:

- Explain the basic concepts of working of robot
- Analyze the function of sensors in the robot
- Write program to use a robot for a typical application
- Use Robots in different applications

TEXT BOOKS:

1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., “Industrial Robotics”, Mc Graw-Hill, Singapore, 1996.
2. Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers, Chennai, 1998.

REFERENCES:

1. Deb. S.R.,“Robotics Technology and flexible Automation”, John Wiley, USA 1992.
2. Klafter R.D., Chimielewski T.A., Negin M., “Robotic Engineering – An integrated approach”, Prentice Hall of India, New Delhi, 1994.
3. Mc Kerrow P.J. “Introduction to Robotics”, Addison Wesley, USA, 1991.
4. Issac Asimov “Robot”, Ballantine Books, New York, 1986.
5. Barry Leatham - Jones, "Elements of industrial Robotics" PITMAN Publishing, 1987.
6. Mikell P.Groover, Mitchell Weiss, Roger N.Nagel Nicholas G.Odrey, "Industrial Robotics Technology, Programming and Applications ", McGraw Hill Book Company 1986.

MICRO ELECTRO MECHANICAL SYSTEMS Elective – II (for VII Semester)

Pre-requisite: Basic knowledge of Integrated circuits, Measurement & Instrumentation

L	T	P	C
3	1	0	3

OBJECTIVES:

- To understand the basics of MEMS
- To understand sensors and actuators
- Understand Micromachining Technics
- Understand optical MEMS

UNIT I INTRODUCTION

Intrinsic Characteristics of MEMS – Energy Domains and Transducers- Sensors and Actuators – Introduction to Micro fabrication - Silicon based MEMS processes – New Materials – Review of Electrical and Mechanical concepts in MEMS – Semiconductor devices – Stress and strain analysis – Flexural beam bending- Torsional deflection.

UNIT II SENSORS AND ACTUATORS-I

Electrostatic sensors – Parallel plate capacitors – Applications – Interdigitated Finger capacitor – Comb drive devices – Thermal Sensing and Actuation – Thermal expansion – Thermal couples – Thermal resistors – Applications – Magnetic Actuators – Micromagnetic components – Case studies of MEMS in magnetic actuators.

UNIT III SENSORS AND ACTUATORS-II

Piezoresistive sensors – Piezoresistive sensor materials - Stress analysis of mechanical elements – Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric sensors and actuators – piezoelectric effects – piezoelectric materials – Applications to Inertia , Acoustic, Tactile and Flow sensors.

UNIT IV MICROMACHINING

Silicon Anisotropic Etching – Anisotropic Wet Etching – Dry Etching of Silicon – Plasma Etching – Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants – Case studies - Basic surface micromachining processes – Structural and Sacrificial Materials – Acceleration of Sacrificial Etch – Striction and Antistriction methods – Assembly of 3D MEMS – Foundry process

UNIT V POLYMER AND OPTICAL MEMS

Polymers in MEMS– Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene – Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors- Optical MEMS – Lenses and Mirrors – Actuators for Active Optical MEMS.

OUTCOMES:

At the end of the course, the students should be able to:

- Explain the characteristics of MEMS
- Explain various types of sensors and actuators

TEXT BOOK:

1. Chang Liu, 'Foundations of MEMS', Pearson Education Inc., 2006. ACC.NO: B127890

REFERENCES:

1. Nadim Maluf, "An introduction to Micro electro mechanical system design", Artech House, 2000.
2. Mohamed Gad-el-Hak, editor, "The MEMS Handbook", CRC Baco Raton, 2000
3. Tai Ran Hsu, "MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002.
4. Julian w. Gardner, Vijay k. varadan, Osama O.Awadelkarim, micro sensors MEMS and Smart devices, John Wiley & son LTD, 2002
5. James J.Allen, micro electro mechanical system design, CRC Press published in 2005

RADAR AND NAVIGATIONAL AIDS

Elective – II (for VII Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Antenna Propagation and Digital communication

OBJECTIVES

- To understand Doppler principle to radars and hence detect moving targets, cluster, also to understand tracking radars
- To understand Principles of antennas and propagation as related to radars, also study of transmitters and receivers.
- To understand principles of navigation, in addition to approach and landing aids as related to navigation

UNIT I INTRODUCTION TO RADAR EQUATION

Introduction- Basic Radar –The simple form of the Radar Equation- Radar Block Diagram- Radar Frequencies –Applications of Radar – The Origins of Radar - Detection of Signals in Noise- Receiver Noise and the Signal-to-Noise Ratio-Probability Density Functions- Probabilities of Detection and False Alarm- Integration of Radar Pulses- Radar Cross Section of Targets- Radar cross Section Fluctuations- Transmitter Power-Pulse Repetition Frequency- Antenna Parameters- System losses – Other Radar Equation Considerations

UNIT II MTI AND PULSE DOPPLER RADAR

Introduction to Doppler and MTI Radar- Delay –Line Cancellers- Staggered Pulse Repetition Frequencies –Doppler Filter Banks - Digital MTI Processing - Moving Target Detector - Limitations to MTI Performance - MTI from a Moving Platform (AMIT) – Pulse Doppler Radar – Other Doppler Radar Topics- Tracking with Radar –Monopulse Tracking –Conical Scan and Sequential Lobing – Limitations to Tracking Accuracy - Low-Angle Tracking - Tracking in Range - Other Tracking Radar Topics - Comparison of Trackers - Automatic Tracking with Surveillance Radars (ADT).

UNIT III DETECTION OF SIGNALS IN NOISE

Matched –Filter Receiver –Detection Criteria – Detectors –-Automatic Detector - Integrators - Constant-False-Alarm Rate Receivers - The Radar operator - Signal Management - Propagation Radar Waves - Atmospheric Refraction -Standard propagation - Nonstandard Propagation - The Radar Antenna - Reflector Antennas - Electronically Steered Phased Array Antennas – Phase Shifters- Frequency-Scan Arrays Radar Transmitters and Receivers - Introduction –Linear Beam Power Tubes - Solid State RF Power Sources - Magnetron - Crossed Field Amplifiers - Other RF Power Sources – Other aspects of Radar Transmitter.- The Radar Receiver - Receiver noise Figure – Super heterodyne Receiver - Duplexers and Receiver Protectors- Radar Displays.

UNIT IV RADIO DIRECTION AND RANGES

Introduction - Four methods of Navigation .- The Loop Antenna - Loop Input Circuits - An Aural Null Direction Finder - The Goniometer - Errors in Direction Finding - Adcock Direction Finders - Direction Finding at Very High Frequencies - Automatic Direction Finders – The Commutated Aerial Direction Finder - Range and Accuracy of Direction Finders - The LF/MF Four course Radio Range - VHF Omni Directional Range(VOR) - VOR Receiving Equipment - Range and Accuracy of VOR – Recent Developments. Hyperbolic Systems of Navigation (Loran and Decca) - Loran-A - Loran-A Equipment - Range and precision of Standard Loran - Loran-C - The Decca Navigation System -Decca Receivers - Range and Accuracy of Decca - The Omega System

UNIT V SATELLITE NAVIGATION SYSTEM

Distance Measuring Equipment - Operation of DME - TACAN - TACAN Equipment – Instrument Landing System - Ground Controlled Approach System - Microwave Landing System(MLS) The Doppler Effect - Beam Configurations -Doppler Frequency Equations - Track Stabilization - Doppler Spectrum - Components of the Doppler Navigation System - Doppler range Equation - Accuracy of Doppler Navigation Systems. Inertial Navigation - Principles of Operation - Navigation over the Earth – Components of an Inertial Navigation System - Earth Coordinate Mechanization - Strapped-Down Systems - Accuracy of Inertial Navigation Systems-The Transit System - Navistar Global Positioning System (GPS)

OUTCOMES:

At the end of the course, the students should be able to:

- Explain the principles of navigation
- Derive and discuss the range equation and nature of detection

TEXTBOOKS:

1. Merrill I. Skolnik," Introduction to R a d a r Systems", 3rd Edition Tata McGraw-Hill 2003.
2. N.S. Nagaraja, "Elements of Electronic Navigation Systems", 2nd Edition, TMH, 2000.

REFERENCES:

1. Peyton Z. Peebles: "Radar Principles", John Wiley, 2002.
2. J.C Toomay, "Principles of Radar", 2nd Edition –PHI 2004

ADVANCED MICROCONTROLLERS Elective – II (for VII Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Microprocessors and Microcontrollers

OBJECTIVES:

- To study the properties and evolution of RISC and CISC processors.
- To study the architecture addressing modes and instruction set of R8C microcontroller.
- To impart knowledge on embedded software development.

UNIT I RISC PROCESSORS

RISC Vs CISC, RISC properties and evolution, Advanced RISC microcontrollers, PIC 8-bit Microcontrollers

UNIT II R8C 16-BIT MICROCONTROLLER

The R8C Architecture, CPU Registers, Instruction Set, On-Chip Peripherals, R8CTinyDevelopment Tools, ADC, PWM, UART, Timer Interrupts, System design using R8C Microcontroller.

UNIT III MSP430 16 - BIT MICROCONTROLLER

The MSP430 Architecture, CPU Registers, Instruction Set, On-Chip Peripherals, MSP430 Development Tools, ADC, PWM, UART, Timer Interrupts, System design using MSP430 Microcontroller.

UNIT IV EMBEDDED SOFTWARE DEVELOPMENT

Cross development tools, Debugging techniques, Real-time Operating System, Memory Management, scheduling techniques.

UNIT V SYSTEM DEVELOPMENT

Microcontroller based System Design, Peripheral Interfacing, Inter-Integrated Circuit Protocol for RTC, EEPROM, ADC/DAC, CAN BUS interfacing, Application in Automobiles, Robotic and consumer Electronics.

OUTCOMES:

At the end of the course, the students should be able to

- Explain RISC and CISC properties
- Interfacing using CAN bus
- System design based on microcontroller

TEXT BOOK:

1. Julio Sanchez Maria P. Canton, ―Microcontroller Programming: The microchip PIC, CRC Press, Taylor & Francis Group, 2007.

REFERENCES:

1. D. E. Simon, ―An Embedded Software Primer‖, Addison-Wesley, 1999.
2. Wayne Wolf, ―Computers as Components: Principles of Embedded Computing System Design, Morgan Kaufman Publishers, 2006.
3. John H.Davis , ―MSP 430 Micro controller basics‖ Elsevier, 2008

INFORMATION THEORY AND CODING

Elective – II (for VII Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Digital Communication

OBJECTIVE: To get exposed to information and entropy, compression technique, audio & video

UNIT I: INFORMATION THEORY

Information – Entropy, Information rate, classification of codes, Kraft McMillan inequality, Source coding theorem, Shannon-Fano coding, Huffman coding, Extended Huffman coding - Joint and conditional entropies, Mutual information - Discrete memory less channels – BSC, BEC – Channel capacity, Shannon limit

UNIT II: **ERROR CONTROL CODING: BLOCK CODES**

Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding - Single parity codes, Hamming codes, Repetition codes - Linear block codes, Cyclic codes - Syndrome calculation, Encoder and decoder - CRC

UNIT III: **ERROR CONTROL CODING: CONVOLUTIONAL CODES**

Convolution codes – code tree, trellis, state diagram - Encoding – Decoding: Sequential search and Viterbi algorithm – Principle of Turbo coding

UNIT IV: SOURCE CODING: TEXT, AUDIO AND SPEECH

Text: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm – Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III, Dolby AC3 - Speech: Channel Vocoder, Linear Predictive Coding

UNIT V: SOURCE CODING: IMAGE AND VIDEO

Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF – Image compression: READ, JPEG – Video Compression: Principles-I, B, P frames, Motion estimation, Motion compensation, H.261, MPEG standard

OUTCOMES:

At the end of the course, the students should be able to

- Learn Various types of error correcting codes
- Understand different types of image and video standards.

TEXT BOOKS:

1. R Bose, “Information Theory, Coding and Cryptography”, TMH 2007
2. Fred Halsall, “Multimedia Communications: Applications, Networks, Protocols and Standards”, Pearson Education Asia, 2002

REFERENCES:

1. K Sayood, “Introduction to Data Compression” 3/e, Elsevier 2006
2. S Gravano, “Introduction to Error Control Codes”, Oxford University Press 2007
3. Amitabha Bhattacharya, “Digital Communication”, TMH 2006

RF DESIGN

Elective – II (for VII Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Electronic Circuits and Microwave Engineering

OBJECTIVE:

- To design RF components and RF filters.

UNIT-I: **RF ISSUES:** Importance of RF design, Electromagnetic Spectrum, RF behavior of passive components, Chip components and Circuit Board considerations, Scattering Parameters, Smith Chart and applications.

UNIT II: RF FILTER DESIGN: Overview, Basic resonator and filter configuration, Special filter realizations, Filter implementations, Coupled filter.

UNIT III : ACTIVE RF COMPONENTS & APPLICATIONS:RF diodes, BJT, RF FETs, High electron mobility transistors; Matching and Biasing Networks –Impedance matching using discrete components, Microstrip line matching networks, Amplifier classes of operation and biasing networks.

UNIT IV: RF AMPLIFIER DESIGNS: Characteristics, Amplifier power relations, Stability considerations, Constant gain circles, Constant VSWR circles, Low Noise circuits, Broadband , high power and multistage amplifiers.

UNIT V: OSCILLATORS, MIXERS & APPLICATIONS: Basic Oscillator model, High frequency oscillator configuration, Basic characteristics of Mixers; Phase Locked Loops; RF directional couplers and hybrid couplers; Detector and demodulator circuits.

OUTCOMES:

At the end of the course, the student should be able to

- Explain the active and passive RF devices and components.
- Analyze the RF filter and Oscillator design.

TEXT BOOKS:

1. Reinhold Ludwig and Powel Bretchko, RF Circuit Design – Theory and Applications, Pearson Education Asia, First Edition, 2001.
2. Pozar, Microwave Engineering, John Wiley, 3rd ed., 2004.

REFERENCES:

1. Joseph. J. Carr, Secrets of RF Circuit Design, McGraw Hill Publishers, Third Edition, 2000.
2. Mathew M . Radmanesh, Radio Frequency & Microwave Electronics, Pearson

BIO-MEDICAL SIGNAL PROCESSING

Elective – III (for VII Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Signal Processing and Circuit theory.

OBJECTIVES: To study the various Bio-Medical Instruments and their spectrums for the recognition and cure of biological disorders (research).

UNIT I : Basic Physiology: Bio electrodes; Transducers: Cells and their structures Resting and action potential- nerve system - blood circulation system- cardio system bio- electrodes – transducers and its application to bio medical instrumentation.

UNIT II: Imaging system: Recording & Analyzing Bio signals: X-Ray imaging – image intensifiers- CT scan systems; MRI, ECG, EEG, EMG, their lead systems and signal / Nature characteristics.

UNIT III: Signal conversion & processing: Sampling theorem-Simple signal conversion system & its circuits- Basics of digital filtering-IIR & FIR filters and its applications - Band pass filtering techniques - Differentiation techniques- Template matching techniques – QRS detection algorithm.

UNIT IV: Data reduction techniques: Turning point algorithm – A2 TEC algorithm –FAN algorithm – Discrete cosine transform for ECG compression.

UNIT V: Bio-telemetry: Introduction to biotelemetry - components of bio-telemetry systems – Channels used in Bio- telemetry - applications of telemetry in patient care – applications of computer in bio-medical instrumentation

OUTCOMES:

At the end of the course, the students should be able to

- Learn the various medical imaging systems
- Learn the fundamentals of Bio elementary system and their applications.

TEXT BOOK:

1. Willes J Tompokins,"Biomedical Digital signal processing", Prentice hall, 1993
2. M.Arumugam "Bio-medical Instrumentation" Anuradha agencies publishers, 1992

REFERNCES:

1. Lesis Cromwell, Fred. j. Werbell and Erich.A. Ofraffer "Bio-medical Instrumentation and measurements" PHI, 1990.
2. Khandpur, "Handbook on bio-medical instrumentation", TMH Ltd, 1989.

SPEECH PROCESSING

Elective – III (for VII Semester)

Pre-requisite: Basic knowledge Signal & Systems and Digital Signal Processing

L	T	P	C
3	1	0	3

OBJECTIVES:

- To introduce speech production and related parameters of speech.
- To show the computation and use of techniques such as short time Fourier transform, linear predictive coefficients and other coefficients in the analysis of speech.
- To understand different speech modeling procedures such as Markov and their implementation issues.

UNIT I BASIC CONCEPTS

Speech Fundamentals: Articulatory Phonetics – Production and Classification of Speech Sounds; Acoustic Phonetics – Acoustics of speech production; Review of Digital Signal Processing concepts; Short-Time Fourier Transform, Filter-Bank and LPC Methods.

UNIT II SPEECH ANALYSIS

Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures– mathematical and perceptual – Log–Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths.

UNIT III SPEECH MODELING

Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-estimation, Implementation issues.

UNIT IV SPEECH RECOGNITION

Large Vocabulary Continuous Speech Recognition: Architecture of large vocabulary continuous speech recognition system – acoustics and language models – n-grams, context dependent sub-word UNITs; Applications and present status.

UNIT V SPEECH SYNTHESIS

Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub-word UNITs for TTS, intelligibility and naturalness – role of prosody, Applications and present status.

OUTCOMES:

At the end of the course, the students should be able to

- Model speech production system and describe the fundamentals of speech.
- Extract and compare different speech parameters.
- Choose an appropriate statistical speech model for a given application.
- Design a speech recognition system.
- Use different speech synthesis techniques.

TEXT BOOKS:

1. Lawrence Rabiner and Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Pearson Education, 2003. ACC.NO: B130767
2. Daniel Jurafsky and James H Martin, “Speech and Language Processing – An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Pearson Education, 2002.
3. Frederick Jelinek, “Statistical Methods of Speech Recognition”, MIT Press, 1997.

REFERENCES:

1. Steven W. Smith, “The Scientist and Engineer’s Guide to Digital Signal Processing”, California Technical Publishing, 1997.
2. Thomas F Quatieri, “Discrete-Time Speech Signal Processing – Principles and Practice”, Pearson Education, 2004.
3. Claudio Becchetti and Lucio Prina Ricotti, “Speech Recognition”, John Wiley and Sons, 1999.
4. Ben Gold and Nelson Morgan, “Speech and Audio Signal Processing, Processing and Perception of Speech and Music”, Wiley- India Edition, 2006.

CLOUD COMPUTING

Elective – III (for VII Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Data Communication Networks.

OBJECTIVES:

- To understand the concept of cloud computing
- To Understand the cloud services

UNITI CLOUD COMPUTING PRIMER

Cloud computing characteristics, cloud definition -cloud deployment models – private, public, hybrid and Community cloud, cloud services – SaaS, PaaS, and IaaS, Drivers for cloud computing, building cloud infrastructure – a phased approach- virtualization and its benefits- cloud economics and challenges.

UNIT-II CLASSIC DATA CENTER (CDC)

Key elements of data center - application, DBMS, compute, storage and network, server clustering, RAID technology, intelligent storage system, DAS, FC-SAN – components, port type, addressing, and zoning, IP- SAN – iSCSI and FCIP, converged network - FCoE, NAS, object based and unified storage, business continuity terminologies, backup-recovery and duplication, local and remote replication, CDC monitoring and management, Information lifecycle strategy.

UNIT-III VIRTUALIZED DATA CENTER (VDC)

Compute: Compute virtualization benefits, hypervisor types, virtual machine (VM) -resources, VM resource management, physical to virtual conversion – process, benefits.

Storage: Storage virtualization benefits, storage for VMs, block and file level storage virtualization, virtual provisioning – benefits and best practices, storage tiering.

Networking: Network virtualization benefits, VDC network infrastructure components, VLANs, and Network traffic management techniques.

UNIT-IV VIRTUALIZED DATA CENTER – DESKTOP AND APPLICATION

Desktop, application, and user state virtualization – benefits, tools, and deployment methods. **Business Continuity in VDC:-**Eliminating single points of failure, clustering, fault tolerance, and NIC teaming, backup and replication in VDC, VM templates and VM migration. **Cloud Security:-**Basic information security concepts, cloud security concerns and threats, security mechanisms in cloud at compute, storage, and network layer, Governance, Risk and compliance in Cloud.

UNIT-V CLOUD INFRASTRUCTURE AND MANAGEMENT

Cloud infrastructure framework -components, infrastructure management and service creation tools-processes – asset - configuration management, service catalog management, financial management, capacity, performance availability management, incident, problem and compliance management. **Cloud Migration Considerations:-**Considerations for choosing right application and cloud model, service provider specific considerations, cloud adoption phases, Financial and technical feasibility assessment, migration and optimization considerations.

OUTCOMES:

At the end of the course, the students should be able to:

- Understand the pros and cons of cloud computing
- Understand cloud service development tools

TEXT BOOK:

1. Cloud Infrastructure and Services Student Guide - EMC Education Services- 2011.

REFERENCES:

1. EMC IT's Journey to the Private Cloud: A Practitioner's Guide -2011
2. EMC IT'S "ON-RAMP" TO THE JOURNEY TO THE PRIVATE CLOUD Replat form to an Open, Scalable Infrastructure-2011
3. EMC IT's Journey to the Private Cloud: Applications & Cloud Experience.
4. EMC IT's Journey to the Private Cloud: Server virtualization.
5. EMC IT's Journey to the Private Cloud: Backup & Recovery Systems.
6. EMC IT's Journey to the Private Cloud: Virtual Desktop-2011. (Incl.Ref.no: 3, 4, 5, 6)

GLOBAL POSITIONING SYSTEMS

Elective – III (for VII Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Communication Systems.

OBJECTIVE:

- To understand the basics of GPS
- To understand the geographical co-ordinate system.

UNIT I

History of GPS – BC-4 System – HIRAN – NNSS – NAVSTAR GLONASS and GNSS Systems – GPS Constellation – Space Segment – Control Segment – User Segment – Single and Dual Frequency – Point – Relative – Differential GPS – Static and Kinematic Positioning – 2D and 3D – reporting Anti Spoofing (AS); Selective Availability (SA) – DOP Factors.

UNIT II

Coordinate Systems – Geo Centric Coordinate System – Conventional Terrestrial Reference System – Orbit Description – Keplerian Orbit – Kepler Elements – Satellite Visibility – Topocentric Motion – Disturbed Satellite Motion – Perturbed Motion – Disturbing Accelerations - Perturbed Orbit – Time Systems – Astronomical Time System – Atomic Time – GPS Time – Need for Coordination – Link to Earth Rotation – Time and Earth Motion Services.

UNIT III

C/A code; P-code; Y-code; L1, L2 Carrier frequencies – Code Pseudo Ranges – Carries Phases – Pseudo Ranges – Satellite Signal Signature – Navigation Messages and Formats – Undifferenced and Differenced Range Models – Delta Ranges – Signal Processing and Processing Techniques – Tracking Networks – Ephemerides – Data Combination: Narrow Lane; Wide Lane – OTF Ambiguity.

UNIT IV

Propagation Media – Multipath – Antenna Phase Centre – Atmosphere in brief – Elements of Wave Propagation – Ionospheric Effects on GPS Observations – Code Delay – Phase Advances – Integer Bias – Clock Error – Cycle Slip – Noise-Bias – Blunders – Tropospheric Effects on GPS Oberservables – Multipath Effect – Antenna Phase Centre Problems and Correction.

UNIT V

Inter Disciplinary Applications – Crystal Dynamics – Gravity Field Mapping – Atmospheric Occulation– Surveying – Geophysics – Air borne GPS – Ground Transportation – Space borne GPS – Metrological and Climate Research using GPS.

OUTCOMES:

At the end of the course, the students should be able to:

- Learn the GPS systems
- Understand the geographic systems and their applications.

TEXT BOOKS:

1. B.Hoffman - Wellenhof, H.Lichtenegger and J.Collins, "GPS: Theory and Practice", 4th revised edition, Springer, Wein, New york, 1997
2. A.Leick, "GPS Satellites Surveying", 2nd edition, John Wiley & Sons, NewYork, 1995

REFERENCES:

1. B.Parkinson, J.Spilker, Jr. (Eds), "GPS: Theory and Applications", Vol.I & Vol.II, AIAA, Enfant Promenade SW, Washington, DC 20024, 1996.
2. A.Kleusberg and P.Teunisen (Eds), “GPS for Geodesy”, Springer-Verlag, Berlin, 1996

WIRELESS SENSOR NETWORKS

Elective – III (for VII Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Data Communication Networks.

OBJECTIVES:

- To understand the basics of Wireless sensor Networks, it architecture, Networking and Infrastructure.

UNIT I OVERVIEW OF WIRELESS SENSOR NETWORKS

Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks.

UNIT II ARCHITECTURES

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture -Sensor Networks, Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT III NETWORKING S ENSORS

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols-Energy-Efficient Routing, Geographic Routing.

UNIT IV INFRASTRUCTURE ESTABLISHMENT

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

UNIT V SENSOR NETWORK PLATFORMS AND TOOLS

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node- level Simulators, State-centric programming.

OUTCOMES:

At the end of the course, the students should be able to:

- Understand challenges and technologies for wireless networks
- Understand architecture and sensors
- Establishing infrastructure and simulations

TEXT BOOKS:

1. Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley, 2005.
2. Feng Zhao & Leonidas J.Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

REFERENCES:

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks-Technology, Protocols, and Applications”, John Wiley, 2007.
2. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

CRYPTOGRAPHY AND NETWORK SECURITY — Elective – III (for VII Semester)

Pre- requisite: Basic knowledge of Digital Communication

L	T	P	C
3	1	0	3

OBJECTIVES:

- To understand OSI security architecture and classical encryption techniques.
- To acquire fundamental knowledge on the concepts of finite fields and number theory.
- To understand various block cipher and stream cipher models.
- To describe the principles of public key cryptosystems, hash functions and digital signature.

UNIT I INTRODUCTION & NUMBER THEORY

Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography).FINITE FIELDS AND NUMBER THEORY: Groups, Rings, Fields-Modular arithmetic-Euclid‟s algorithm-Finite fields- Polynomial Arithmetic –Prime numbers-Fermat‟s and Euler‟s theorem-Testing for primality -The Chinese remainder theorem- Discrete logarithms.

UNIT II BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY

Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm. **Public key cryptography:** Principles of public key cryptosystems-The RSA algorithm-Key management – Diffie Hellman Key exchange- Elliptic curve arithmetic-Elliptic curve cryptography.

UNIT III HASH FUNCTIONS AND DIGITAL SIGNATURES

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 - SHA - HMAC – CMAC - Digital signature and authentication protocols – DSS – EI Gamal – Schnorr.

UNIT IV SECURITY PRACTICE & SYSTEM SECURITY

Authentication applications – Kerberos – X.509 Authentication services - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions. Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security.

UNIT V E-MAIL, IP & WEB SECURITY

E-mail Security: Security Services for E-mail-attacks possible through E-mail - establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy- S/MIME.

IP Security: Overview of IPsec - IP and IPv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding). **Web Security:** SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSL Attacks fixed in v3-Exportability-Encoding-Secure Electronic Transaction (SET).

OUTCOMES:

At the end of the course, the students should be able to:

- Design firewalls and intrusion detection system
- Design security services for E-mail

TEXT BOOKS:

1. William Stallings, Cryptography and Network Security, 6th Edition, Pearson Education, March 2013.

REFERENCES:

1. Behrouz A. Ferouzan, “Cryptography & Network Security”, Tata McGraw Hill, 2007.
2. Man Young Rhee, “Internet Security: Cryptographic Principles”, “Algorithms and Protocols”, Wiley Publications, 2003.
3. Charles Pfleeger, “Security in Computing”, 4th Edition, Prentice Hall of India, 2006.
4. Ulysses Black, “Internet Security Protocols”, Pearson Education Asia, 2000.
5. Charlie Kaufman and Radia Perlman, Mike Speciner, “Network Security, Second Edition, Private Communication in Public World”, PHI 2002.
6. Bruce Schneier and Neils Ferguson, “Practical Cryptography”, First Edition, Wiley Dreamtech India Pvt Ltd, 2003.
7. Douglas R Simson “Cryptography – Theory and practice”, First Edition, CRC Press, 1995

VLSI SIGNAL PROCESSING

Elective – IV (for VIII Semester)

Pre-requisite: Basic knowledge of Electronics and Digital Signal Processing

L	T	P	C
3	1	0	3

OBJECTIVES:

- To know the techniques used in DSP implementing in VLSI

UNIT – I Unfolding & Folding

Unfolding: Algorithm for Unfolding- Properties of Unfolding- Critical Path- Unfolding and Retiming - Applications of Unfolding and Folding: Folding Transformation- Register Minimization Techniques - Lifetime analysis-Data Allocation using forward-Backward register Allocation- Register Minimization in Folded Architectures- Folding of Multirate Systems.

UNIT – II Bit-Level Arithmetic Architectures

Parallel Multipliers- Interleaved Floor-plan and Bit-Plane-Based Digital Filters- Bit-Serial Multipliers- Bit- serial Filter Design and Implementation- Canonic Signed Digit Arithmetic- Distributed Arithmetic.

UNIT – III Redundant Arithmetic

Redundant Number Representations- Carry-Free Radix-2 Addition and Subtraction - Hybrid Radix-4 .Addition- Radix-2 Hybrid Redundant Multiplication Architectures- Data Format Conversion- Redundant to Non redundant Converter. Numerical Strength Reduction: Sub expression Elimination- Multiple Constant Multiplication- Sub expression sharing in Digital Filters- Additive and Multiplicative Number Splitting.

UNIT – IV Synchronous, Wave & Asynchronous Pipelines

Synchronous Pipelining and Clocking Styles- Clock Skew and Clock Distribution in Bit-Level Pipelined VLSI Designs- Wave Pipelining- Constraint Space Diagram and Degree of Wave Pipelining- Implementation of Wave-Pipelined Systems- Asynchronous Pipelining- Signal Transition Graphs- Use of STG to Design Interconnection Circuits- - Implementation of Computational UNITs.

UNIT – V Low-Power design

Theoretical Background- Scaling Versus Power Consumption- Power Analysis- Power Reduction Techniques- Power Estimation Approaches.-Simulation Based Approach.

OUTCOMES:

At the end of the course, the students should be able to:

- Know the methods and techniques for implementation of DSP systems

TEXT BOOK:

1. K.K PARHI, "VLSI Digital Signal processing", John-Wiley, 1999.

HIGH PERFORMANCE COMMUNICATION NETWORKS

Elective – IV (for VIII Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Data Communication Networks

OBJECTIVES:

- To study the properties of switching and routing.
- To study the multimedia networking applications.
- To impart knowledge on traffic modeling, network security and management

UNIT I INTRODUCTION

Review of OSI, TCP/IP; Multiplexing, Modes of Communication, Switching, Routing. SONET – DWDM – DSL – ISDN – BISDN, ATM.

UNIT II MULTIMEDIA NETWORKING APPLICATIONS

Streaming stored Audio and Video – Best effort service – protocols for real time interactive applications – Beyond best effort – scheduling and policing mechanism – integrated services – RSVP- differentiated services.

UNIT III ADVANCED NETWORKS CONCEPTS

VPN-Remote-Access VPN, site-to-site VPN, Tunneling to PPP, Security in VPN.MPLS- Operation, Routing, Tunneling and use of FEC, Traffic Engineering, MPLS based VPN, overlay networks-P2P connections.

UNIT IV TRAFFIC MODELLING

Little's theorem, Need for modeling, Poisson modeling and its failure, Non- Poisson models, Network performance evaluation.

UNIT V NETWORK SECURITY AND MANAGEMENT

Principles of cryptography – Authentication – integrity – key distribution and certification – Access control and: fire walls – attacks and counter measures – security in many layers. Infrastructure for network management – The internet standard management framework – SMI, MIB, SNMP, Security and administration – ASN.1

OUTCOMES:

At the end of the course, the students should be able to:

- Implement multimedia networking Applications
- Implement network security and management

TEXTBOOKS:

1. J.F. Kurose & K.W. Ross, "Computer Networking- A top down approach featuring the Internet", Pearson, 2nd Edition, 2003.
2. Walrand .J. Varatya, High performance communication network, Morgan Kauffman – Harcourt Asia Pvt. Ltd. 2nd Edition, 2000.
3. LEOM-GarCIA, WIDJAJA, "Communication networks", TMH seventh reprint 2002.
4. Aunurag kumar, D. MAnjunath, Joy kuri, "Communication Networking", Morgan Kaufmann Publishers, Limited 2004.

REFERENCES:

1. Hersent Gurle & petit, "IP Telephony, packet Pored Multimedia communication Systems", Pearson education 2003.
2. Fred Halsall and Lingana Gouda Kulkarni," Computer Networking and the Internet" fifth edition, Pearson education.
3. Nader F.Mir, Computer and Communication Networks, first edition.

CMOS IC DESIGN

Elective – IV (for VIII Semester)

Pre-requisite: Basic knowledge of VLSI Design

L	T	P	C
3	1	0	3

OBJECTIVE:

To understand MOS Devices and CMOS IC's, Design of a CMOS Amplifier, CMOS oscillator circuits and comparators.

UNIT-I CMOS INTEGRATED CIRCUITS TECHNOLOGY AND MOS DEVICES

Overview of Integrated Circuits Fabrication Process, n-well process, STI process, BiCMOS process, MOS Device Structure in Integrated Circuits, Passive Components in Integrated Circuits, MOS Controlled Switch, MOS Diode, MOS Capacitor, MOS Active Resistor, Circuit Design Considerations for MOS, Supply Variation Effect, Device Size Effect, Temperature Variation Effect, High Frequency Effect, Device Noise

UNIT-II CURRENT AND VOLTAGE REFERENCE AND CMOS AMPLIFIER

MOS Current Mirror, Supply-Independent Biasing, Temperature-Independent Biasing, Circuits using BiCMOS Device, Implementation and Case Studies, Circuit Layout Techniques, Supply Variation Effect, Device Sizing Effect, Temperature Variation Effect, Noise, Performance Metrics of Amplifier Circuits, Single-Stage Inverting Amplifier Circuits, Two-Stage Amplifier Circuits: Analysis and Design, Feedback Techniques, Phase-margin, Stability and Compensation, Cascode Device based Design, Circuits using BiCMOS Device, Special Purpose OP-AMPS, High Frequency OPAMP, Low Voltage OPAMP, High Output Current OPAMP, Low Noise OPAMP, Implementation and Case Studies, Circuit Layout Techniques, Supply Variation Effect, Device Sizing Effect, Temperature Variation Effect, High Frequency Effect, Noise

UNIT-III CMOS COMPARATOR

Performance metrics of Comparator, Two Stage Comparator: Analysis and Design, Auto-Zeroing of Comparator, Hysteresis of Comparator, Circuits using BiCMOS Device, Special Purpose Comparators - Regenerative Comparator, High Output Current Comparator, High Speed Comparator, Implementation and Case Studies, Circuit Layout Techniques, Supply Variation Effect, Device Sizing Effect, Temperature Variation Effect, High Frequency Effect, Noise

UNIT-IV CMOS OSCILLATOR CIRCUITS

Performance Metrics of Oscillator, Ring Oscillator, LC Oscillator, Voltage Controlled Oscillator - Frequency Coarse and Fine Tuning, Amplitude Calibration, Circuits using BiCMOS Device, Implementation and Case Studies, Circuit Layout Techniques, Supply Variation Effect, Device Sizing Effect, Temperature Variation Effect, High Frequency Effect, Noise

UNIT-V PACKAGING AND MEASUREMENTS

Integrated Circuit Packaging for Analog Circuits, Package parasitic and Modeling, I/O Pad and ESD Structure, Implementation and Case Studies, Circuit Layout Techniques, Supply Variation Effect, Device Sizing Effect, Temperature Variation Effect, High Frequency Effect, Noise, Measurement Fixture Design - Supply-Current and Return-Current Path, Shielding, Sensing and Guard Voltage/Current , Special Purpose Measurement Techniques - OPAMP Specifications, Comparator Specifications, VCO Specifications.

OUTCOMES:

At the end of the course, the students should be able to:

- Be Familiar about CMOS IC technology and MOS devise
- Understand the concept of various packing and measurement techniques,

TEXT BOOK:

1. CMOS Analog Circuit Design, P. Allen and D. Holberg, Oxford University Press.

REFERENCES:

1. Design of Analog CMOS Integrated Circuits, B. Razavi, Tata McGraw-Hill.
2. Analysis and Design of Analog Integrated Circuits, P.Gray, P.Hurst, S.Lewis and R.Meyer, Wiley.
3. The Art of Analog Layout, A.Hastings, Prentice Hall of India.

Ad-Hoc Networks

Elective – IV (for VIII Semester)

L	T	P	C
3	1	0	3

Pre-Requisite: Basic knowledge of Data Communication Networks

OBJECTIVES:

- To study the wireless networks
- To understand the concept of wireless protocols

UNIT I

INTRODUCTION TO WIRELESS NETWORKS

Characteristics of wireless channels, Fundamentals of WLANs, IEEE 802.11 standard, HIPERLAN Standard, First-, Second, third and beyond 3G - generation cellular systems, WLL, Wireless ATM, IEEE 802.16 standard, HIPERACCESS, AdHoc Wireless Internet.

UNIT II

MAC, ROUTING AND MULTICAST ROUTING PROTOCOLS

MAC Protocols: Design issues, goals and classification, Contention –based protocols with reservation and scheduling mechanisms, Protocols using directional antennas.

Routing protocols: Design issues and classification, Table-driven, On-demand and Hybrid routing protocols, Routing protocols with efficient flooding mechanisms, Hierarchical and power-aware routing protocols.

Multicast Routing Protocols: Design issues and operation, Architecture reference model, classification, Tree-based and Mesh-based protocols, Energy-efficient multicasting.

UNIT III

TRANSPORT LAYER AND SECURITY PROTOCOLS

Transport layer Protocol: Design issues, goals and classification, TCP over AdHoc wireless Networks, Security, Security requirements, Issues and challenges in security provisioning, Network security attacks, Security routing. Quality of Service: Issues and challenges in providing QoS, Classification of QoS solutions, MAC layer solutions, Network layer solutions, QoS frameworks.

UNIT IV: WIRELESS SENSOR NETWORKS

Architecture, Data dissemination, Date gathering, MAC protocols, location discovery, Quality of a sensor network.

UNIT V ENERGY MANAGEMENT

Classification o f battery management schemes, Transmission power management schemes, System power management schemes. Performance Analysis -ABR beaconing, Performance parameters, Route-discovery time, End-to-end delay performance, Communication throughput performance, Packet loss performance, Route reconfiguration repair time, TCP/IP based applications.

OUTCOMES:

At the end of the course, the students should be able to:

- Understand the fundamentals of sensor networks
- Understand the various wireless sensor protocols

TEXTBOOKS:

1. C. Siva Ram Murthy and B.S. Manoj, AdHoc Wireless Networks: Architectures and protocols, Prentice Hall PTR, 2004
2. C.-K.Toh, AdHoc Mobile Wireless Networks: Protocols and Systems, Prentice Hall PTR, 2001

REFERENCES:

1. Mohammad Ilyas, The Handbook of AdHoc Wireless Networks, CRC press, 2002
2. Charles E. Perkins, AdHoc Networking, Addison – Wesley, 2000
3. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan Stojmenovic, Mobile AdHoc Networking, Wiley – IEEE press, 2004.

VLSI TESTING

Elective – IV (for VIII Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Digital Circuits

OBJECTIVES:

- To understand the basics of testing and the testing equipments
- To understand the different testing methods

UNIT I INTRODUCTION

Test process and automatic test equipment, test economics and product quality, fault modeling

UNIT II DIGITAL TESTING

Logic and fault simulation, testability measures, combinational and sequential circuit test generation.

UNIT III ANALOG TESTING

Memory Test, DSP Based Analog and Mixed Signal Test, Model based analog and mixed signal test, delay test, IIDQ test.

UNIT IV DESIGN FOR TESTABILITY

Built-in self-test, Scan chain design, Random Logic BIST, Memory BIST, Boundary scan test standard, Analog test bus, Functional Microprocessor Test, Fault Dictionary, Diagnostic Tree, Testable System Design, Core Based Design and Test Wrapper Design, Test design for SOCs

UNIT V LOADED BOARD TESTING

Unpowered short circuit tests, unpowered analog tests, Powered in-circuit analog, digital and mixed signal tests, optical and X-ray inspection procedures, functional block level design of in-circuit test equipment

OUTCOMES:

At the end of the course, the students should be able to:

- Explain different testing equipments.
- Design the different testing schemes for a circuit.
- Discuss the need for test process

TEXT BOOK:

1. Michael L. Bushnell and Vishwani D. Agarwal, “Essentials of Electronic Testing for Digital, Memory & Mixed-Signal VLSI Circuits”, Springer, 2006.

REFERENCE:

1. Dimitris Gizopouilos, “Advances in Electronic Testing”, Springer 2006.

COMPUTER ORGANIZATION

Elective – IV (for VIII Semester)

L	T	P	C
3	1	0	3

Pre- requisite: Basic knowledge of Digital Electronics and Microprocessor architectures

OBJECTIVES:

- To study the general purpose architecture for computer system
- To study the design of data path UNIT and control UNIT for ALU Operation
- To understand the concept of various memories
- To introduce the concept of interfacing and organization of multiple processors

UNIT I BASIC STRUCTURE OF COMPUTERS

Functional units – Basic operational concepts – Bus structures – Performance and metrics – Instructions and instruction sequencing – Instruction set architecture – Addressing modes-Basic I/O Operation.

UNIT II BASIC PROCESSING UNIT

Fundamental concepts – Execution of a complete instruction – Multiple bus organization – Hardwired control – Micro programmed control – computer arithmetic - Addition and Subtraction – Multiplication Algorithm – Division Algorithm – Floating Point Arithmetic operations – Decimal Arithmetic Unit – Decimal Arithmetic Operations.

UNIT III PIPELINING

Basic concepts – Data hazards – Instruction hazards – Influence on instruction sets – Data path and control considerations – Performance considerations – Exception handling.

UNIT IV MEMORY SYSTEM

Basic concepts – Semiconductor RAM – ROM – Speed – Size and cost – Cache memories – Improving cache performance – Virtual memory – Memory management requirements – Associative memories – Secondary storage devices.

UNIT V I/O ORGANIZATION

Accessing I/O devices – Programmed Input/output -Interrupts – Direct Memory Access – Buses – Interface circuits – Standard I/O Interfaces (PCI, SCSI and USB), I/O devices and processors.

OUTCOMES:

At the end of the course, the students should be able to:

- Design data path and control unit for ALU operations
- Understand the concept of various memories, interfacing and organization of multiple processors.

TEXT BOOKS:

1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software interface", Third Edition, Elsevier, 2005.
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", Fifth Edition, Tata McGraw Hill, 2002.

REFERENCES:

1. William Stallings, "Computer Organization and Architecture – Designing for Performance", Ninth Edition, Pearson Education, 2012
2. John P. Hayes, "Computer Architecture and Organization", Third illustrated Edition, Tata McGraw Hill, 2007.

ASIC DESIGN

Elective – V (for VIII Semester)

Pre-requisite: Basic knowledge of Digital System Design and VLSI

L	T	P	C
3	1	0	3

OBJECTIVES:

- To understand the programmable logic devices.
- To understand the logic of chip design.

UNIT I INTRODUCTION TO ASICS, CMOS LOGIC AND ASIC LIBRARY DESIGN

Types of ASICs - Design flow - CMOS transistors CMOS Design rules - Combinational Logic Cell – Sequential logic cell - Data path logic cell - Transistors as Resistors – Transistor Parasitic Capacitance- Logical effort –Library cell design - Library architecture.

UNIT II: PROGRAMMABLE ASICS, PROGRAMMABLE ASIC LOGIC CELLS AND PROGRAMMABLE ASIC I/O CELLS

Anti-fuse - static RAM - EPROM and EEPROM technology - PREP benchmarks - Actel ACT- Xilinx LCA –Altera FLEX - Altera MAX DC & AC inputs and outputs - Clock & Power inputs - Xilinx I/O blocks.

UNIT III PROGRAMMABLE ASIC INTERCONNECT, PROGRAMMABLE ASIC DESIGN SOFTWARE AND LOW LEVEL DESIGN ENTRY

Actel ACT -Xilinx LCA - Xilinx EPLD - Altera MAX 5000 and 7000 - Altera MAX 9000 – Altera FLEX – Design systems - Logic Synthesis - Half gate ASIC -Schematic entry - Low level design language - PLA tools -EDIF- CFI design representation.

UNIT IV LOGIC SYNTHESIS, SIMULATION AND TESTING

Verilog and logic synthesis -VHDL and logic synthesis - types of simulation -boundary scan test - fault simulation - automatic test pattern generation.

UNIT V ASIC CONSTRUCTION, FLOOR PLANNING, PLACEMENT AND ROUTING

System partition - FPGA partitioning - partitioning methods - floor planning - placement - physical design flow –global routing - detailed routing - special routing - circuit extraction - DRC.

OUTCOMES:

At the end of the course, the students should be able to:

- Be familiar with chip design
- Understand the concept of IC floor planning, Placement and routing.

TEXT BOOK:

1. M.J.S .Smith, "Application Specific Integrated Circuits, Addison -Wesley Longman Inc., 1997.

REFERENCES:

1. Farzad Nekoogar and Faranak Nekoogar, From ASICs to SOCs: A Practical Approach, Prentice Hall PTR, 2003.
2. Wayne Wolf, FPGA-Based System Design, Prentice Hall PTR, 2004.
3. R. Rajsuman, System-on-a-Chip Design and Test. Santa Clara, CA: Artech House Publishers, 2000.
4. F. Nekoogar. Timing Verification of Application-Specific Integrated Circuits (ASICs). Prentice Hall PTR, 1999.
5. Malcolm R.Haskard, Can C.May," Analog VLSI Design – NMos and CMOS," Prentice Hall,1988

LOW POWER VLSI

Elective – V (for VIII Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of VLSI Design.

OBJECTIVES:

- To learn the power dissipations in VLSI circuits.
- To learn the power optimization techniques.

UNIT I POWER DISSIPATION IN CMOS

Hierarchy of limits of power – Sources of power consumption – Physics of power dissipation in CMOS FET devices- Basic principle of low power design.

UNIT II POWER OPTIMIZATION

Logical level power optimization – Circuit level low power design – Circuit techniques for reducing power consumption in adders and multipliers.

UNIT III DESIGN OF LOW POWER CMOS CIRCUITS

Computer Arithmetic techniques for low power systems – Reducing power consumption in memories – Low power clock, Interconnect and layout design – Advanced techniques – Special techniques

UNIT IV POWER ESTIMATION

Power estimation techniques – Logic level power estimation – Simulation power analysis – Probabilistic power analysis.

UNIT V SYNTHESIS AND SOFTWARE DESIGN FOR LOW POWER SYSTEM

Synthesis for low power –Behavioral level transforms- Software design for low power systems.

OUTCOMES:

At the end of the course, the students should be able to:

- Know the concepts of power consumption and power estimation in VLSI circuits.

TEXT BOOKS:

1. K.Roy and S.C. Prasad, LOW POWER CMOS VLSI circuit design, Wiley, 2000
2. Dimitrios Soudris, Chirstian Pignet, Costas Goutis, Designing CMOS Circuits For Low Power, Kluwer, 2002

REFERENCES:

1. J.B. Kuo and J.H Lou, Low voltage CMOS VLSI Circuits, Wiley 1999.
2. A.P.Chandrakasan and R.W. Broadersen, Low power digital CMOS design, Kluwer, 1995.
3. Gary Yeap, Practical low power digital VLSI design, Kluwer, 1998.
4. Abdellatif Bellaouar, Mohamed.I. Elmasry, Low power digital VLSI design, Kluwer, 1995.
5. James B. Kuo, Shin – chia Lin, Low voltage SOI CMOS VLSI Devices and Circuits. John Wiley and sons, Inc 2001

BROADBAND WIRELESS TECHNOLOGIES Elective – V (for VIII Semester)

L	T	P	C
3	1	0	3

Pre-requisite: Basic knowledge of Wireless Communication

OBJECTIVES:

- To analyse the basics of OFDM and MIMO technology.
- To categorize UWB and MAC Protocol.
- To differentiate types of wireless networks and routing protocols.
- To describe the Architectures for EPON and WiMAX.

UNIT I:OFDM & Block Based Transmissions: Block based transmissions, OFDM multiplexing systems, Single carrier cyclic prefix systems, orthogonal FDMA, interleaved FDMA, single carrier FDMA, CP based CDMA, receiver design. **MIMO Antenna Systems:** MIMO system model, channel capacity, diversity and spatial multiplexing gain, SIMO & MISO systems, space-time coding, MIMO transceiver design, SVD based Eigen bean forming, MIMO for frequency selective fading channels, cyclic delay diversity.

UNIT II : UWB and Medium Access Control: Time hopping UWB, Direct sequence UWB, Multiband, other types UWB, Slotted ALOHA MAC, Carrier sense multiple access with collision avoidance MAC, polling MAC, Reservation MAC, Energy efficient MAC, Multichannel MAC, Directional Antenna MAC, Multihop saturated Throughput of IEEE 802.11 MAC, Multiple Access Control.

UNIT III: Multihop Wireless Broadband Networks, Radio Resource Management and QOS: Multihop Wireless Broadband networks: Mesh networks, Importance of Routing Protocols, Routing Metrics, Classification of Routing Protocols, MANET routing protocols, Packet scheduling, Admission Control, Traffic Models, QoS in wireless systems, Out\age probability for video services in a multirate DS- CDMA system. **WiMAX and Optical Access Networks:** Point–multipoint WiMAX networks, Mesh mode, Mobility in WiMAX networks, Data link layer Protocols, Multi – point control Protocols, Dynamic BW allocation algorithm (DBA)

UNIT IV: Ethernet Passive Optical Networks (EPONS): Intra–ONU scheduling, QoS enabled DBA, QoS protection and Admission control in EPON, BW management for Multichannel EPONS, Separate/combined time and wavelength assignment

UNIT V : EPON – WiMAX, Hybrid WOBAN, Point – Point FTTx, Broadband Access Networks Integrated Architectures for EPON and WiMAX, Design & operation Issues, WOBAN- a network for future, connectivity, routing, fault tolerance &self healing, fiber topology vs. transmission scheme, Architectural/deployment/operational/cost considerations, open fiber access, transmission technologies, broadband networks & network requirements, scalable broadband access networks, next generation access & backhaul.

OUTCOMES:

At the end of the course, the students should be able to:

- Analyze different parameters of MIMO system and types of OFDM systems.
- Discriminate types of UWB and MAC protocols.
- Describe different routing protocols and QoS in wireless systems.
- Describe architectures for EPON and WiMAX, their Design & operation Issues.

TEXT BOOK:

1.David Tung Choug Wong, Peng Yong Kong, Ying Chang Liang, Lee Chaing Chua, Jon W.Mark, Wireless Broadband Networks, Wiley Publication, March 2009.

REFERENCES:

1. AbdallahShami, MartinMaier, ChadiAssi: BiswanathMukharjee- series Editor, Broadband Access Networks Technologies Deployments, Springer, 2009.

2. Regis J. "Bud" Bates, Broadband Telecommunications Handbook, Mc GRAW – Hill, 31 May 1999.

MULTIMEDIA COMPRESSION TECHNIQUES

Elective – V (for VIII Semester)

L	T	P	C
3	1	0	3

Pre- requisite: Basic knowledge of Coding Theory and Communication Systems

OBJECTIVES:

- To have a complete understanding of error–control coding.
- To understand encoding and decoding of digital data streams.
- To introduce methods for the generation of these codes and their decoding techniques.
- To have a detailed knowledge of compression and decompression techniques.
- To introduce the concepts of multimedia communication.

UNIT I MULTIMEDIA COMPONENTS

Introduction - Multimedia skills - Multimedia components and their characteristics - Text, sound, images, graphics, animation, video, hardware.

UNIT II AUDIO AND VIDEO COMPRESSION

Audio compression–DPCM-Adaptive PCM –adaptive predictive coding-linear Predictive coding-code excited LPC-perpetual coding Video compression –principles-H.261-H.263-MPEG 1, 2, and 4.

UNIT III TEXT AND IMAGE COMPRESSION

Compression principles-source encoders and destination encoders-lossless and lossy compression- entropy encoding –source encoding -text compression –static Huffman coding dynamic coding – arithmetic coding – Lempel ziv-welsh Compression-image compression

UNIT IV VOIP TECHNOLOGY

Basics of IP transport, VoIP challenges, H.323/ SIP –Network Architecture, Protocols, Call establishment and release, VoIP and SS7, Quality of Service- CODEC Methods- VOIP applicability

UNIT V MULTIMEDIA NETWORKING

Multimedia networking -Applications-streamed stored and audio-making the best Effort service- protocols for real time interactive Applications-distributing multimedia-beyond best effort service- secluding and policing Mechanisms-integrated services-differentiated Services-RSVP.

OUTCOMES

At the end of the course, the students should be able to:

- Describe various multimedia components
- Describe compression and decompression techniques.
- Apply the compression concepts in multimedia communication.

TEXT BOOK:

1. Fred Halshall “Multimedia communication - Applications, Networks, Protocols and Standards”, Pearson Education, 2007.

REFERENCES:

1. Tay Vaughan, “Multimedia: Making it work”, 7th Edition, TMH 2008 98
2. Kurose and W.Ross “Computer Networking “a Top Down Approach”, Pearson Education 2005
3. Marcus Goncalves “Voice over IP Networks”, McGraw hill 1999.
4. KR. Rao,Z S Bojkovic, D A Milovanovic, “Multimedia Communication Systems: Techniques, Standards, and Networks”, Pearson Education 2007.
5. R. Steimnetz, K. Nahrstedt, “Multimedia Computing, Communications and Applications”, Pearson Education Ranjan Parekh, “Principles of Multimedia”, TMH 2007.

ADVANCED WIRELESS COMMUNICATION

Elective – V (for VIII Semester)

L	T	P	C
3	1	0	3

Pre- requisite: Basic knowledge of Wireless Communication

OBJECTIVES:

- To teach the importance of improving capacity of wireless channel using MIMO
- To teach the characteristic of wireless channel
- To teach techniques for channel improvements using space-time block and Trellis codes
- To teach advanced MIMO system like layered space time codes, MU-MIMO System and MIMO-OFDM systems

UNIT I INTRODUCTION

The crowded spectrum, need for high data rate, MIMO systems – Array Gain, Diversity Gain, Data Pipes, Spatial MUX, MIMO System Model. MIMO System Capacity – channel known the TX, Ch unknown to the TX – capacity of deterministic channels, Random channels and frequency selective channels.

UNIT II RADIO WAVE PROPAGATION

Radio wave propagation – Macroscopic fading - free space and out door, small scale fading – Fading measurements – Direct pulse measurements, spread spectrum correlation channel sounding frequency domain channel sounding, Antenna Diversity – Diversity combining methods.

UNIT III STBC

Delay Diversity scheme, Alamouti space time code – Maximum likelihood decoding maximum ratio combining. Transmit diversity space time block codes for real signal constellation and complex signal constellation- decoding of STBC.

UNIT IV STTC

Space time coded systems space time code word design criteria, design of space time T C on slow fading channels, design of STTC on Fast Fading channels, performance analysis in slow and fast fading channels effect of imperfect channel estimation and Antenna correlation on performance, comparison of STBC & STTC.

UNIT V LAYERED SPACE TIME CODES

LST transmitter – Horizontal and Vertical LST receiver – ML Rx, Zero forcing Rx; MMSE Rx, SIC Rx, ZF V-blast Rx -MMSE V-blast Rx, Iterative Rx- capacity of MIMO – OFDM systems – capacity of MIMO multi user systems.

OUTCOMES:

At the end of the course, the students should be able to:

- Improve the capacity of wireless channel using MIMO
- Analyze the Characteristics of wireless channels

TEXT BOOKS:

1. Mohinder Jankiraman, Space-time codes and MIMO systems, Artech House, Boston, London. www.artech house.com, ISBN 1-58053-865-7-2004
2. Paulraj Rohit Nabar, Dhananjay Gore, Introduction of space time wireless communication Systems, Cambridge University Press, 2003.

4G LTE CELLULAR SYSTEMS

Elective – V (for VIII Semester)

L	T	P	C
3	1	0	3

Pre -request: Basic knowledge of Cellular Mobile Communication

OBJECTIVES

- To categorize the current wireless cellular standards of LTE and LTE -advanced.
- To analyze the effective utilization of spectrum and RF requirements for LTE.
- To discriminate the LTE Air Interface, OFDMA, MIMO, SDR and CoMP technology.
- To describe the relay deployment and overview of WiMAX.

UNIT I STANDARDIZATION OF LTE :3rd Generation Partnership Project **(3GPP);**The 3G Evolution to 4G; Long Term Evolution **(LTE)** and System Architecture Evolution**(SAE)**, LTE and LTE-Advanced; **LTE-Advanced E-UTRAN architecture**; **Protocol stack**: NAS (Non- Access Stratum),RRC (Radio Resource Control), PDCP (Packet Data Convergence Protocol),RLC (Radio Link Control), MAC (Medium Access Control); **Evolved Packet Stratum**: Mobility Management Entity (MME),Serving Gateway (S-GW), Packet Data Network Gateway (PDN-GW).

UNIT II SPECTRUM AND RF CHARACTERISTICS: Carrier aggregation: LTE and LTE-Advanced carrier aggregation scenario; Control channels; Multiple access scheme; Transceiver architecture; **Spectrum sharing**; **Research challenges**: Transceiver design; Increased FFT size, Resource management; **Retransmission control**; **Overview of RF Requirements for LTE**

UNIT III KEY 4G TECHNOLOGIES: **OFDMA; SOFTWARE DEFINED RADIO, Enhanced MIMO**, **HANDOVER AND MOBILITY**, **Enhanced MIMO**: Single-User MIMO (SU- MIMO): MIMO adaptive switching scheme. LTE-Advanced main MIMO modes; Multi-User MIMO (MU-MIMO); Cooperative MIMO; Single-site MIMO: Advanced precoding concept. Downlink MIMO transmission; Uplink MIMO transmission

UNIT IV CoMP Transmission & reception: CoMP architecture: Centralized architecture, Distributed architecture,. Mixed architectures: **The CoMP schemes**: Downlink, Uplink**, Relays: Relay basic scheme**, Relay deployment scenarios; **Types; Duplexing schemes**: Integration into RAN, Add-ons; **BACKHAUL DESIGN FOR INBAND RELAYING.**

UNIT V LTE Vs WIMAX: WiMAX Overview: WiMAX Standards Evolution, **WiMAX Deployment**; Technology Comparison between LTE and WiMAX

OUTCOMES

At the end of the course, the student should be able to

- Describe the different standards of LTE and LTE –advanced such as SAE, EPC
- Discriminate 4G technology.
- Differentiate relay schemes and compare LTE with WiMAX.

TEXT BOOKS:

1. Erik Dahlman, Stefan Parkvall , John Skold, "4G: LTE Advanced for Mobile Boradband ",2nd Edition 2011
2. Erik Dahlman, Stefan Parkvall , John Skold, "4G ,LTE Advanced Pro and The Road to 5 G",3rd Edition

REFERENCE:

1. Christopher Cox, Wiley, "An introduction to LTE: LTE Advanced, SAE and 4G Mobile Communication 2012