COURSE STRUCTURE
AND
DETAILED SYLLABUS
R18 REGULATIONS

DEPARTMENT OF

ELECTRONICS AND COMMUNICATION ENGINEERING

COLLEGE VISION

KSRMCE seeks to be recognized as one of the best engineering colleges in India in providing high standards of academics with most productive, creative learning environment by including research, Innovation thoughts and producing graduates with human values & leadership qualities to serve nation.

COLLEGE MISSION

M1: To provide high quality education in Engineering & Technology in order to bring out knowledgeable engineers.

M2: To creative environment a collaborative environment with stakeholders to take up need-based research and industry specific programs.

M3: To organize co-curricular and extracurricular activities for character and personality development to produce highly competent and motivated engineers and professionals to serve and lead the society.

DEPARTMENT VISION

To emerge the Electronics and Communication Engineering Department as a value based globally recognized centre ensuring academic excellence, fostering research innovation and entrepreneurial attitude.

DEPARTMENT MISSION

M1: To be a student centric institute imbibing experiential, innovative and lifelong learning skills, addressing industrial and societal problems.

M2: To promote all-inclusive research and development.

M3: To inculcate entrepreneurial attitude and values amongst the learners.

M4: To strengthen National and International, Industrial and Institutional collaborations for symbiotic relations.

PROGRAM EDUCATIONAL OBJECTIVES

PEO1: To provide students with a strong foundation in mathematics, science and engineering.

PEO2: To provide students with sufficient technical and programming skills to meet the industry demands.

PEO3: To provide students with sufficient leadership, entrepreneurship qualities, professional and ethical attitude for a successful professional career.

PEO4: To generate graduates with a multidisciplinary approach and an ability to relate engineering issues to broader social context.

PROGRAM OUTCOMES

PO1 - Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 - Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 - Design/Development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4 - Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 - Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including predication and modeling to complex engineering activities with an understanding of the limitations.

PO6 - The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 - Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 - Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO9 - Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 - Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and

write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11 - Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12 - Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

PSO1: An ability to design and conduct experiments, as well as to analyze and interpret data.

PSO2: An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

PSO3: An ability to understand the impact of engineering solutions in a global, economic, environmental and societal context.

PSO4: An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

I Semester

S. No.	Subject Code	Subject	Category	L	T	P	IM	EM	Credits
1	1821101	Mathematics – I	BSC	3	1	0	30	70	4
2	1822102	Engineering Physics	BSC	3	1	0	30	70	4
3	1802103	Basic Electrical Engineering	ESC	3	1	0	30	70	4
4	1803107	Engineering Graphics & Design	ESC	1	0	4	50	50	3
5	1822108	Engineering Physics Lab	BSC	0	0	3	50	50	1.5
6	1802109	Basic Electrical Engineering Lab	ESC	0	0	2	50	50	1
7	1803110	Workshop and Manufacturing Practices	ESC	1	0	4	50	50	3
		Total:							20.5

IISemester

S. No.	Subject Code	Subject	Category	L	T	P	IM	EM	Credits
1	1821201	Mathematics – II	BSC	3	1	0	30	70	4
2	1823202	Engineering Chemistry	BSC	3	1	0	30	70	4
3	1824203	English	HSMC	2	0	0	30	70	2
4	1805204	Programming for Problem Solving	ESC	3	0	0	30	70	3
5	1823207	Chemistry Lab	BSC	0	0	3	50	50	1.5
6	1805208	Programming for Problem Solving Lab	ESC	0	0	4	50	50	2
7	1824209	English Lab	HSMC	0	0	2	50	50	1
		Total:							17.5

III Semester

S. No.	Subject Code	Subject	Category	L	T	P	IM	EM	Credits
1	1821301	Mathematics – III	BSC	3	1	0	30	70	4
2	1825307	Managerial Economics and Financial Analysis	HSMC	3	0	0	30	70	3
3	1804303	Electronic Devices and Circuits	EC	3	0	0	30	70	3
4	1804304	Digital System Design	EC	3	0	0	30	70	3
5	1804305	Signals And Systems	EC	3	0	0	30	70	3
6	1804306	Network Theory	EC	3	0	0	30	70	3
7	1805307	Python Programming	ESC	0	0	3	50	50	1.5
8	1804308	Electronic Devices and Circuits Lab	EC	0	0	3	50	50	1.5
9	18993M1	Environment Science	MC	2	0	0	30	-	0
		Total:							22

IV Semester

S. No.	Subject Code	Subject	Category	L	T	P	IM	EM	Credits
1	1823401	Biology for Engineers	BSC	2	0	0	30	70	2
2	1804402	Probability Theory and Stochastic Processes	EC	3	0	0	30	70	3
3	1804403	Analog and Digital Circuits	EC	3	0	0	30	70	3
4	1802404	Control Systems	EC	3	0	0	30	70	3
5	1804405	Linear IC Applications	EC	3	0	0	30	70	3
6	1804406	Electromagnetic Theory and Transmission lines	EC	3	0	0	30	70	3
7	1804407	LABVIEW Programming Lab	ESC	0	0	3	50	50	1.5
8	1804408	Analog and Digital Circuits Lab	EC	0	0	3	50	50	1.5
9	1824409	Advanced English Communication Skills	HSMC	0	0	4	50	50	2
		Total:							22

V Semester

S. No.	Subject Code	Subject	Category	L	T	P	IM	EM	Credits
1	1804501	Antennas and wave Propagation	EC	3	0	0	30	70	3
2	1804502	Digital Signal Processing	EC	3	0	0	30	70	3
3	1804503	Computer Organization	EC	2	0	0	30	70	2
4	1804504	Analog Communication	EC	3	0	0	30	70	3
5	1804505	Digital IC Applications	EC	3	0	0	30	70	3
6	1804506	Microprocessors & Microcontrollers	EC	3	0	0	30	70	3
7	1804507	Microprocessors & Microcontrollers Lab	EC	0	0	3	50	50	1.5
8	1804508	Analog and Digital ICs Lab	EC	0	0	3	50	50	1.5
9	1804509	Socially Relevant Project	PR	-	-	-	100	-	2
		Total:							22

VI Semester

S. No.	Subject Code	Subject	Category	L	T	P	IM	EM	Credits
1	1804601	Embedded Systems	EC	3	0	0	30	70	3
2	1804602	Digital Communication	EC	3	0	0	30	70	3
3	1804603	Microwave Engineering	EC	3	1	0	30	70	4
		Professional Elective I							
4	1804604	Fiber-Optic Communication	PE	3	0	0	30	70	3
5	1804605	Data structures and Algorithms	PE	3	0	0	30	70	3
6	1804606	Digital Signal Processors & Architectures	PE	3	0	0	30	70	3
7	1804607	Analog IC Design	PE	3	0	0	30	70	3
8	1804608	Introduction to MEMS	PE	3	0	0	30	70	3
9		Open Elective I	OE	3	0	0	30	70	3

10	1804609	Analog and digital communication Lab	EC	0	0	3	50	50	1.5
11	1804610	Digital Signal Processing Lab	EC	0	0	3	50	50	1.5
12	1804611	Micro Wave &Optical Communication Lab	EC	0	0	2	50	50	1
13	1899612	Organizational Behaviour	MC	3	0	0	30	-	0
14	1804613	Internship	PR	-	-	-	100	-	2
		Total:							22

VII Semester

S. No.	Subject Code	Subject	Category	L	T	P	IM	EM	Credits
1	1804701	Internet Of Things	EC	3	0	0	30	70	3
2	1804702	Electronic Measurements & Instrumentation	EC	3	0	0	30	70	3
		Professional Elective II							
3	1804703	Information Theory & Coding	PE	3	0	0	30	70	3
4	1804704	Real Time Operating Systems	PE	3	0	0	30	70	3
5	1804705	Scientific Computing	PE	3	0	0	30	70	3
6	1804706	CMOS Design	PE	3	0	0	30	70	3
7	1804707	Electromagnetic Interference & Compatibility	PE	3	0	0	30	70	3
		Professional Elective III							
8	1804708	Radar and Satellite Communication	PE	3	0	0	30	70	3

9	1804709	Computer System Architecture	PE	3	0	0	30	70	3
10	1804710	Digital Image & Video processing	PE	3	0	0	30	70	3
11	1804711	Digital IC Design	PE	3	0	0	30	70	3
12	1804712	Cognitive Radio	PE	3	0	0	30	70	3
13		**Open Elective II**	OE	3	0	0	30	70	3
14		**Open Elective III**	OE	3	0	0	30	70	3
15	1804713	IOT Lab	EC	0	0	2	50	50	1
16	1804714	Project Stage-I	PR	0	0	6	50	0	3
17	1824715	Human Values and Professional Ethics	MC	0	0	3	30	0	0
		Total:							22

VIII Semester

S. No.	Subject Code	Subject	Category	L	T	P	IM	EM	Credits
1	1825801	Management Science	HSMC	2	0	0	30	70	2
		Professional Elective IV							
2	1804802	Wireless Communication	PE	2	0	0	30	70	2
3	1804803	SoC Architecture	PE	2	0	0	30	70	2
4	1804804	Speech Processing	PE	2	0	0	30	70	2
5	1804805	Low Power VLSI	PE	2	0	0	30	70	2
6	1804806	RF System Design	PE	2	0	0	30	70	2
7		**Open Elective IV**	OE	3	0	0	30	70	3
8	1804807	Project Stage-II	PR	0	0	20	50	100	5
		Total:							12

Course Title	MATHEMATICS – I				B. Tech. ECE I Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
1821101	**BSC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	1	--	4	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**		

Course Objectives:

To enable the students to apply the knowledge of mathematics in various engineering fields by making them to learn the following:

- The essential tool of matrices in a comprehensive manner.
- The convergence of series.
- Maxima and minima of a function and the radius of curvature
- The Jacobians and extreme values of a function.
- Evaluate the definite integrals, Beta and Gamma functions. Apply Fourier series in engineering problems.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Apply**the essential tool of matrices in a comprehensive manner.
CO 2	**Describe** the convergence of series.
CO 3	**Classify** the functions of several variables which is useful in optimization techniques.
CO 4	**Define** Beta and gamma functions and solve definite integrals.
CO 5	**Determine** the Fourier series of the functions.

UNIT I

Matrices:

Basic definitions of Symmetric, skew-symmetric and orthogonal matrices – Elementary transformations – Rank – Echelon form, Normal form– System of linear equations –Eigen values and Eigen vectors for real matrices – Cayley-Hamilton theorem – Diagonalization of matrix by orthogonal transformation.

UNIT II

Sequences and series:

Convergence of sequences and series – Comparison test – p test – D'Alemberts ratio test – Cauchy's root test. Power series – Series for exponential, trigonometric and logarithm functions.

UNIT III

Differential Calculus:

Taylor's and Maclaurin's series – Maxima and minima of single variable – Curvature: Curvature of a curve – Curvature of a circle – Radius of a curvature – Centre of Curvature – Equation to the circle of curvature.

UNIT IV

Multivariable Calculus:

Functions of two or more variables – Partial derivatives, Total derivative – Jacobians – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT V

Integral Calculus:
Evaluation of definite integrals – Beta and Gamma functions and their properties. Fourier series: Half range Fourier sine and cosine expansions – Parseval's theorem.

Text Books:

1. Higher Engineering Mathematics, Dr. B.S. Grewal, Khanna Publishers-43 edition 2014.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Publications, 9th edition-2013.
3. Calculus and Analytic geometry, G.B. Thomas and R.L. Finney, Pearson, 9th Edition, Reprint, 2002.

Reference Books:

1. Higher Engineering Mathematics, B.V. Ramana, Mc. Graw Hill Education (India) Pvt. Ltd, New Delhi, 11th Edition, Reprint 2010.
2. Linear Algebra: A Modern Introduction, D Poole, 2nd Edition, Brooks/Cole, 2005.
3. A Text Book of Engineering Mathematics, N.P. Bali and Manish Goyal, Lakshmi Publications, Reprint 2008.

Course Title	ENGINEERING PHYSICS				B. Tech. ECE I Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1822102	BSC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	1	0	4	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs		

Course Objectives:

1. Expose studentsin understanding the basic laws of nature through wave equationusing the principles of oscillations and waves.
2. Expose students to theoretical and mathematical aspects of Interference, Diffraction techniques and Lasers for testing of materials.
3. Develop knowledge and understanding the fundamental concepts of Quantum mechanics.
4. Develop knowledge and understanding the fundamental concepts of solids and semiconductors.
5. Adaptability to new developments in science and technology.

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

CO 1	**Describe**a mathematical wave equation using the principles of waves and oscillations.
CO 2	**Explain** the role of semiconductors in different realms of physics and their applications in both science and technology.
CO 3	**Apply** the knowledge of Sciences to solve engineering problems by using Interference and Diffraction techniques.
CO 4	**Analyze**the working elements of different lasers and parameters.

Unit I

Wave Optics

Introduction, Huygens' Principle, Superposition of waves, Young's double slit experiment, expression for fringe width, interference in thin film by reflection, Newton's rings experiment, Diffraction Fraunhofer diffraction due to single slit, and Diffraction grating (N-slits).

Unit II

Lasers: Introduction to lasers, characteristics of laser, interaction of radiation with matter-spontaneous and stimulated emission, Einstein's coefficients; population inversion, excitation mechanisms, types of lasers: Solid-state lasers – Nd-YAG laser, Gas lasers - He-Ne Laser, Semiconductor p-n junction diode laser, Applications of lasers

Unit III

Damped and Forced Simple Harmonic Oscillator: Mechanical and electrical simple harmonic oscillators, Damped harmonic oscillator – Heavy, critical and light damping, Energy decay in a damped harmonic oscillator, Quality factor, Forced Mechanical and Electrical oscillators, Electrical and Mechanical impedance.

UNIT IV

Non-dispersive transverse and longitudinal waves in one dimension String: Transverse wave on a string, the wave equation on a string, Harmonic waves, Reflection and transmission of waves at a boundary, Impedance matching, Standing waves and their Eigen frequencies, Longitudinal waves and the wave equation for them.

Unit V

Solids & Semiconductors: Introduction, Free electron theory of metals (drift velocity and electrical conductivity), Fermi-Dirac distribution, Kronig-Penney model and origin of energy bands, band structure of metals, semiconductors, and insulators. Direct and indirect band gap semiconductors, Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), diffusion and drift, p -n junction.

Text Books:

1. H. J. Pain, "The physics of vibrations and waves", Wiley, 2006.
2. Engineering Physics by K. Thyagarajan, Mac Graw – Hill Publishing Co. New Delhi.

Reference Books:

1. Physics Vol I & II, Halliday/Resnick/Krane 5th Edition, John Wiley, 2003.
2. A. Ghatak, "Optics", McGraw Hill Education, 2012.
3. D. A. Neamen, "Semiconductor Physics and Devices", Mac Graw – Hill Education, 2002.

Course Title	BASIC ELECTRICAL ENGINEERING				B. Tech. ECE I Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
1802103	**ESC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	1	--	4	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**		

Course Objectives:

The objective of the course is to learn the concepts of circuit analysis which includes DC excitations and AC excitations, different types of DC generators, motors which are widely used in industry, Construction and working principle of 1-F Transformers & 3-F Induction Motors ,Components of low tension switchgear

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Understand** basic electric circuits and network solving techniques.
CO 2	**Analyze** RL, RC and RLC circuits for AC excitations
CO 3	**Understand** working principle, operation and construction of DC machines, 3-Ø induction motors and 1-Ø transformers
CO 4	**Understand** the components of low voltage electrical installations
CO 5	**Solve** the problems on EMF, Current ,Torque ,Regulation and Efficiency of DC machines ,3-Ø induction motor and 1-Ø transformer

UNIT – I

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources – source transformation, Series & Parallel networks - Star-Delta transformation, Kirchoff's current and voltage laws, Mesh and Nodal analysis of simple circuits with DC -Problems.

UNIT – II

AC Circuits: Representation of sinusoidal waveforms, average, peak and rms values, Form factor Peak factor for sinusoidal waveform - problems, phasor representation, impedance, admittance, reactance, susceptance, real power, reactive power, apparent power, power factor. Analysis of 1Φ ac circuits for series & parallel combinations - simple problems.

UNIT – III

DC machines: DC Generators: Construction– working principle – EMF equation – types of DC generators- applications - simple problems.

Working Principle of DC motor, types, Torque Equation, Concept of Back EMF- applications - simple Problems.

UNIT – IV

Transformers & Induction Machines: Single phase transformer - principle of operation, constructional details, emf equation, losses in transformer, regulation and efficiency, equivalent circuit - simple problems.

Three phase Induction Motor: Construction and working principle, slip, rotor frequency, rotor current, and rotor power factor –simple Problems.

UNIT – V

Electrical Installations: Components of LT switchgear: Switch Fuse Unit (SFU), Miniature Circuit Breaker (MCB), Wires and Cables, Earthing. Batteries, Introduction to power converters

Text Books:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.

Reference Books:

1 E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
2. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
3. A. Chakrabarti "Circuit Theory", Dhanapath Roy & Co.
4. Electrical Circuits – N. Sreenivasulu – Reem Publications.

Course Title	ENGINEERING GRAPHICS & DESIGN				B. Tech. ECE I Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
1803107	**ESC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		1	0	4	3	50	50	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**		

Course Objectives:

- To Increase ability to communicate with people
- To Learn to sketch and take field dimensions.
- To Learn to take data and transform it into graphic drawings.
- To Learn basic Auto Cad skills.
- To Learn basic engineering drawing formats
- To Prepare the student for future Engineering positions

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Use** CAD drafting and editing tools along with page templates ,title block & print settings
CO 2	**Describe** the geometric details of Engineering objects & Become familiar with Auto Cad 2D 3D drawings
CO 3	**Understand** Engineering drawing basic theory of projections related to points lines, plane and solids in different orientations and drafting them in cad software
CO 4	**Analyze** various sectional views related to Engineering Drawings and Create isometric drawings with 3d tools along with basic theory& procedures in engineering drawing

UNIT-I

Overview of CAD: Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), Status Bar, Different methods of zoom as used in CAD, Select and erase objects, copy, move, scaling objects, mirror, rotate, offset, polar array, rectangular Array.

UNIT-II

Customization & CAD Drawing: Consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning; Orthographic, constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods, Applying various ways of drawing circles; Annotations, layering & other functions, Diagrams for practice covering drafting and editing commands

UNIT-III

Introduction to Engineering drawing: Principles of Engineering Graphics and their significance, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epi cycloid, Hypocycloid and In volute.

UNIT-IV

Projection of Points, lines, Planes & solids: Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes Projections of Regular Solids

Projections of solids inclined to both planes. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc

UNIT V

Sections and Sectional Views of Right Angular solids: Sections of Prism, Cylinder, Pyramid and Cone and representation of hatching for various sectional views in cad Development of surfaces of Right Regular Prism, Pyramid, Cylinder and Cone

Isometric & ortho Graphic Projections: Principles of Isometric projection – Isometric Scale, Isometric Views, Orthographic projection and isometric projection techniques with 3d commands, Boolean operations(Union, Region, subtract etc…,)Representation of orthographic projections with viewports, Ucs orientation for representing dimensions for isometric diagrams, scaling

Text Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Narayana, K.L. & P Kannaiah (2012), 5th Edition, Text book on Engineering Drawing, Scitech Publishers.
3. Engineering Drawing + AutoCAD Paperback by K. Venugopal,New age publishers,3rd Edition ,2011

References:

1. Shah, M.B. &Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
2. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
3. Engineering Drawing with an Introduction to AutoCAD by Dhananjay Jolhe ,Mc Graw hill Edition
4. Corresponding set of CAD Software Theory and User Manuals

Course Title	ENGINEERING PHYSICS LAB					B. Tech. ECE I Sem		
Course Code	Category	Hours/Week			Credits	Maximum marks		
1822108	BSC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	50	50	100
							End Exam Duration: 3Hrs	

Course Objectives:

- To explore the application of interference and diffraction by doing concerned experiments.
- Elucidate the concepts of Physics through involvement in the experiment by applying theoretical knowledge.
- Develop an ability to apply the knowledge of physics experiments in the later studies.
- To understand the concept of energy gap, B-H curve, and synthesis of nano material by performing the experiments**.**

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Evaluate** the interference, diffraction phenomena along with laser.
CO 2	**Use** scientific process in the conduct and reporting of experimental investigations.
CO 3	**Formulate** the measurement technology, usage of new instruments and real time applications in engineering studies.
CO 4	**Justify** the theoretical ideas and concepts covered in lecture by doing hands on in the experiments.
CO 5	**Develop** the characteristics of various materials in a practical manner and gain knowledge about various optical technique methods.
CO 6	**Examine** the physical laws using experimental data.

LIST OF EXPERIMENTS

Any 7 of the following experiments has to be performed in a semester:

1. Determination of wavelengths of spectral lines of mercury spectrum using diffraction grating in normal incidence method.
2. Determination of dispersive power of the prism.
3. Rigidity Modulus- Torsonal Pendulum.
4. Study of resonance effect in series and parallel LCR circuit.
5. Determination of thickness of thin object by wedge method.
6. Determination of radius of curvature of lens by Newton's Rings.
7. Laser: Determination of wavelength using diffraction grating.
8. Energy gap of a semiconductor using p-n junction diode.
9. Hysteresis: B-H curve.
10. Magnetic field along the axis of a current carrying coil – Stewart and Gee's method.
11. Frequency of the tuning fork - Melde's apparatus.
12. Spring constant - Coupled Pendulums.

Course Title	BASIC ELECTRICAL ENGINEERING LAB				B. Tech. ECE I Sem		
Course Code	**Category**	**Hours/Week**		**Credits**	**Maximum marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
1802109	**ESC**	-	-	2	1	50	50	100
						End Exam Duration: 3Hrs		

Course Objectives:

- The objective of the course is to verify theoretically and practically Kirchhoff's laws, determination of R, L, and C Parameters, measure the power for RL, RC circuits, speed-torque characteristics of DC shunt motor, speed control of 3-F IM, performance of transformer.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Understand** the Kirchhoff's laws by theoretically and practically.
CO 2	**Determine** the active and reactive power for RL, RC and RLC circuits.
CO 3	**Determine** equivalent circuit parameters on no-load and its performance on load of a 1-Ø transformer.
CO 4	**Analyze** the characteristics of DC shunt motor and 3-Ø Induction motor
CO 5	**Identify** various parts of DC and AC machines, fuse, MCB & Batteries.

List of Experiments

1. Determination of values of R, L and C parameters of a given R-L-C series circuit
2. Verification of KCL and KVL.
3. Determination of Active, reactive and apparent power for R-L circuit (series & parallel).
4. Determination of Active, reactive and apparent power for R-C circuit (series & parallel).
5. Load test on 1-phase transformer.
6. OC & SC tests on 1-phase transformer to obtain equivalent circuit.
7. Torque-speed characteristics of DC shunt motor.
8. Speed Control of three –phase induction motors using pole changing method
9. Demonstration of cut out sections of DC & AC machines
10. Study of fuse, MCB, Batteries

Course Title	WORKSHOP AND MANUFACTURING PRACTICES				B. Tech. ECE I Sem			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
1803110	**ESC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		1	0	4	3	50	50	100
						End Exam Duration: 3Hrs		

Course Objectives:

- To understand the basic knowledge of Workshop Practice and Safety.
- To identify and use of different hand tools and other instruments like Hack Saw, Jack Plane, Chisels etc. and operations like Marking, Cutting etc.
- To expose students to different types of manufacturing/fabrication processes
- To develop a skill in dignity of labour, precision, safety at work place, team working and development of right attitude.

Course Outcomes:: At the end of the course, the student will be able to

CO 1	**Identify** different manufacturing processes which are commonly employed in the industry
CO 2	**Analyze** the practical knowledge about fabricate components using different materials with their own hands
CO 3	**Understand** the knowledge of the dimensional accuracies and tolerances applicable for different manufacturing processes
CO 4	**Understand** the knowledge of the dimensional accuracies and tolerances applicable for different manufacturing processes

WORKSHOP AND MANUFACTURING PRACTICES:

LIST OF EXPERIMENTS IN THE SYLLABUS

1. MACHINE SHOP: 1. STEP TURNING OPERATION
2. TAPER TURNING OPERATION

2. FITTING SECTION: 1. SQUARE FITTING
2. STEEPED FITTING

3. CARPENTRY SECTION: 1. TEE HALVING JOINT
2. DOVETAIL TEE HALVING JOINT

4. HOUSE WIRING SECTION:

1. TO CONTROL TWO LAMPS BY ONE SINGLE WAY SWITCH (IN SERIES)
2. TO CONTROL TWO LAMPS BY ONE SINGLE WAY SWITCH(PARALLEL)

5. WELDING SECTION: 1. SINGLE V BUTT JOINT
2. LAP JOINT

6. FOUNDRY SECTION:	1. SINGLE PIECE SQUARE PATTERN 2. SINGLE PIECE ROUND PATTERN
7. SHEET METAL SECTION	1. SQUARE TRY 2. CYLINDER

Textbooks:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., ―Elements of Workshop Technology‖, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.

2. Rao P.N., ―Manufacturing Technology‖, Vol. I and Vol. II, Tata McGrawHill House, 2017.

Reference Books:

1. (Kalpakjian S. And Steven S. Schmid, ―Manufacturing Engineering and Technology ‖, 4th edition, Pearson Education India Edition, 2002.
2. Gowri P. Hariharan and A. Suresh Babu,‖Manufacturing Technology – I‖ Pearson Education,2008.
3. Roy A. Lindberg, ―Processes and Materials of Manufacture‖, 4th edition, Prentice Hall India, 1998.

Course Title	MATHEMATICS – II				B. Tech. ECE II Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1821201	BSC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	1	--	4	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs		

Course Objectives:

- To enable the students to apply the knowledge of mathematics in various engineering fields by making them to learn the following:
- First order differential equations.
- Linear differential equations with constant coefficients.
- Laplace transforms in engineering problems.
- Evaluate multiple integrals.
- Understand Vector Calculus concepts and their applications.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Solve the first order differential equations.
CO 2	Solve linear differential equations with constant coefficients.
CO 3	Apply Laplace Transforms in engineering problems.
CO 4	Evaluation of multiple integrals.
CO 5	Understand Vector Calculus concepts and their applications.

Unit I

First order ordinary differential equations:

Linear, Bernoulli equations, Exact and equations reducible to Exact Applications: Orthogonal trajectories, Newton's law of cooling, Law of natural growth and decay.

Unit I

Ordinary differential equations of higher order:

Linear differential equations of second and higher order with constant coefficients – R.H.S term of the type e^{ax}, sinax, cosax, polynomials in x, e^{ax} V(x), xV(x) – Method of variation of parameters.

Unit III

Laplace transforms:

Laplace transforms of standard functions – Properties of Laplace Transforms – Transforms of derivatives and integrals– Evaluation of integrals by Laplace transforms – Laplace transform of periodic functions. Convolution theorem. Inverse Laplace Transforms – Applications of Laplace transforms to ordinary differential equations.

Unit IV

Multiple Integrals: Evaluation of double integrals in Cartesian coordinates and polar coordinates – Change of variables in double integrals – Change the order of integration in double integrals – Evaluation of triple integrals in Cartesian and polar coordinates – Change of variables in triple integrals.

Unit V

Vector calculus:

Vector differentiation: Scalar point function - Vector point function – Vector operator Del – Gradient – Divergence – Curl. Vector integration: Line, Surface and Volume integrals. Green's theorem in a plane, Stoke's theorem and Gauss-divergence theorems (Statements only).Applications of Green's, Stoke's and Gauss divergence theorems.

Text Books:

1. Higher Engineering Mathematics, Dr. B.S. Grewal, Khanna Publishers-43 edition 2014.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Publications, 9th edition- 2013
3. Calculus and Analytic geometry, G.B. Thomas and R.L. Finney, Pearson, 9th Edition, Reprint, 2002.

Reference Books:

1. Higher Engineering Mathematics, B.V. Ramana, Mc. Graw Hill Education (India) Pvt. Ltd, New Delhi, 11th Edition, Reprint 2010.
2. A Text Book of Engineering Mathematics, N.P. Bali and Manish Goyal, Lakshmi Publications, Reprint 2008.

Course Title	ENGINEERING CHEMISTRY				B. Tech. ECE II Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1823202	BSC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	1	--	4	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs		

Course Objectives:

- Knowledge in Chemistry serves as basic nutrient for the understanding and thereby design of materials of importance in life. Thus the advancement in Engineering depend on the outcome of basic sciences.
- The Engineering Chemistry course for undergraduate students is framed to strengthen the fundamentals of chemistry and then build an interface of theoretical concepts with their industrial! Engineering applications.
- The course main aim is to impart in-depth knowledge of the subject and highlight the role of chemistry principles (or) applications in the field of engineering.
- An attempt has been made to logically correlate the topic with its application.
- After the completion of the course, the student would understand about the concepts of chemistry.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces. Rationalize bulk properties and processes using thermodynamic considerations.
CO 2	Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
CO 3	Rationalize periodic properties such as ionization potential, electro negativity, oxidation states and electro negativity.
CO 4	List major chemical reactions that are used in the synthesis of molecules.

Unit-I

Atomic and molecular structure

Schrodinger wave equation.Particle in a box(one dimensional) and their applications.Molecular orbitals of diatomic molecules and plots of the multicenter orbitals.Equations for atomic and molecular orbitals.Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties.Band structure of solids and the role of doping on band structures.

Unit-II

Periodic properties

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard, soft acids and bases.

Unit-III

Intermolecular forces

Ionic, dipolar and van Der Waals interactions.Equations of state of real gases and critical phenomena.

Use of free energy in chemical equilibria

Thermodynamic functions: Introduction, define energy, entropy , Free energy. Free energy and emf.Cell potentials, the Nernst equation and applications.Water chemistry-types of water and Boiler troubles.Corrosion-types of corrosion and factors influencing corrosion.

Unit-IV

Spectroscopic techniques and applications

Principles of spectroscopy and selection rules.Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules.

Unit-V

Stereochemistry

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis of Cyclohexane.

Simple Organic Reactions

Introduction to reactions involving Substitution(SN^1 &SN^2), Addition Reactions involving C=C(Markonikoffreaction) & C=O(Grignardreagent),Elimination(E_1&E_2) Oxidation(Baeyer villiger reaction),Reduction(Clemmensen reduction).

TextBooks

1. Engineering Chemistry, Satyaprakash, Khanna Book Publishing, Delhi
2. A Text Book of Engg. Chemistry, Shashi Chawla, Dhanpat Rai & Co. (P) Ltd.
3. Essentials of Physical Chemistry, Bahl&Tuli, S.Chand Publishing
4. Applied Chemistry, Sunita Rattan, Kataria
5. Engineering Chemistry, Baskar, Wiley
6. Engineering Chemistry – I, D. GrourKrishana, Vikas Publishing
7. Laboratory Manual Engg. Chemistry, Anupma Rajput, Dhanpat Rai & Co.

Course Title	ENGLISH					B. Tech. ECE II Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1824203	HSMC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	-	--	2	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs			

Course Objectives:

- To improve the language proficiency of the students in English with an emphasis on LSRW Skills.
- To develop an awareness in the students about the significance of silent reading and comprehension
- To equip the students study academic subjects with greater facility through theoretical and practical components of the syllabus.
- To develop study skills as well as communication in formal and informal situations.
- To develop an awareness in the students about writing as an exact and formal skill.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Retrieve the knowledge of basic grammatical concepts
CO 2	Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
CO 3	Apply grammatical structures to formulate sentences and correct word forms
CO 4	Analyze discourse markers to speak clearly on a specific topic in informal discussions
CO 5	Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
CO 6	Create a coherent paragraph interpreting a figure/graph/chart/table

1. Vocabulary Building

1.1 The concept of Word Formation

1.2 Root word from foreign languages and their use in English

1.3 Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives

1.4 Synonyms, antonyms

1.5 Idioms and phrases.

2 Basic Writing Skills

2.1 Sentence Structures

2.2 Use of phrases and clauses in sentences

2.3 Importance of proper punctuation

2.4 Creating coherence

2.5 Organizing principles of paragraphs in documents

2.6 Techniques for writing precisely

3 Transformation

3.1 Interchange of parts of speech

3.2 Active voice and Passive voice

3.3 Direct and Indirect speech

3.4 3.4Degrees of comparison

3.5 3.5Simple, compound and complex sentences

2. Identifying Common Errors in Writing

a. Subject-Verb agreement
b. Noun-pronoun agreement
c. Misplaced modifiers
d. Articles
e. Prepositions
f. Redundancies
g. Clichés
h. Tenses

3. Reading and Writing Practices

a. Comprehension
b. Précis Writing
c. Essay writing
d. Essay writing

Course Title	PROGRAMMING FOR PROBLEM SOLVING				B. Tech. ECE II Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
1805204	**ESC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	-	--	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**		

Course Objectives:

- The course aims to provide exposure to problem-solving through programming
- It aims to train the student to the basic concepts of the C programming language

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Formulate simple algorithms for arithmetic and logical problems and translate the algorithms to programs
CO 2	Choose the loops and decision making statements to solve the problem.
CO 3	Implement different Operations on arrays.
CO 4	Use functions to solve the given problem.
CO 5	Understand structures, unions and pointers

UNIT 1

Introduction to Computers: - Introduction, computer hardware and software, creating and running programs, software development life cycle, algorithms, flowcharts.

Introduction to C programming: - Overview of C, structure of a C program, variables, constants, data types, identifiers, keywords, Input/output statements in C, programming examples.

UNIT 2

Operators and Expressions:-Operators, expressions, precedence and associativity, evaluating expressions, type conversion, typedef, enumerations.

Decision making statements: if statement, if-else statement, nested if-else statement, switch statement.

Loops in C: while loop, for loop, do-while loop, nested for loops,

Jumping statements: break, continue and goto statements.

UNIT 3

Arrays: Introduction, Declaration and initialization of 1D and 2D arrays.

Array applications: -bubble (exchange) sort, selection sort, linear search, binary search.

Strings: -Definition, declaration and initialization of strings, string I/O functions, string handling functions, array of strings (table of strings).

UNIT 4

Functions: introduction, category of functions, parameter passing methods, storage classes, recursive function.

Pointers: Understanding pointers, declaring and initialization of pointer variable, accessing the address of variables, accessing a variable through its pointer, chain of pointers.

UNIT 5

Structures and union: Introduction, defining a structure, declaring structure variable, structure initialization, accessing members of structure, copying and comparing structure variables, structures within structures, array of structures, and introduction of union.

TEXT BOOKS

1. E. Balagurusamy, Programming in ANSI C, Fifth Edition, McGraw Hill.
2. Rema Theraja, Programming in C, second edition, Oxford.

REFERENCE TEXT BOOKS

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. R.G. Dromey, How to solve it by Computer, Pearson.
3. Yashavant Kanetkar, Let us C, 15th edition, BPB Publications.
4. Dr. P. ChennaReddy, Computer Fundamentals and C Programming, Second Edition.

Course Title	CHEMISTRY LAB					B. Tech. ECE II Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
1823207	**BSC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		-	-	3	1.5	50	50	100
						End Exam Duration: 3Hrs		

Course Objectives:

- The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Estimate rate constants of reactions from concentration of reactants/products as afunction of time.
CO 2	Measure molecular/system properties such as surface tension, viscosity,conductance of solutions, redox potentials, chloride content of water, etc.
CO 3	Synthesize a small drug molecule and analyse a salt sample.

Choice of experiments from the following:

1.Estimation of Hardness of Water present in given water sample by EDTA method.

2. Determination of surface tension and viscosity.

3. Determination of chloride content of water.

4. Colligative properties using freezing point depression.

5. Estimation of Dissolved Oxygen present in given water sample by Winkler's method.

6. Potentiometry - determination of Redox potentials and emfs.

7. Synthesis of a polymer/drug.

8. Saponification/acid value of oil.

9. Determination of cell constant and conductance of solutions..

10. Chemical oscillations- Iodine clock reaction.

11. Determination of the partition coefficient of a substance between two immiscible liquids.

12. Adsorption of acetic acid by charcoal.

Course Title	PROGRAMMING FOR PROBLEM SOLVING LAB				B. Tech. ECE II Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
1805208	**ESC**	-	-	4	2	50	50	100
					End Exam Duration: 3Hrs		

Course Objectives:

- To impart knowledge so that the student will
- know how to write and debug programs
- know the principles of designing structured programs
- Know when and how to use the appropriate statements available in the C language.
- Write basic C programs using, Selection statements, Repetitive statements, Functions, Pointers, Arrays, Strings and structures

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Formulate the algorithms for simple problems.
CO 2	Translate given algorithms to a working and correct program
CO 3	Correct syntax errors as reported by the compilers.
CO 4	Identify and correct logical errors encountered at run time
CO 5	Write iterative as well as recursive programs
CO 6	Represent data in arrays, strings and structures and manipulate them through a program

DOS commands, Algorithms, Flowcharts and sample C programs

1. Practice DOS commands necessary for design of C programs.

2. Design and develop algorithms and flowcharts for simple and logical problems

3. If the total selling price of 15 items and total profit earned on them is input through the keyboard. Write a C program to find the cost price of one item.

4. Ramesh’s basic salary is input through the keyboard. His dearness allowance is 40% of basic salary and house rent allowance is 20% of basic salary. Write a C program to calculate his gross salary.

5. The distance between two cities (in km) is input through the keyboard. Write a C program to convert and print the distance in meters, centimetres, inches and feet.

6. Write a program to take input of name, roll no and marks obtained by a student in 5 subjects each have its 100 full marks and display the name, roll no with percentage score secured.

Problems involving if-then-else structures

7. Write a C program to find out whether a given number is even number or odd number.

8. Write a C program to check whether a given year is leap year or not.
9. Design and develop an algorithm that takes three coefficients (***a***, ***b***, and ***c***) of a Quadratic equation ($ax^2+bx+c=0$) as input and compute all possible roots. Implement a C program for the developed algorithm and execute the same to output the possible roots for a given set of coefficients with appropriate messages.

10. If the ages of the Ramesh, Suresh and Mahesh are input through the keyboard, write a C program to determine youngest of the three.

11. A character is entered through keyboard. Write a C program to determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol using if-else and switch case. The following table shows the range of ASCII values for various characters.

Characters	**ASCII values**
A – Z	65 – 90
a – z	97 – 122
0 – 9	48 – 57
Special symbols	0 – 47, 58 – 64, 91 – 96, 123 – 127.

12. A library charges fine for every book returned late. For first five days the fine is 50 paisa, for 6-10 days fine is one rupee and above 10 days fine is 5 rupees. If you return the book after 30 days your membership will be cancelled. Write a C program to accept the number of days that the member is late to return the book and display the fine or appropriate message.

13. Write a C program which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, *, /, % and use switch statement).

Problems involving Looping statements

14. If the sum of the cubes of each digit of a number is equal to the number itself, then the number is called Armstrong number. (for example, $153 = 1^3+5^3+3^3$). Design and develop an algorithm to find whether a given number is Armstrong number or not. Implement a C program for the developed algorithm.

15. Design and develop an algorithm to find the square root of a given number ***N***. Implement a C program for the same and execute for all possible inputs with appropriate messages. Note: **Don't use library function *sqrt(n)*.**

16. If a number and its reversed number are same then the number is called as palindrome number. Design and develop an algorithm to check whether a given number is palindrome or not. Implement a C program for the same.

17. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

18. Write a C program to evaluate the sin(x) function series

$$\sin x = \frac{x}{1!} - \frac{x3}{3!} + \frac{x5}{5!} - \frac{x7}{7!} + \cdots$$

19. **Fibonacci Sequence**

A Fibonacci sequence is defined as follows:

The first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a program to generate the first N terms of the sequence.

Arrays

20. Write a C program to find the smallest and largest number in a given array.

21. Write a C program to find the frequency of a particular number in a list of integers.

22. Write a C program to sort the list of elements using

a) Bubble Sort b) Selection sort.

23. Write a C program to search for an element in a list of elements using

a) Linear search b) Binary search

24. Write a C program to find the transpose of a matrix.

25. Write a C program to read two matrices and perform the following operations

a) Addition of two matrices

b) Multiplication of two matrices

Additional Problems on arrays

26. **Partitioning an array**

Given a randomly ordered array of n elements, write a C program to partition the elements into two subsets such that elements ≤X are in one subset and elements ≥X are in another subset.

27. **Finding the k^{th} smallest element**
    Given a randomly ordered array of n elements, write a C program to determine the k^{th} smallest element.
28. **Array order reversal**
    Write a C program to rearrange the elements in an array so that they appear in reverse order.

Strings

29. If a string and its reversed string are same then the string is called as palindrome string. Design and develop an algorithm to check whether a given string is a palindrome or not and implement a C program for the same.

30. Write a C program to sort the names of students in a class in alphabetical order.

Additional Problems on strings

31. Write a C program to read two strings and perform the following operations without using built string library functions.

i) String length
ii) String reversing
iii) Comparison of two strings
iv) Concatenation of two strings

32. Write a C program to count the number of vowels, consonants, digits, blank spaces and special characters in a given string.

Functions and Recursion

33. Write a C program to swap the contents of two variables using
a) Call by value
b) Call by reference.

34. Write a C program using recursion to
a) Find the factorial of a given number
b) Print the Fibonacci series up to a given number.
c) Find the GCD of two integers.

Structures

35. Write a C program to define a structure with the following members.
    Roll No., Name, marks in Sub1, Sub2, Sub3. Read the n students records and find the total marks of each student and print the result in the following format.

Roll No	Name	Sub1	Sub2	Sub3	Total marks	result
189Y1A0501	Kavya	80	70	75	225	Distinction

Files

36. Write a C program to copy the contents of one file to another file.

TEXT BOOKS

1. Yashavant Kanetkar, Let us C, 15th edition, BPB publications.
2. E. Balagurusamy, Programming in ANSI C, Fifth Edition, McGraw Hill.
3. R.G. Dromey, How to solve it by Computer, Pearson.

Course Title	ENGLISH LAB				B. Tech. ECE II Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1824209	HSMC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		-	-	2	1	50	50	100
					End Exam Duration: 3Hrs		

Course Objectives:

- To improve the language proficiency of the students in English with an emphasis on LSRW Skills.
- To develop an awareness in the students about the significance of silent reading and comprehension
- To equip the students study academic subjects with greater facility through theoretical and practical components of the syllabus.
- To develop study skills as well as communication in formal and informal situations.
- To develop an awareness in the students about writing as an exact and formal skill.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Retrieve the knowledge of basic grammatical concepts
CO 2	Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
CO 3	Apply grammatical structures to formulate sentences and correct word forms
CO 4	Analyze discourse markers to speak clearly on a specific topic in informal discussions
CO 5	Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
CO 6	Create a coherent paragraph interpreting a figure/graph/chart/table

Oral Communication

(This unit involve interactive practice sessions in Language Lab)

- Listening Comprehension ----- Language Lab
- Pronunciation, Intonation, Stress and Rhythm ----- Language Lab
- Common Everyday Situations: Conversations and Dialogues ------ Communication Lab
- Communication at workplace ------ Communication Lab
- Interviews ------ Communication Lab
- Formal Presentations ------ Communication Lab

Course Title	MATHEMATICS – III					B. Tech. ECE III Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
1821301	**BSC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	1	--	4	30	70	100
Mid Exam Duration: 2Hrs						**End Exam Duration: 3Hrs**		

Course Objectives:

The objective of this course is to familiarize the students Bessel functions, Legendre's equations and the concepts of complex variables to equip the students to solve application problems in their disciplines.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	**Solve** Bessel and Legendre's equations in terms of polynomials.
CO 2	**Define** analytic function, singularities, poles and residues
CO 3	**Determine** the differentiation of complex functions used in engineering problems and analyze images from z-plane to w-plane.
CO 4	**Discuss** the various special transformations.
CO 5	**Analyze** real definite integrals in definite regions.

UNIT I

Bessel functions –Introduction – Recurrence formulae for $J_n(x)$ – Generating function for $J_n(x)$ – Jacobi series – Orthogonality of Bessel functions – Legendre's equation – Rodrigue's formula, Legendre Polynomials – Generating function for $P_n(x)$ - Recurrence formulae for $P_n(x)$ – Orthogonality of Legendre polynomials.

UNIT II

Functions of a complex variable – Limit – Continuity -Differentiability – Analytic function – Properties – Cauchy – Riemann equations in cartesian and polar coordinates – Harmonic and Conjugate harmonic functions. Construction of analytic function using Milne's Thomson method.

UNIT III

Conformal Mapping: Some standard transforms – translation, rotation, magnification, inversion and reflection. Bilinear transformation – invariant points. Special conformal transformations: $w = e^z$, z^2, sinz and cosz.

UNIT IV

Complex integration: Line integral - Evaluation along a path – Cauchy's theorem – Cauchy's integral formula – Generalized integral formula. Singular point – Isolated singular point – Simple pole, Pole of order *m* – Essential singularity.

UNIT V

Residues: Evaluation of residues by formula. Cauchy's residue theorem – Evaluation of the real definite integrals of the type (i) Integration around the unit circle $\int_0^{2\pi} f(cos\theta, sin\theta)d\theta$ (ii) integration around a small semi circle $\int_{-\infty}^{\infty} f(x)dx$

Text Books:

1. Higher Engineering Mathematics, Dr. B.S Grewal, Khanna Publishers-42 edition.
2. Advanced Engineering Mathematics, Erwin Kreyszig, Willey Publications, 9th edition- 2013.

Reference Books:

1. Higher Engineering Mathematics, B.V.Ramana, Mc.Graw Hill Education (India) Private Limited.
2. Advanced Engineering Mathematics by N. Bali, M Goyal, Firewall Media 7th edition.
3. Engineering Mathematics, Volume – III, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.

Course Title	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS				B. Tech. ECE III Sem			
Course Code	Category	Hours/Week			Credits			
1825307	HSMC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	--	--	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs			

Course Objectives:

- To equip the budding engineering student with an understanding of concepts and tools of economic analysis.
- Provide knowledge of managerial economics through differential economics concepts, accounting concepts are necessary to analyze and solve complex problems relating financial related matters in bog industries.
- An understanding of professional and ethical responsibility and ability to communicate effectively.
- The broad education necessary to understand the impact of engineering solutions in a global and societal context.
- Recognition of the need for, and an ability to engage in life-long learning and to meet contemporary issues.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Acquire knowledge** in principles and concepts of Managerial Economics and Accountancy
CO 2	**Understand** the Economic theories i.e., Demand, Production, Cost, Markets and Price.
CO 3	**Describe** different types of Markets and competition, forms of organization and Methods of Pricing.
CO 4	**Examine** the profitability of various Projects.
CO 5	**Utilize** tools and techniques to analyze and interpret the key parameters of financial performance.

UNIT – I

INTRODUCTION TO MANAGERIAL ECONOMICS

Definition, nature and scope of Managerial Economics –Demand analysis – Determinants, Law of Demand and its exceptions – Elasticity of Demand – Types and Measurement of Elasticity of Demand – Methods of Demand Forecasting (Statistical mehtods) – Supply Analysis.

UNIT – II

THEORY OF PRODUCTION AND COST ANALYSIS

Production Functions: Law of variable proportion, Isoquants and Isocost, least cost combination of inputs, Returns to Scale and Cobb- Douglas production function. Internal and external economies of scale.

Cost Analysis: Cost concepts – Break-Even Analysis (BEA) – Break Even Point – significance and limitations of BEA.

UNIT – III

INTRODUCTION TO MARKETS AND PRICING

Markets structures: Perfect and Imperfect competition – Features of Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly.Price- Output determination under perfect competition, monopoly and monopolistic competition – Price rigidity in Oligopoly.Methods of pricing – cost plus pricing, marginal cost pricing, skimming pricing, penetration pricing, differential pricing and administrative pricing.

UNIT – IV

BUSINESS ORGINATIONS AND CAPITAL BUDGETING

Business Organizations: Types of business organizations- Sole Proprietorship, Partnership, Joint Stock Company, Public Ltd and Private Ltd companies, Public Private Partnership (PPP).

Capital Budgeting: Types of capital, methods and sources of raising Capital. Capital Budgeting Techniques: Payback Period Method, Accounting Rate of return (ARR) and Net Present Value Method (NPV) (simple problems).

UNIT – V

FINANCIAL ACCOUNTING AND ANALYSIS

Double Entry Book keeping, Journal, Ledger, Trail Balance – Final Accounts (Preparation of Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Analysis and interpretation of financial statements through ratios (Liquidity, Profitability and Activity Ratios) (Simple problems).

TEXT BOOKS:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand Publishers, 2009.
2. Prasad and K.V.Rao: Financial Accounting, jaibharth Publishers, Vijayawada.

REFERENCES:

1. P.L Mehtha: Managerial Economics, Sulthan Chand Publishers
2. K K Dewett - Managerial Economics ,S. Chand Publishers
3. S.P Jain & K.L Narang: Financial Accounting, Kalyani publishers.
4. M.Sugunatha Reddy: Managerial Economics and Financial Analysis, Research India Publication, New Delhi, 2013.
5. Paul A Samuleson and William nordhaus : Economics, Oxford University Publications.
6. M L Jhingan : Micro Economics & Macro Economics, Vrinda Publacations (P) Ltd.

Course Title	ELECTRONIC DEVICES AND CIRCUITS				B. Tech. ECE III Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1804303	EC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	--	--	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs		

Course Objectives:

- To teach principles of semiconductorPhysics
- To introduce electronic devices, including diodes, bipolar junction transistors andFET.
- To understand basic circuits of the electronicdevices.
- To learn the biasing of BJT andFET.
- To teach small signal analysis of BJT andFET.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Describe** the operation of various Diodes, transistors and their applications
CO 2	**Understand** the operation of transistor circuits under different configurations
CO 3	**Analyze** the small signal analysis of BJT Amplifiers and of FET amplifiers
CO 4	**Illustrate** the Biasing of BJT and FET.
CO 5	**Classify** the family of MOS devices.

UNIT-I

PN Junction Diode: Construction and operation of PN Junction Diode, V-I characteristics, Temperature Dependence, Static and dynamic resistance, Transition and Diffusion capacitance, Zener diode.

Diode Applications: Diode clippers and Clampers, Half wave, Full wave and Bridge Rectifiers with and without filters, Ripple factor and regulation characteristics. Applications of Zener Diode.

UNIT-II

Bipolar Junction Transistors: NPN and PNP Junction Transistors, Current components, CB, CE & CC configurations and their Input & Output Characteristics, Comparison of CE, CB and CC configurations, Saturation, Cutoff and Active regions, α, β and γ parameters and relation between them.

FET: JFET, JFET characteristics and configurations, Pinch off voltage, Drain saturation current,

Parameters of JFET, FET as Voltage Variable Resistor, Comparison between FET and BJT.MOSFET- Depletion and Enhancement types.

UNIT-III

BJT Biasing: Operating point, biasing stability, Various biasing circuits, thermal runaway, stabilization and compensation, Thermal stability, Transistor as an amplifier.
FET Biasing: Fixed bias, Self bias and voltage divider bias.

UNIT-IV

Low frequency Analysis of Transistors: Hybrid model (h-parameters), small signal analysis of a single stage BJT amplifiers, comparison of CE, CB and CC amplifiers, Approximate model analysis, effects of coupling and bypass capacitors on low frequency response.
Small signal models and analysis of JFET and MOSFET.CS, CD and CG Amplifiers and their comparison.

UNIT-V

Special Semiconductor Devices: LED, Photo diode,Photo Transistor, SCR, UJT, Tunnel diode.
Introduction to CMOS: NMOS, PMOS and CMOS-construction, operation, characteristics, advantages and comparison

Text Books:

1. Jacob Millman, Christos C. Halkias, "Integrated electronics" Tata McGraw Hill Publication
2. K. R. Botkar, "Integrated Circuits" 5 th edition, Khanna Publications
3. A.Anand Kumar, "Pulse and Digital Circuits", PHI, 2005.

Reference Books:

1. Y. Tsividis and M. Colin, "Operation and Modeling of the MOS Transistor," Oxford Univ.Press, 2011.
2. D. Neamen , D. Biswas "Semiconductor Physics and Devices," McGraw-Hill Education
3. S. M. Sze and K. N. Kwok, "Physics of Semiconductor Devices," 3rd edition, John Wiley
&Sons, 2006.

4. C.T. Sah, "Fundamentals of solid state electronics," World Scientific Publishing Co. Inc, 1991.

Course Title	DIGITAL SYSTEM DESIGN					B. Tech. ECE III Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1804304	EC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	--	--	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs			

Course Objectives:

- To provide fundamentals of number systems and BooleanAlgebra.
- To learn the design of combinational and sequentialcircuits.
- To teach various memories andPLDs.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Identify** various number systems andbinary codes.
CO 2	**Understand** the postulates, theorems and properties of Boolean algebra.
CO 3	**Show** the correlation between the Boolean expression and their corresponding logic diagram.
CO 4	**Analyze** Combinational & sequential logic circuits.
CO 5	**Solve** Switching functions using Programmable Logic Devices

UNIT-I

Number Systems & Codes: Overview of number systems –complement representation of negative numbers- binary arithmetic, binary codes, code conversion, error detecting & error correcting codes –Hamming codes.

UNIT-II

Boolean Algebra and Minimization of Switching Functions: Fundamental postulates of Boolean Algebra - Basic theorems and properties –Canonical and Standard forms- Minimal SOP and POS forms ,Algebraic simplification, digital logic gates –universal gates-Multilevel NAND/NOR realizations. The K- map method, tabulation method.

UNIT-III

Combinational Logic Design: Design using conventional logic gates, Half and Full Adders, Subtractors, Serial and Parallel Adders, Encoder, Decoder, Multiplexer, De-Multiplexer, Realization of switching functions using multiplexer, Parity bit generator, Code-converters, Hazards and hazard free realizations.

UNIT-IV

Sequential Logic Design: Synchronous and Asynchronous sequential circuits, Flip-flops-Triggering and excitation tables, Flip flop conversions, shift registers, Design of Synchronous and Asynchronous counters, Ring and Johnson counters. Finite state machines (Mealy Model, Moore Model) and their representation, Designing synchronous Sequential circuits like Serial Binary adder, Sequence detector.

UNIT-V

Semiconductor Memories and Programmable Logic Devices: ROM- Internal structure, Static RAMandDynamicRAM.BasicPLD‟s-ROM,PROM,PLA,andPAL,RealizationofSwitching functions using basic PLD‟s. Concept of PLD‟s like CPLDs andFPGAs.

Text Books:

1. ZVI Kohavi, Switching & Finite Automata theory –, TMH, 2ndEdition.
2. Morris Mano, “Digital Design”, PHI, 3rd Edition,2006.
3. A. Anand Kumar, “Switching Theory & Logic Design”, 2008,PHI

Reference Books:

1. R.P. Jain, “Modern digital Electronics”, Tata McGraw Hill, 4th edition,2009.
2. W.H. Gothmann, “Digital Electronics- An introduction to theory and practice”, PHI, 2nd edition ,2006.
3. D.V. Hall, “Digital Circuits and Systems”, Tata McGraw Hill,1989
4. William I. Fletcher, “An Engineering Approach to Digital Design”,PHI.
5. Charles H. Roth, “Fundamentals of Logic Design”, Thomson Publications, 5th Edition,2004.
6. John M. Yarbrough, “Digital Logic Applications and Design”, Thomson Publications,

<table>
<tr><td>Course Title</td><td colspan="4">SIGNALS AND S YSTEMS</td><td colspan="3">B. Tech. ECE III Sem</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">1804305</td><td rowspan="2">EC</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exams</td><td>Total</td></tr>
<tr><td>3</td><td>--</td><td>--</td><td>3</td><td>30</td><td>70</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration: 2Hrs</td><td colspan="4">End Exam Duration: 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives:
● To introduce terminology of signals andsystems.
● To present Fourier tools through the analogy between vectors andsignals.
● To teach concept of sampling and reconstruction ofsignals.
● To present linear systems in time and frequencydomains.
● To teach Laplace and z-transform as mathematical tool to analyze continuous and discrete- time signals andsystems.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Identify the various signals and operations on signals.</td></tr>
<tr><td>CO 2</td><td colspan="8">Describe the spectral characteristics of signals.</td></tr>
<tr><td>CO 3</td><td colspan="8">Illustrate signal sampling and its reconstruction.</td></tr>
<tr><td>CO 4</td><td colspan="8">Apply convolution and correlation in signal processing.</td></tr>
<tr><td>CO 5</td><td colspan="8">Analyze continuous and discrete time systems.</td></tr>
</table>

UNIT-I

Introduction: Definition and Classification of Signals, Elementary signals, Basic operations on signals.

Fourier series representation of periodic signals: Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions. Representation of function by a set of mutually orthogonal functions, Dirichlet‟s conditions, Trigonometric Fourier series and Exponential Fourier series, Spectrum and its significance, Amplitude and Phase spectra, bandwidth of a signal.

UNIT-II

Fourier transforms: Fourier transform, Fourier transform of standard signals, properties of Fourier transforms, Fourier transforms involving impulse function, Fourier transform of periodic signals.

UNIT-III

Discrete Time Signals: Sampling of continuous time signals, Sampling theorem, Reconstruction of signal from its samples, effect of under sampling – Aliasing. Elementary sequences- Unit impulse, step, ramp, and exponential sequences, Periodicity of Discrete-time signals, Operations on Discrete-time signals.

Signal transmission through LTI systems: Systems, Classification of Systems, Linear time invariant (LTI) system, Transmission of signals through LTI systems, Transfer function of a LTI system, Causality & Stability. Distortion less transmission through LTI system, Bandwidth of systems, relation between bandwidth and rise time.

UNIT-IV

Discrete Time Systems: Definition, classification, Linear Shift Invariant(LSI) system, Stability, Causality, Linear constant coefficient difference equation, Impulse response, Discrete time Fourier transform, Properties, Transfer function, System analysis using DTFT.
Convolution and correlation: Graphical method of convolution, auto correlation and Cross correlation of functions, properties of correlation function, Energy density spectrum, Power density spectrum, Relation between convolution and correlation, Applications of convolution andcorrelation.

UNIT-V

Laplace Transform: Definition , ROC , Properties , Inverse Laplace transform , The S-plane and BIBO stability , Transfer functions , System response to standardsignals.
Z–Transforms: Definition, ROC and its properties, analysis of LTI system using Z-transform, The Inverse Z-transform using, Z-transform properties, Unilateral Z- Transform, solution of linear constant coefficient difference equations using Z-transforms.

Text Books:

1. Simon Haykin, "Communication Systems", 2nd Edition, Wiley-Eastern,2003.
2. Oppenheim AV and Willisky, "Signals and Systems", 2nd Edition, Pearson Ed,1997.
3. B.P. Lathi, "Principles of Linear systems and signals," Oxford Univ. Press, Second Edition International version,2009.

Reference Books:

1. Simon Haykin, Van Veen, and Wiley, "Signals & Systems", 2nd Edition,2003.
2. Luis F. Chaparro, "Signals and Systems using MATLAB," Academic Press,2011.
3. P. Ramesh Babu, R. Ananda Natarajan, "Signals and Systems", 2nd edition, SciTech Publications,2006.
4. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms,and Applications, 4 th Edition, PHI,2007.

Course Title	NETWORK THEORY				B. Tech. ECE III Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1804306	EC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	--	--	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs		

Course Objectives:

- To learn network theorems,
- To teach application of resonance, transients applied for ac and dc circuits
- To study necessary conditions for network functions, various parameters and its relationships.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Understand** the basic concepts of magnetic circuits,resonance and network functions.
CO 2	**Solve** DC and AC circuits by using various theorems.
CO 3	**Analyze** RL,RC and RLC for DC and AC transient response.
CO 4	**Analyze** two port networks for Z,Y,ABCD,H parameters and its relationship between them

UNIT - I

Network Theorems: Superposition theorem, Thevenin & Norton theorems, Maximum power transfer theorem, Reciprocity, Millman's and Compensation Theorems applied to DC and sinusoidal excitations.

UNIT – II

DC Transient Analysis: Determination of initial conditions – transient response of R-L, R-C & R-L-C circuits for dc–solution method using differential equation and Laplace transforms.

AC Transient Analysis: Transient response of R-L, R-C and R-L-C series circuits for sinusoidal excitations, solution method using differential equation and Laplace transforms

UNIT – III

Resonance: Series, parallel circuits, concept of half power frequencies, bandwidth and Q factor. simple problems.

Magnetic Circuits: Concept of self and mutual inductances, dot conventions, coefficient of coupling, series and parallel magnetic circuits, composite magnetic circuits.

UNIT – IV

Single port and multiport networks, immittance functions of two port parameters, necessary conditions for driving point and transfer functions, complex frequencies, poles and zeros, time domain response from pole zero plots, restrictions from pole zero locations.

UNIT – V

Two port Networks: Two port networks, impedance parameters, admittance parameters, transmission parameters, hybrid and inverse hybrid parameters, relationship between parameters, conditions for symmetry and reciprocity, interconnected two port networks, terminated two port parameters and image parameters.

Text Books

1. Network Analysis – Van Valkenburg - 3rd edition, PHI.
2. Circuit Theory -A.Chakrabarti, Dhanapat Rai & Co publications.
3. Electrical Circuits - N.Sreenivasulu, Reem publications.
4. Engineering circuit analysis -Hayt and Kimmerly-7th edition

Reference Books

1. Circuits & Networks – A. Sudhakar, Shayammohan. S. Pillai, 4th Edition –. TMH
2. Networks and Systems – D. Roy Chowdari – New Age International
3. Network Analysis with applications – Stanely - Pearson education 4th edition
4. Network Analysis by G.K.Mittal, Khanna Publishers.
5. Network Analysis by G.K.Mittal,Khanna Publisher

Course Title	PYTHON PROGRAMMING				B. Tech. ECE III Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1805307	ESC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		--	--	3	1.5	50	50	100
						End Exam Duration: 3Hrs		

Course Objectives:

- To write, test, and debug simple Pythonprograms.
- To implement Python programs with conditionals andloops.
- Use functions for structuring Pythonprograms.
- Represent compound data using Python lists, tuples,dictionaries.
- Read and write data from/to files inPython.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Demonstrate** the functions in Python programming.
CO 2	**Illustrate** Python programs with conditionals and loops.
CO 3	**Test** functions for structuring Python programs.
CO 4	**Design** functions for structuring Python programs.
CO 5	**Evaluate** compound data using Python lists, tuples, dictionaries.

LIST OF PROGRAMS

1. Compute the GCD of twonumbers.
2. Find the square root of a number (Newton‟smethod)
3. Exponentiation (power of anumber)
4. Find the maximum of a list ofnumbers
5. Linear search and Binarysearch
6. Selection sort, Insertionsort
7. Mergesort
8. First n primenumbers
9. Multiplymatrices
10. Programs that take command line arguments (wordcount)
11. Find the most frequent words in a text read from afile
12. Simulate elliptical orbits inPygame
13. Simulate bouncing ball usingPygame

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

Course Title	ELECTRONICDEVICES AND CIRCUITS LAB				B. Tech. ECE III Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1804308	EC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		--	--	3	1.5	50	50	100
							End Exam Duration: 3Hrs	

Course Objectives:

- To verify the characteristics of different diodes andtransistors.
- To verify the performance of circuits with diodes andtransistors.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Verify** the V-I Characteristics of various diodes.
CO 2	**Examine** the load characteristics of rectifiers.
CO 3	**Verify** the Input and Output characteristics of various transistors.
CO 4	**Experiment** clipper and clamper circuits.

LIST OF EXPERIMENTS:

1. V-I Characteristics of Pn JunctionDiode
2. V-I Characteristics o ZenerDiode
3. Zener RegulatorCharacteristics
4. V-I Characteristics ofLED
5. Half-Wave Rectifier With and WithoutFilter
6. Full-Wave Rectifier With and WithoutFilter
7. Bridge Rectifier With and WithoutFilter
8. ClipperCircuits
9. ClamperCircuits
10. Input & Output Characteristics of Transistor In CBConfiguratio
11. Input & Output Characteristics of Transistor In CEConfiguration
12. FET Characteristics
13. SCR
14. UJT Characteristics

Course Title	ENVIRONMENT SCIENCE				B. Tech.ECE III Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
18993M1	**MC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		2	--	--	0	30	--	30
Mid Exam Duration: 2Hrs								

Course Objectives:

- To make the students to get awareness on importance of environment in our life.
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Recall** environmental concepts for the sustainable developmental activities towards the society.
CO 2	**Summarize** the interconnection of human dependence on this ecosystem.
CO 3	**Solve** environmental problems by gaining a higher level of knowledge and personal involvement.
CO 4	**Outline** the impact of developmental activities on environment and proper utilization of natural resources.

UNIT-I

Introduction to Environmental Studies- Natural Resources

Multidisciplinary nature of environmental studies.Scope andImportance.

Natural resources and associated problems – Renewable and non renewable Resources

(a) Forest resources –Deforestation: Causes and impacts due to mining, dams – benefits and problems

(b) Water resources – Use and over utilization of surface and ground water – Floods, drought, and conflicts over water

(c) Energy resources –Renewable and Non Renewable energy resources, use of alternate energy resource

(d) Land resources -Soil erosion and desertification, Land degradation.

Role of an individual in conservation of natural resources.

UNIT-II

Ecosystem

Ecosystem- Definition–Structure and function of an ecosystem– Energy flow in the ecosystem –Food chains, food webs, Ecological succession.

Introduction, types, characteristic features of the following ecosystem:

(a)Forest ecosystem, (b)Grassland ecosystem,(c)Desert ecosystem,(d)Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT-III

Biodiversity and its conservation

Levels of Biodiversity: genetic, species andecosystem diversity – Bio-geographical classification of India – Hotspots .Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – India as a mega-diversity nation – Endangered and endemic species. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT-IV

Environmental Pollution

Definition, Cause, effects and control measures of (a) Air Pollution,(b)Water pollution,(c)Soil pollution (d)Noise pollution. Nuclear hazards –Risks to human health .Solid waste management: Control measures of urban and industrial wastes. Pollution case studies. Global Warming, Ozone layer depletion, acid rains and impacts on human communities and environment .Disaster management: floods, earthquakes, cyclones

UNIT-V

Environmental policies

Environment Protection Act – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act .International agreements: Montreal and Kyoto protocols and conservation on Biological Diversity (CBD).

Human communities and Environment

Human population and growth: impacts on environment, human health and welfares.
Environmental movements: chipko, silent valley.
Environmental Ethics: Role of individual in environmental conservation. Public awareness

FIELD WORK:Visit to a local area to document environmental assets River/forestgrassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds – Study of simple ecosystems-pond, river, hill slopes, etc..

Text Books:

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental studies by Benny Joseph, Mc, Graw Hill Publications.
3. Principles and a basic course of Environmental science for under graduate course by Kousic,KouShic.
4. Text book of Environmental science and Technology by M. Anji Reddy,BS Publication.

Reference Books:

1. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Printice hall of India Private limited.
2. Environmental Studies by Anindita Basak – Pearson education.
3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.

Course Title	BIOLOGY FOR ENGINEERS				B. Tech. ECE IV Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1823401	BSC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	-	-	2	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs			

Course Objectives:

- Introduction to Basics of Biology which includes cell, the unit of life, Different types of cells and classification of living organisms.
- Understanding what are bio molecules present in a cell, their structure function and their role in a living organism. Application of certain bio molecules in Industry.
- Brief introduction to human physiology, which is essential for bioengineering field.
- Understanding the hereditary units, that is genes and genetic materials (DNA and RNA) present in living organisms and how they replicate and pass and preserve vital information in living organisms.
- How biology can be applied in our daily life using different technology, for production of medicines to transgenic plants and animals to designing new biotechnological products.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the difference between lower organisms (prokaryotes) from higher organisms (eukaryotes).
CO 2	Interpret the relationship between the structure and function of nucleic acids.
CO 3	Understand the mechanism and process of important human functions
CO 4	Describe the proteins synthesization, recombinant DNA technology and its application in different fields.
CO 5	Apply biology for production of useful products for mankind

Unit I

Introduction to Basic Biology

Cell: What is a Cell, Cell theory, Cell shapes, structure of a Cell, Cell cycle chromosomes The Plant Cell and animal Cell, protoplasm, prokaryotic and eukaryotic Cell, Plant Tissue and Animal Tissue. Brief introduction to five kingdom of classification.

Learning Outcomes:

After completing this unit, the student will be able to

- Summarize the basis of life. (L2)
- Understand the difference between lower organisms (prokaryotes) from higher organisms (eukaryotes). (L3)
- Understand how organisms are classified based. (L2)

Unit II

Introduction to Bio-molecules

Carbohydrates, proteins, Amino acid, nucleic acid (DNA and RNA) and their types.

Enzymes and their application in Industry.Large scale production of enzymes by Fermentation.

Learning Outcomes:

After completing this unit, the student will be able to

- Understandwhat are bio molecules? Their role in living cells their structure function and how they are produced. (L2)
- Interpret the relationship between the structure and function of nucleic acids. (L2)
- Summarize the applications of enzymes in industry. (L2)
- Understand what is fermentation and its applications of fermentation in industry. (L2)

Unit III

Human Physiology

Nutrition (Classes of nutrients or food substances), Digestive systems

Respiratory system (two kinds of respiration – aerobic and anaerobic) Respiratory organs, respiratory cycle. Excretory system

Learning Outcomes:

After completing this unit, the student will be able to

- Understand the mechanism and process of important human functions

Unit IV

Genes, Replication of DNA, And Introduction to recombinant DNA Technology:

Prokaryotic gene and Eukaryotic gene structure, gene replication, Transcription and Translation in Prokaryote and Eukaryote and synthesis of protein in Eukaryotes. Recombinant DNA technology and cloning introduction.

Learning Outcomes:

After completing this unit, the student will be able to

- Understand and explain about gene structure and replication in prokaryotes and Eukaryotes
- How genetic material is replicated and also understands how proteins are synthesized.
- Understand about recombinant DNA technology and its application in different fields.
- Explain what is cloning.

Unit V

Application of Biology

Brief introduction to Production of vaccines, Enzymes, antibodies, Cloning in microbes, plants and animals, Basics of biosensors, biochips, Bio fuels, and Biosensors. What is Tissue engineering? And its application, transgenic plants and animals, Bio engineering (production of artificial limbs, joints and other parts of body).

Learning Outcomes:

After completing this unit, the student will be able to Understand.

- How biology is applied for production of useful products for mankind.

Text books:

1. Cell and Molecular Biology-P.K.Gupta
2. Cell Biology-Verma and Agarwal
3. Cell Biology-Rastogi
4. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2018.
5. T Johnson, Biology for Engineers, CRC press, 2011 Molecular Biology and Biotechnology 2nd ed. J.M. Walker and E.B. Gingold. Panima Publications. PP 434.

Reference Books:

1. Alberts Et.Al. The molecular biology of the cell, 6/e, Garland Science, 2014
2. De Robertis EDP & EMF De Robertis. 2001. Cell and Molecular biology. Lippincott Williams & Wilkins.Bombay.
3. E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, "Outlines of Biochemistry", John Wiley and Sons, 2009.
4. John Enderle and Joseph Bronzino Introduction to Biomedical Engineering, 3/e, 2012 Principles of Biochemistry. 2nd ed. 1993. A.L. Lehninger, D.L.Nelson.M.Cox. Paniama Publications. PP. 1090.
5. Harper's biochemistry. 1988. R.K. Murray. D.K. Granner, P.A. Mayes. Printice Hall International.
6. Introductory Microbiology. 1995, by Trevor Gross.
7. Molecular Biology by G. Padmanabhan, K. Sivaram Sastry, C. Subramanyam, 1995, Mac Millan.
8. Biochemistry of Nucleic Acids.1992.11th ed.R.L.P.Adams.J.T.Knowler.D.P Leader.Chapman and Hall.
9. Genetic Engineering –Sandhya Mitra.
10. Molecular Biology and Biotechnology by Meyers, RA, A comprehensive Desk reference (VCH Publishers).

Course Title	PROBABILITY THEORY AND STOCHASTIC PROCESSES				B. Tech. ECE IV Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1804402	EC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	-	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs			

Course Objectives:

- The Objective of this course is to provide the students with knowledge about the random variable, random process.
- To model the random processes in the communication system such as receiver performance, interference, thermal noise, and multipath phenomenon.
- The Objective of this course is to provide the students with knowledge about the random variable, random process.
- To model the random processes in the communication system such as receiver performance, interference, thermal noise, and multipath phenomenon.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Interpret probability by modeling sample spaces.
CO 2	Apply various random processes like Gaussian, Exponential, Uniform and Poisson processes experimentally.
CO 3	Compute PSD of Random process.
CO 4	solve complex engineering problems involving random processes

UNIT-I

Probability: Probability definition, Event, Sample space, Axioms, Joint and conditional probability, Independent events, Total probability theorem, Baye's theorem, Bernoulli trials. **Random Variable**: Concept, Distribution function, Density function, Conditional distribution and density functions.

UNIT –II

Operations on Single random variables: Expectation, Conditional expected value, Moments, Chebyshev, Markov‟s and Chernoff‟s inequalities, Characteristics and moment generating functions, Transformation of continuous and discrete random variable.

UNIT-III

Multiple Random Variables: Vector random variables, Joint distribution & Density functions , Conditional density & Distribution functions, Statistical independence, pdf and cdf for sum of random variables, Central limit theorem, Operations on multiple random variables, Expected value of function of random variables, Joint characteristic function, Joint by Gaussian random variables, Transformations of multiple random variables.

UNIT – IV

Random Processes : Concept, Stationarity, Independence, Time averages, Ergodicity, Correlation functions and its properties, Gaussian, Poisson, and Markov processes, Power spectral density and its properties, Relation between power spectral density and auto-

correlation, Cross power spectral density and its properties, Power spectrum for discrete time processes and sequences, Definition of white and colored noise.

UNIT-V

Linear Systems with Random Inputs: Random signal response of linear system, System evaluation using random noise, Spectral characteristics of system response, Noise bandwidth, Band pass, Band limited, and Narrow band processes, Properties of band limited processes.

Text Books:

1. P.Z. Peebles Jr., "Probability Random Variables and Random Signal Principles", Tata McGraw-Hill, 4th Edition, 2001.
2. A. Papoulis and S. Unnikrishna Pillai, "Probability Random Variables and Stochastic Processes", 4th Edition, PHI, 2007
3. B.P. Lathi, " Modern Digital and Analog Communication Systems," Third Edition, OXFORD University press, 1998.
4. Hwei P. Hsu, Ph.D., "Theory and Problems of Probability, Random Variables, and Random Processes", Schaum's Outline Series, McGraw Hill, New York, 1968.

Reference Books:

1. S.P. Eugene Xavier, "Statistical Theory of Communication", New Age Publications, 2003.
2. G.R. Babu and K. Pushpa, "Probability Theory and Stochastic Processes", Premier Publishing House.
3. D. G. Childer, "Probability and Random Processes", McGraw Hill, 1997.

Course Title	ANALOG AND DIGITAL CIRCUITS				B. Tech. ECE IV Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1804403	EC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	--	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs			

Course Objectives:

- To learn about multistage amplifiers, Feedback amplifiers and poweramplifiers.
- To provide knowledge about working and design ofoscillators.
- To teach multivibrators and time basegenerators.
- To know the fundamentals of logicfamilies.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Analyze the multistage amplifiers, feedback amplifiers and power amplifiers.
CO 2	Design sinusoidal and non-sinusoidal oscillators
CO 3	Design different multi-vibrator circuits
CO 4	Illustrate time base generators
CO 5	Understand the operation of various digital circuits

UNIT-I

High frequency analysis of transistors: The Hybrid-pi (π)- Common Emitter Transistor Model, CE short Circuit Current gain, Current gain with Resistive Load, Single Stage CE Transistor Amplifier response, Emitter follower at higher frequencies. High frequency analysis of FET-CS and CD amplifiers.

UNIT-II

Frequency Response of Amplifier: RC Low Pass Filter - RC Integrator, RC High Pass Filter - RC Differentiator, Frequency Response of BJT Amplifier, Analysis at Low and High Frequencies, Bandwidth, Gain-Bandwidth Product, Step response of an amplifier- rise time ,tilt.

Multi Stage Amplifiers: Types of coupling- RC, transformer and direct, choice of amplifier configurations, overall gain and bandwidth of n-stage amplifier, analysis of two-stage RC coupled amplifier, Darlington and Bootstrap circuits.

UNIT-III

Feedback Amplifiers: Feedback concept, classification, effects of negative feedback on gain, stability, noise, distortion, bandwidth, input and output resistances. Different types of feedback circuits.

Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), non-sinusoidal oscillators.

UNIT-IV

Power amplifiers: Classification of power amplifiers, Distortion in amplifiers, efficiency of class-A, class-B, class-C and class-D power amplifiers, complementary symmetry push pull power amplifier.

Tuned Amplifiers: Introduction, Q-Factor, Small Signal Tuned Amplifiers, Effect of Cascading Single Tuned Amplifiers on Bandwidth, Effect of Cascading Double Tuned Amplifiers on Bandwidth, Stagger Tuned Amplifiers, Stability of Tuned Amplifiers.

UNIT-V

Digital Logic Circuits: AND, OR & NOT gates using Diodes and transistors, Analysis of DCTL, RTL, DTL, TTL, ECL, IIL, MOS, CMOS Logic families and Comparison between the logic families.

Text Books:

1. J Jacob Millman, Christos C. Halkias, "Integrated electronics" Tata McGraw Hill Publication
2. J.Millman, H.Taub and Mothiki S. Prakash Rao, " Pulse, Digital and Switching Waveforms",TMH ,2nd Edition, 2008.
3. K. R. Botkar, "Integrated Circuits" 5 th edition, Khanna Publications

Reference Books:

1. P. Horowitz and W. Hill, The Art of Electronics, 2nd edition, Cambridge University Press, 1989.
2. Paul R. Gray and Robert G. Meyer, Analysis and Design of Analog Integrated Circuits, John Wiley, 3rd Edition
3. A.S. Sedra and K.C.Smith, Microelectronic Circuits, Saunder's College Publishing, Edition IV

Course Title	CONTROL SYSTEMS				B. Tech. ECE IV Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1802404	EC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	--	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs			

Course Objectives:

- To learn mathematical modelling of physical system, electrical systems.
- To teach time response of first order and second order Systems.
- To learn stability analysis using time domain and frequency domain.
- To learn design compensator in frequency domain to improve the performance.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Classify the types of control systems
CO 2	Choose the method to solve the problems for time and frequency domain input systems
CO 3	Compare the system stability for different inputs
CO 4	Design lag, lead, lag-lead compensators in frequency domain

UNIT I

Control System Concepts: Introduction to control systems, classification, transfer function, effect of feedback, mathematical modeling of physical systems, block diagram, reduction techniques, signal flow graphs and mason's gain formula, transfer function of simple electrical systems.

UNIT II

Time Domain Analysis: Standard test signals, time response of first and second order systems- time response specifications , steady state error and error constants, response of P, PI, and PID controllers.

UNIT III

Concept of Stability and Root Locus: The concept of stability, necessary conditions for stability – routh hurwitz's criterion – limitations of routh's stability – root locus concept – construction of root loci, effect of poles & zeros on stability.

UNIT IV

Frequency Domain Analysis: Introduction, correlation between time and frequency response, frequency domain specifications, bode plots, nyquist stability criterion - gain and phase margin.

UNIT – V

Compensation Techniques: System design and compensation – realization of basic lead, lag and lead – lag cascade compensations in frequency domain.

Text Books

1. “Control Systems Engineering” by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 5th edition, 2007.
2. “Automatic Control Systems” by B. C. Kuo and Farid Goinaraghi – John Wiley and Son’s, 8th edition, 2003.
3. “Control Systems” by A. Anand Kumar, Prentice Hall of India Pvt. Ltd.
4. Control System Engineering by A.Nagoor Kani , RBA PUB.

Reference Books

1. “Modern Control Engineering” by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. “Control Systems Engineering” by NISE, 5th edition, John Wiley.

Course Title	LINEAR IC APPLICATIONS				B. Tech. ECE IV Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1804405	EC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	--	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs		

Course Objectives:

- To introduce Operational Amplifiers (Op-Amps)
- To give the concepts of design and analysis related to Op-Amp Applications as Timers, Phase Locked Loops (PLLs),Waveform Generators, Analog Filters, Data Converters.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand characteristics of Op-Amps and 555 timers
CO 2	Compare DC and AC characteristics of Op-Amps in the design and simulation of analog systems and subsystems
CO 3	Apply Op-Amps and 555 Timers in various applications.
CO 4	Analyze Data Converters and Active Analog Filter circuits in the development of Instrumentation and Control Systems

UNIT I

Differential amplifiers: Definition, DC and AC analysis of Dual input-Balanced output Differential Amplifier, Properties of other three differential amplifier configurations, Transfer characteristics of Differential Amplifier, Level Translator.

Operational Amplifiers: Ideal op-amp Characteristics, Internal circuit of Op-Amp, Block diagram of Commercial IC Op-Amp, FET input op-amp, DC and AC characteristics of Op-Amp, Frequency Compensation.

UNIT II

Basic Op-Amp Applications: Ideal Inverting and Non-Inverting Amplifiers, Voltage Follower, Summer, Subtractor, Differentiator - Ideal Differentiator, Practical Differentiator, Integrator - Ideal Integrator, Practical Integrator, Instrumentation amplifier, DC and AC Amplifiers, V to I and I to V converters, Precision rectifiers, Sample and Hold Circuit.

UNIT III

Comparators and waveform generators: Principle of Comparator, Schmitt Trigger, Astable Multivibrator, Monostable Multivibrators, Triangular Wave Generator.

Active Filters: Introduction to Analog Active Filters, Design and analysis of First Order Low Pass Filter and First Order High Pass Filter, Design and analysis of Second order Low pass Filter and Second Order High Pass Filter, Qualitative treatment of Band pass Filters and Band Reject Filters.

UNIT IV

Sinusoidal Oscillators: Criterion for Oscillations,RC Phase Shift Oscillator and Wien Bridge Oscillator using OP-Amp.

555 Timers: Functional block diagram and Pin diagram of 555 Timer, 555 Timer in Monostable Mode, 555 Timer in Astable Mode

Phase Locked Loops (PLLs): Basic principle of PLL, Components used in PLL, IC PLL (565), PLL applications.

UNIT V

Digital to Analog Converters (DACs): Introduction, Basic DAC Technique, Weighted Resistor DAC, R-2R Ladder DAC, Inverted R-2R DAC, IC 1408 DAC, DAC Specifications
Analog to Digital Converters (ADCs): Functional Diagram of ADC, 'Direct type' vs 'Integrating type' ADCs, Parallel Comparator (Flash) ADC, Successive Approximation ADC, Dual Slope ADC, ADC Specifications.

Text Books:

1. D. Roy Choudhury and Shail Jain, "Linear Integrated Circuits", 2nd Edition, New Age, 2003
2. Ramakant A. Gayakward, "Op-amps and Linear Integrated Circuits", 4th Edition, Pearson Education, 2003
3. David A. Bell, 'Op-amp & Linear ICs', Oxford, 2013

Reference Books:

1. James M. Fiore, "Opamps & Linear Integrated Circuits Concepts & Applications", Cengage, 2010.
2. Thomas L. Floyd and David M. Buchla, "Fundamentals of Analog Circuits", Pearson, 2013.
3. Jacob Millman and Christos C. Halkias, "Integrated Electronics - Analog and Digital Circuits and Systems", Tata McGraw-Hill, 2003
4. Robert F. Coughlin, Fredrick F. Driscoll, "Op-amp and Linear ICs", PHI Learning, 6th Edition, 2012.

Course Title	ELECTROMAGNETIC THEORY AND TRANSMISSION LINES				B. Tech. ECE IV Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1804406	EC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	--	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs			

Course Objectives:

- Understanding and increasing the ability to use vector algebra, and vector calculus.
- Proficiency in the use of vector identities, and various Coordinate systems & transformations
- Providing the basic education in static electromagnetic fields and time varying electromagnetic waves.
- Developing analytical skills for understanding propagation of electromagnetic waves in different media.
- Understanding the concepts of transmission lines & their applications.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the basics of Electro Statics and Magneto Statics.
CO 2	Apply Maxwells equations in the derivation of fields.
CO 3	Calculate Electric and magnetic fields due to various sources.
CO 4	Analyze the wave propagation in different media.
CO5	Design the single and double stub matching using Smith chart.

UNIT-I

Electrostatics: Review of Vector algebra, Co-ordinate systems & transformation, Vector calculus, Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations between E and V, Maxwell's two Equations for Electrostatic Fields, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

UNIT-II

Magneto statics: Biot-savart's law, Ampere's law and applications, Magnetic flux density, Maxwell's two equations for magneto static fields, magnetic scalar and vector potentials, Forces due to Magnetic fields, Ampere's force law, inductances and magnetic energy, illustrative problems.

UNIT-III

Maxwell's Equations (Time varying fields): Faraday's law and transformer emf, Inconsistency of ampere's law and displacement current density, Maxwell's equations in different final forms and word statements, conditions at boundary surface: Dielectric-Dielectric and Dielectric-conductor interfaces, illustrative problems.

UNIT-IV

EM wave characteristics: Wave equations for conducting and perfect dielectric media, Uniform plane waves-Definition, All relations between E&H, Sinusoidal variations, Wave

propagation in loss less and conducting media, conductors& dielectrics- characterization, wave propagation in good conductors and good dielectrics, polarization.

Reflection and Refraction of plane waves: Normal and Oblique incidences for both perfect conductors and dielectrics, Brewster angle, Critical angle and total internal reflection, Surface impedance, pointing vector and pointing theorem-applications, power losses in a plane conductor, illustrative problems.

UNIT-V

Transmission lines: Types, parameters, Transmission line equations, Primary & Secondary constants, Expression for characteristic impedance, Propagation constant, Phase and group velocities, Loss less and low loss characterization, Distortion- condition for Distortion less and minimum attenuation, input impedance relations, SC and OC lines, Reflection coefficient, VSWR, Smith chart & its applications, illustrative problems.

Text Books:

1. Matthew N.O. Sadiku, "Elements of Electromagnetics," Oxford Univ. Press, 4th ed., 2008.
2. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics," TMH, 7th ed., 2006.
3. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems "PHI, 2nd Ed., 2000.

Reference Books:

1. John D. Krauss, "Electromagnetics", McGraw- Hill publications, 3rd ed., 1988.
2. John D. Ryder, "Networks, Lines, and Fields," PHI publications, Second Edition, 2012.
3. Schaum's out – lines, "Electromagnetics,", Tata McGraw-Hill publications, Second Edition, 2006.

Course Title	LABVIEW PROGRAMMING LAB				B. Tech. ECE IV Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1804407	ESC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		-	-	3	1.5	50	50	100
					End Exam Duration: 3Hrs			

Course Objectives:

- 1. To write, test, and debug simple LabViewprograms.
- To implement LavView programs with conditionalstatements.
- To perform operations on arrays andstrings.
- Use SubVi‟s for structuring LabViewprograms.
- Read and write data from/to files in LabView.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Write simple Lab view Programs
CO 2	Implement LavView programs with conditional statements.
CO 3	Perform operations on arrays and strings.
CO 4	Use SubVi‟s for structuring LabView programs.

LIST OF PROGRAMS

1. Basic arithmeticoperations
   (Add, mul, div, compound arithmetic, expression node, express formula and formula node)
2. Booleanoperations
   (truth table verification of logic gates, Half Adder and Full Adder, convert binary to decimal value, convert BCD to Gray and Vice-Versa)
3. Stringoperations

(Length, concatenation, insert string, sub-string, replace string, reverse string, rotate string, etc)

4. Sumof„N‟numbersusingfeedbackloop(use„for‟loopand„while‟loop)
5. Factorial of a give number using shift register (use „for‟ loop and „while‟loop)
6. Generate Fibonacci series for N iteration (use „for‟loop)
7. Create a VI to increase the tank level from 0 to 100 & decrease the value from 100 to0 using while loop in a singleprocess.
8. Create a VI to implement and, or & not gates(or arithmetic operations) usingcase structure

9. Build a VI that generates a 1D array of random numbers and sort the array in descending and ascending order and find thefollowing:

a) Maximum and min value of arrayelements

b) Size of thearray

c) Sum and product of arrayelements

d) Rotate array by 1position

e) Split the array after 2elements

10. Build an array of cluster controls in which each cluster consists of a numeric control and 1D numeric array. This forms the database of students. The numeric control indicates the roll no and array indicates the test marks of 4 subjects. Build the logic to modify themark in a particular subject of a particular student. Input the roll number, subject in which mark is to be changed and new mark. Display the database on a separate arrayindicator.

11. Create a VI to implement Full Adder circuit usingSubVI.

12. Any application using Flat and stackedsequence

PLATFORM NEEDED

LABVIEW Software for Windows/Linux

Course Title	ANALOG AND DIGITAL CIRCUITS LAB				B. Tech. ECE IV Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1804408	EC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		-	-	3	1.5	50	50	100
					End Exam Duration: 3Hrs		

Course Objectives:

- To study the performance of various amplifiers and oscillators using hardware and software.
- To study the performance ofmultivibrators.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Analyze the circuits including MOSFET, BJT.
CO 2	Design analog electronic circuits using discrete components.
CO 3	Obtain frequency responses of amplification circuits.
CO 4	Measure parameters of analog circuits to compare experimental results in the laboratory with theoretical analysis.
CO5	Verify the truth tables of various logic circuits.

LIST OF EXPERIMENTS:

Hardware:

1. CEAMPLIFIER
2. CCAMPLIFIER
3. VOLTAGE SHUNT FEEDBACKAMPLIFIER
4. TWO STAGE -RC COUPLEDAMPLIFIER
5. RC PHASE - SHIFTOSCILLATOR
6. VRIFICATION OF LOGIC GATES, ADDERS AND SUBTRACTORS.
7. HARTLEY OSCILLATOR

Simulation(MULTISIM):

1. CLASS A POWER AMPLIFIER.
2. CURRENT SERIES FEEDBACKAMPLIFIER
3. RC PHASE - SHIFTOSCILLATOR
4. HARTLEYOSCILLATOR
5. COLPITT‟SOSCILLATOR
6. DESIGN OF COUNTERS USING FLIP FLOPS (DECADE, RING ANDJHONSON)
7. EMITTER FOLLOWER

Course Title	ADVANCED ENGLISH COMMUNICATION SKILLS LAB				B. Tech. ECE IV Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
1824409	**HSMC**	**L**	**T**	**P**	**C**	**Internal Assessment**	**External Exams**	**Total**
		--	--	4	2	50	50	100
					End Exam Duration: 3Hrs		

Course Objectives:

- To focus on improving the student's proficiency in English at all levels.
- To train students to use language effectively to participate in group discussions,
- To help them face interviews and sharpen public speaking skills
- To enhance the confidence of the student by exposing him/her to various situations and contexts which he/she would face in his/her career.
- To make students industry-ready.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Describe**Speaking and listening skills
CO 2	**Understand** various kinds of reports and present them schematically
CO 3	**Analyze**Behavioural skills
CO 4	**Illustrate** various employability skills required for the employment
CO 5	**Classify** the verbal and non-verbal communication

The following course content is prescribed for the Advanced Communication Skills Lab:

- **Reading Comprehension --** Reading for facts, guessing meanings from context, speed reading, scanning, skimming for building vocabulary (synonyms and antonyms, one word substitutes, prefixes and suffixes, idioms and phrases.)
- **Listening Comprehension** ---Listening for understanding, so as to respond relevantly and appropriately to people of different backgrounds and dialects in various personal and professional situations.
- **Technical Report Writing** --- Types of formats and styles, subject matter, organization, clarity, coherence and style, data-collection, tools, analysis
- **Resume' Writing** --- Structure, format and style, planning, defining the career, objective, projecting one's strengths, and skills, creative self marketing, cover letter
- **Group Discussion**--- Communicating views and opinions, discussing, intervening. Providing solutions on any given topic across a cross-section of individuals, (keeping an eye on modulation

of voice, clarity, body language, relevance, fluency and coherence) in personal and professional lives.

- **Interview Skills ---** Concept and process, pre-interview planning, mannerisms, body language, organizing, answering strategies, interview through tele and video-conferencing.
- **Technical Presentations (Oral) ---** Collection of data, planning, preparation, type, style and format, use of props, attracting audience, voice modulation, clarity, body language, asking queries.

1. Minimum Requirements

The English Language Lab shall have two parts:

The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.

The Communication Skills Lab with movable chairs and audio-visual aids with a P.A System, a TV, A digital stereo-audio and video system, Camcorder etc.

System Requirement (Hardware Component):

Computer network with LAN with a minimum of 60 multimedia systems with the following specifications:

P-IV Processor, Speed-2.8 GHz, RAM_512 MB minimum, Hard Disk-80 GB, Headphones

Prescribed Software: Walden and K-Van Solutions.

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

1. **Technical writing and professional communication, Huckin and Olsen** Tata Mc Graw-Hil 2009.
2. **Speaking about Science,** A Manual for Creating Clear Presentations **by Scott Morgan and Barrett Whitener, Cambridge University press, 2006**.
3. **Handbook for Technical Writing** by David A McMurrey & Joanne Buckely CENGAGE Learomg 2008.
4. **Technical Communication**by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
5. **The ACE of Soft Skills** by Gopal Ramesh and Mahadevan Ramesh, Pearson Education, 2010.
6. **Cambridge English for Job-Hunting** by Colm Downes, Cambridge Unicversity Press, 2008.
7. **Resume's and Interviews** by M. Ashraf Rizvi, Tata Mc Graw-Hill, 2008.
8. **From Campus To Corporate** by KK Ramachandran and KK Karthick, Macmillan Publishers India Ltd, 2010.
9. **English Language Communication: A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
10. **Managing Soft Skills** by K R Lakshminarayan and T. Muruguvel, Sci-Tech Publications, 2010.
11. **Business Communication** by John X Wang, CRC Press, Spepcial Indian Edition, 2008.

Course Title	ANTENNAS AND WAVE PROPAGATION				B. Tech. ECE V Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
1804501	**EC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	--	--	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**			

Course Objectives:

- The student will learn the fundamental principles of transmission line theory related to communications including the propagation of signals on a transmission line and in free space.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Understand** various antenna characteristics, different modes of wave propagation.
CO 2	**Apply** basic principles to compute and measure antenna parameters.
CO 3	**Analyze** radiation patterns of various antennas, antenna arrays and modes of wave propagation.
CO 4	**Compare** the radiation characteristics of various antenna array and modes of wave propagation.

UNIT- I

Antenna Basics: Introduction, Basic antenna parameters- patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Effective height, Antenna Apertures, Friis transmission formula, Illustrative problems. Fields from oscillating dipole, Antenna temperature, front–to-back ratio, basic Maxwell's equations, retarded potential-Helmholtz Theorem, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Field Components, Radiated power, Radiation Resistance, Beam width, Directivity, Effective Area and Effective Height, Natural current distributions, far fields.

UNIT- II

Antenna Arrays: Point sources- Definition, Patterns, arrays of 2 Isotropic sources. Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End fire Arrays, Derivation of their characteristics and comparison, BSA with Non-uniform Amplitude Distributions, Bionomial Arrays.

UNIT- III

VHF, UHF AND Microwave Antennas: Arrays with Parasitic Elements, Yagi - Uda Arrays, Folded Dipoles & their characteristics. Helical Antennas, Horn Antennas, Parabolic Reflector, Micro strip Antennas.

Antenna Measurements: Introduction, Directivity Measurement, Gain Measurements (by comparison, Absolute and 3-Antenna Methods).

UNIT- IV

Wave Propagation-I: Introduction, Characterizations and general classifications, different modes of wave propagation, Ray/ Mode concepts. Ground wave propagation (Qualitative treatment) - Introduction, Plane earth reflections, Space and surface waves, wave tilt, curved earth reflections. Space wave propagation- Introduction, field strength variation with distance and height, effect of earth's curvature, absorption, Super refraction, M-curves and duct propagation, scattering phenomena, tropospheric propagation, fading and path loss calculations.

UNIT- V

Wave Propagation-II: Sky wave propagation- Introduction, structure of Ionosphere, refraction and reflection of sky waves by Ionosphere, Ray path, Critical frequency, MUF, LUF, OF, Virtual height and Skip distance, Relation between MUF and Skip distance, Multi-HOP propagation, Energy loss in Ionosphere, Summary of Wave Characteristics in different frequency ranges.

Text Books:

1. John D. Kraus, Ronald J. Marhefka and Ahmad S. Khan, "Antennas and wave propagation", TMH, New Delhi, 4th Edition, (Special Indian Edition), 2010
2. E.C. Jordan and. Balmain, "Electromagnetic Waves and Radiating Systems", PHI, 2nd Edition, 2000.
3. C.A. Balanis, "Antenna Theory" John Wiley & Sons, 2nd Edition, 2001.

Reference Books:

1. K.D. Prasad, "Antennas and Wave Propagation", Satya Prakashan, Tech India Publications, New Delhi, 2001
2. F.E. Terman, "Electronic and Radio Engineering," McGraw-Hill, 4th Edition, 1955.

Course Title	DIGITAL SIGNAL PROCESSING				B. Tech. ECE V Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1804502	EC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	--	--	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs			

Course Objectives:

- To become familiar with Discrete Fourier Transform and its efficient computation.
- To understand various IIR and FIR realization techniques.
- To know the design of IIR and FIR filters.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Understand** properties of DFS and DFT, Characteristics of IIR and FIR filters, Decimation and Interpolation.
CO 2	**Realize** Various Digital Filters.
CO 3	**Solve**problems related to IIR and FIR filters, sampling rate conversion.
CO 4	**Design** IIR filters, FIR filters, Decimator and Interpolator.

UNIT-I

Discrete Fourier series: DFS representation of periodic sequences, Properties of discrete Fourier series, Discrete Fourier Transform (DFT), properties of DFT, linear convolution of sequences using DFT.

Fast Fourier Transforms: Efficient computation of the DFT, Decimation in time and decimation in frequency FFT algorithms, FFT algorithms for composite N.

UNIT-II

Realization of Digital Filters: Block diagram representation of linear constant-coefficient difference equations, basic structures of IIR filters- direct form I, direct form II, transposed form, cascade form, parallel forms, basic structures of FIR filters-Direct form, Cascade form, Linear phase structure, Lattice structures.

UNIT-III

IIR Digital Filters: General considerations-Causality and its implications, Characteristics of Practical Frequency-selective filters, Design of analog filters-Butterworth and chebyshev approximations, IIR filter design by backward difference, Impulse Invariance, Bilinear transformation, design examples: frequency transformations, Illustrative Problems.

UNIT-IV

FIR Digital Filters: Symmetric and Anti-symmetric FIR filters, Design of Linear Phase FIR digital filters using windows, Frequency sampling technique, comparison of IIR and FIR

filters, Illustrative Problems, applications of DSP (Dual Tone Multifrequency signal detection, Spectral analysis of sinusoidal and non-stationary signals).

UNIT-V

Multirate Signal Processing: Introduction, Decimation, and interpolation, Sampling rate conversion by a rational factor, Implementation of sampling rate conversion, Multistage implementation of sampling rate conversion, Sampling rate conversion of bandpass signals, Sampling rate conversion by arbitrary factor, Applications of multirate signal processing.

Text Books:

1. A.V.Oppenheim and R.W. Schaffer, & J R Buck, "Discrete Time Signal Processing," 2nd ed., Pearson Education, 2012.
2. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and Aapplications", Pearson Education/PHI, 4th Edition, 2007.
3. Sanjit K Mitra, "Digital signal processing", A computer base approach- Tata McGraw-Hill, 3rd Edition, 2009.

Reference Books:

1. Andreas Antoniou, Digital signal processing: Tata McGraw-Hill, 2006.
2. Digital signal processing: M H Hayes, Schaum's Outlines, Tata McGraw-Hill, 2007.
3. A. Anand Kumar, "Digital Signal Processing," PHI Learning, 2011.

Course Title	COMPUTERORGANIZATION				B. Tech. ECE V Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
1804503	**EC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		2	--	--	2	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**		

Course Objectives:

- To give the concepts related to Computer Organization and Design
- To introduce CPU, Memory, I/O Devices

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Understand** micro programmed control.
CO 2	**Describe** the various functional units of computer.
CO 3	**List** out the various components of CPU.
CO 4	**Classify** various peripheral devices.
CO 5	**Compare** various memory units**.**

UNIT-I

Basic Structure of Computers: Computer Types, Functional Units, Basic operational Concepts, Bus Structures, Software, Performance, Multiprocessors and Multi Computers.

Register Transfer and Micro Operations: Register transfer, Bus and Memory transfers, Arithmetic micro operations, Logic micro operations, Shift Micro Operations, Arithmetic Logic shift units.

UNIT-II

Basic Computer Organization and Design: Instruction codes, computer Registers and instructions, Timing and control, instruction cycles, memory- reference instructions, Input-Output and interrupt.

Microprogrammed Control: Control Memory, Address Sequencing, Micro Program Example, Design of Control Unit.

UNIT-III

Central Processing Unit: General register Organization, Stack Organization, Instruction formats, Addressing Modes, Program Control, RISC, Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline.

UNIT-IV

Input-Output Organization: Peripheral Devices, Input-Output interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, DMA, Input-Output Processor, Serial Communication.

UNIT-V

Memory Organization: Memory Hierarchy, Main memory, Auxiliary memory, Associative Memory, Cache Memory, Virtual memory, Characteristics of Multiprocessors, Interconnection Structures, Inter Processor Arbitration, Inter Processor Communication and Synchronization, Cache Coherence, Shared Memory Multiprocessors.

Text Books:

1. Carl Hamacher, Zvonks Vranesic, SafeaZaky, "Computer Organization", 5th Edition, Tata McGraw-Hill.(Unit I-1chapter)
2. M. Moris Mano, "Computer Systems Architecture", 3rd Edition, Pearson/PHI.

Reference Books:

1. William Stallings, Computer Organization and Architecture, 6th Edition, Pearson/PHI.
2. S Andrew S. Tanenbaum, Structured Computer Organization, 4th Edition, PHI/Pearson.
3. P. Sivarama, Dandamudi, "Fundamentals or Computer Organization and Design", Springer Int. Edition.
4. John L. Hennessy and David A. Patterson, "Computer Architecture a quantitative approach", 4th Edition, Elsevier.
5. Joseph D. Dumas II, "Computer Architecture: Fundamentals and principles of Computer Design", BS Publication.

Course Title	ANALOG COMMUNICATION				B. Tech. ECE V Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
1804504	**EC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	--	--	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**		

Course Objectives:

- To analyze various transmitter and receiver functions andcircuits
- To analyze different modulation and demodulationtechniques

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Understand** Concept of modulation ,sources of noise and different aspects of sampling.
CO 2	**Apply** basic principles to compute various modulation and noise characteristics.
CO 3	**Analyze** various modulators, demodulators, transmitters, receivers and types of sampling.
CO 4	**Compare** various modulation and demodulation techniques.

UNIT-I

Introduction to communication systems: Modulation, its needs and types, Fundamental physical limitations, Electromagnetic Spectrum and Area of Applications.

Amplitudemodulation: HilbertTransformanditsproperties, base band and pass band representation of signals,Pre-envelopeandbandpasssignals,AM, DSBSC and SSB, Generation and detection methods, VSB, frequency translation, FDM, Nonlinear distortion and InterModulation, problem solving.

UNIT-II

Angle modulation: Phase and frequency modulation, NBFM, WBFM, Multi-tone FM, Transmission band width of FM, direct and indirect generations of FM, Demodulation methods, Non-linear effects, FM versus AM, problem solving.

UNIT-III

Radio Transmitters and Receivers: Block diagram study of radio broadcast AM and FM transmitters, Super heterodyne AM and FM receivers, Measurement of sensitivity, selectivity, choice of IF, AGC, Tracking-characteristics of radio receivers, FM stereo.

UNIT--IV

Noise: External and internal sources of noise, Noise calculations, Noise equivalent resistant, Noise figure, Noise temperature, Effect of noise in AM and FM modulation system, FM threshold effect, Pre-emphasis and de-emphasis.

UNIT-V

Sampling: Review of sampling theorem, Practical aspects of sampling; pulses of finite duration, Flat top sampling.

Pulse Modulation: PAM generation and detection, PDM and PPM, Generation and detection, Spectra, Synchronization.

Text books:

1. Simon Haykin, "Communication Systems", Wileyestern,1978, 4th edition.
2. B.P. Lathi "Modern Digital and Analog communication system", Oxford University Press, 2nd Edition, 1996.
3. A. Bruce Carlson "Communication systems", Mc Graw Hill, ISE, 5thedition.

Reference Books:

1. Dennis Roddy and John Coolen, "Electronic communications" Prentice-Hall of India Private Limited, 1981.
2. Kennedy and Davis, "Electronic communication systems",4thEdition, Mc Graw International edition, 1992.
3. Taub and Schilling, "Principles of communication Systems", Mc Grace Hill, ISE,1971.

Course Title	DIGITAL IC APPLICATIONS				B. Tech. ECE V Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1804505	EC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	--	--	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs			

Course Objectives:

- To introduce **Verilog** HDL and its language elements to design digital systems.
- Make students familiar with design of different combinational and sequential digital circuits.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Understand** CMOS, Bipolar logic families and fundamentals of **Verilog** HDL Programming.
CO 2	**Implement** digital logic circuits usingCMOS, BJT and digital ICs.
CO 3	**Analyze** variousCombinational and Sequential logic circuits.
CO 4	**Design and** Simulate digital logic circuits using **Verilog** HDL.

UNIT-I

CMOS Logic and Interfacing:Review of Logic Families (TTL&ECL), CMOS logic, CMOS NAND and NOR gates, CMOS AOI and OAI gates, CMOS steady state and dynamic electrical behavior, CMOS logic families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing. CMOS transmission gates, BiCMOS.

UNIT-II

The Verilog Hardware Description Language: HDL basedDesign flow, Program Structure, Logic system, Nets, Variables and Constants. Vectors and Operators, Arrays.
Logical Operators and Expressions.Compiler Directives. Structural design elements, data flow design elements, behavioral design elements (procedural code), and time dimension, Simulation, Test Benches and Synthesis.

UNIT-III

Combinational Logic Design: Designusing basic gates,Decoders, Encoders, three state devices, Multiplexers and Demultiplexers, Code Converters, EX-OR gates and parity circuits, Design considerations with relevant Digital ICs,**Verilog** Modules for the above ICs.

UNIT-IV

Design Examples (USING Verilog): Design examples (using Verilog) - Comparators, Seven-Segment Decoders, Adders, subtractors, MSI Arithmetic and Logic Units, Combinational multipliers.

UNIT-V

Sequential Logic Design:SSI Latches and Flip-Flops, Counters, Design of Counters using Digital ICs, Ring Counter, Johnson Counter, Modulus N Synchronous Counters, MSI Registers, Shift Registers, Modes of Operation of Shift Registers, Universal Shift Registers, MSI Shift Registers, Design considerations with relevant Digital ICs, **Verilog** Modules for the above ICs.

Text Books:

1. John F. Wakerly, "Digital Design Principles & Practices" PHI/Pearson Education Asia, 4th Edition, 2008.
2. J. Bhasker, "A Verilog HDL Primer", Star Galaxy Publishing; 3rd edition (January 31, 2005)

Reference Books:

1. Fundamentals of Digital Logic with Verilog Design – Stephen Brown, Zvonko Vranesic, TMH, 3rd Edition, 2014
2. Verilog HDL – Samir Palnitkar, 2nd Edition, Pearson Education, 2009.
3. Advanced Digital Design with Verilog HDL – Michael D. Ciletti, PHI, 2009.
4. J. Bhasker, "A Verilog HDL Synthesis: A Practical Primer", Star Galaxy Publishing.
5. T.R. Padmanabhan, B Bala Tripura Sundari, Design Through Verilog HDL, Wiley 2009.
6. Zainalabdien Navabi, Verliog Digital System Design,TMH, 2nd Edition.

Course Title	MICROPROCESSORS & MICROCONTROLLERS				B. Tech. ECE V Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1804506	EC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	--	--	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs		

Course Objectives:

- To become familiar with 8086 Microprocessor and 8051 Microcontroller Architecture, Instructions, Operating Modes and Programming.
- To use 8086 microprocessor and 8051 microcontroller for various applications.
- To study various peripherals for microprocessor based systems.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Understand** the architecture and features of various microprocessors, microcontrollers and peripherals.
CO 2	**Describe** addressing modes, instruction set and data transfer schemes.
CO 3	**Develop** algorithm and assembly language programs to solve problems.
CO 4	**Apply** an appropriate algorithm, program and peripheral for the various applications.
CO 5	**Design** the microprocessor or microcontroller based system to solve real time problems. (Prepare a case study model to get a first prototype)

UNIT I

Introduction to Microprocessors: 8085 Microprocessor - Architecture, Instruction set, Addressing modes, Basic Timing Diagrams, Interrupts and Simple Programs.

8086 Microprocessor - Architecture, Instruction set,Addressing modes, Interrupt system. Pin diagram, Minimum mode 8086 system and timings, Maximum mode 8086 system and timings.

UNIT II

Assembly Language Programming: Assembler directives, Assembly language programs (8086) withAssembler directives for addition, subtraction, multiplication, division etc., sorting and searching, bit manipulation, look-up tables, string manipulations, Macros and Delay subroutines.

Data transfer schemes and Memory Interfacing: Synchronous, Asynchronous, Interrupt driven and DMA type schemes, Address decoding techniques, Interfacing Static RAM and ROM chips,

UNIT III

Peripheral Interfacing: 8255 PPI and its interfacing, Programmable Communication Interface (8251 USART) and its interfacing, Programmable Interval Timer (8254) and its interfacing, Programmable interrupt controller (8259) and its interfacing, Programmable DMA controller (8257) and its interfacing, ADC and DAC Interfacing.

UNIT IV

The 8051 microcontroller: Architecture, pin diagram, memory organization, external memory interfacing, stack, addressing modes, instruction set, Assembler directives, Assembly Language programs and Time delay Calculations, 8051 interrupt structure, 8051 counters and Timers, programming 8051 timers.

UNIT V

Introduction to ARM: ARM Design philosophy, Registers, Program Status Register, Instruction pipeline, Interrupts and vector table, Instruction Set- Data Processing Instructions, Branch, Load-Store, Software interrupt, PSR instructions, Conditional instructions, Thumb instruction Set: Register Usage, Other Branch instructions, Data processing Instructions, Single-Register and Multi Register Load-Store Instructions, Stack, Software Interrupt Instructions.

Text Books:

1. Ramesh S. Gaonkar, "Microprocessor architecture, programming and its applications with 8085", Penram International Publications, 4th Edition.
2. A. K. Ray and K.M. Bhurchandi, "Advanced Microprocessors and Peripherals", TMH.
3. The 8051Microcontroller and Embedded Systems, Mazidi Muhammad Ali, Mazidi Janice Gillespie & McKinlay Rolin D, 2nd Edition, Pearson Education, 2008.
4. The 8051 microcontroller: Architecture, Programming & Applications, Kenneth J Ayala, penram publications, 2nd edition.
5. ARM System Developer's Guide-Designing and Optimizing system software, Andrew N.Sloss, Dominic Symes, Chris Wright, Elsevier, 2008.

Reference Books:

1. Douglas V. Hall, "Microprocessors and Interfacing: Programming and Hardware", 2nd Edition, Tata McGraw-Hill.
2. Barry B. Brey, "The Intel Microprocessors-Architecture, Programming and Interfacing", 8th Edition, PHI.
3. Y. Liu and Glenn A. Gibson, "Microcomputer Systems: 8086/8088 Family Architecture, Programming and Design", 2nd Edition, PHI.
4. Microcontrollers Architecture, Programming, Interfacing and System Design – Raj Kamal, Pearson Education, 2005.
5. Steve Furbur, ARM System onchip Architecture, 2nd Edition, Addison Wesley, 2000.

Course Title	MICROPROCESSORS AND MICROCONTROLLERS LAB				B. Tech. ECE V Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
1804507	**EC**	--	--	3	1.5	50	50	100
						End Exam Duration: 3Hrs		

Course Objectives:

- To write 8086microprocessor and 8051 microcontroller programs for various operations
- Learning interfacing of processor with various Peripherals.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Develop algorithm and assembly language programs to solve problems.
CO 2	Analyze abstract problems and apply a combination of hardware and software to address the problem.
CO 3	Choosing an appropriate algorithm, program and peripheral for the application.
CO 4	Design the microprocessor based system to solve real time problems.

Microprocessor 8086 & Microcontroller 8051: (Any four from 1 – 6. Experiments 7 and 8 are compulsory)

1. Arithmetic operation – Multi byte Addition and Subtraction, Multiplication and Division – Signed and unsigned Arithmetic operation, ASCII – arithmetic operation.
2. Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
3. By using string operation and Instruction prefix: Move Block, Reverse string, Sorting, Inserting, Deleting, Length of the string, String comparison.
4. Reading and Writing on a parallel port.
5. Timer in different modes.
6. Serial communication implementation.
7. 8259 – Interrupt Controller: Generate an interrupt using 8259 timer.
8. 8279 – Keyboard Display: Write a small program to display a string of characters.

General Problems

1. Addition and Subtraction of two 8- bit/16 bit numbers, Multiplication of two 8-bit & two 16-bit numbers, Division of 16-bit by 8-bit and 32-bitby 16-bit number
2. Addition and Subtraction of 6 data bytes with 6-data bytes of another location.
3. Check the given Number is even or odd, Counting of 0's and 1's in a given data, Check the given number is logical palindrome or not.
4. Finding the maximum and minimum numbers in a given string of data.
5. Sorting the given numbers in ascending and descending order.
6. Finding the Factorial and Generating Fibonacci Series.

7. Conversion of BCD to hexadecimal number, Multiplication of two 3x3 matrices.
8. Addition, Subtraction, Multiplication, Division using Microcontroller.

Interfacing

1. Dual DAC interface (waveform generation).
2. Stepper motor control.
3. Display of flags using logic controller.
4. Traffic light controller.

Course Title	ANALOG AND DIGITAL ICs LAB				B. Tech. ECE V Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1804508	EC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		--	--	3	1.5	50	50	100
						End Exam Duration: 3Hrs		

Course Objectives:

- To verify various op-amp applications
- To verify the applications of different ICs
- To write Verilog HDL programs for different logic circuits.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Demonstrate** the circuits with analog IC's (741, 555, 78XX/79XX, 723)
CO 2	**Apply** IC's (741, 555, 78XX/79XX, 723) in electronic applications.
CO 3	**Design** a digital system to meet required specifications.
CO 4	**Test** the functionality of system design with Test Benches.
CO 5	**Test** the results of designed digital system using FPGA.

Part A: Analog IC Application Lab:

1. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
2. Active Filter Applications – LPF, HPF (first order).
3. Function Generator using OP AMPs.
4. IC 555 Timer – Monostable and Astable Operation Circuit.
5. IC 566 – VCO Applications.
6. Voltage Regulator using IC 723.
7. 4 bit DAC using OP AMP.
8. Precision Diodes

Part B: Digital IC Applications:
(Simulate the internal structure of the following Digital IC's usingVerilog HDL)

1. Logic Gates- 74XX.
2. Half Adder, Half Subtractor, Full Adder, Full Subtractor & Ripple Carry Adder.
3. 3-8 Decoder -74138 & 8-3 Encoder- 74X148.
4. 8 x 1 Multiplexer -74X151 and 2x4 Demultiplexer-74X155.
5. 4 bit Comparator-74X85.
6. D Flip-Flop 74X74.
7. JK Flip-Flop 74X109.
8. Decade counter-74X90.

Course Title	SOCIALLY RELEVANT PROJECT					B. Tech. V Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1804509	PR	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		--	--	--	2	100	--	100
Course Objective: The objective of the project is to enable the student to take up investigative study in rural areas in the field of Electrical Engineering								
On successful completion of this course, the students will be able to								
CO 1	Understand core concepts and research findings relative to human development, socialization, group dynamics and life course processes.							
CO 2	Identify and transfer existing ideas into new contexts and applications							
CO 3	Apply and transfer academic knowledge into the real-world							
CO 4	Design a component or a product applying all the relevant standards and with realistic constraints							

The following are the rules and regulation for **Socially Relevant Projects:**

1. The student has to spend 50 to 60 Hrs in the semester on any socially relevant project and submit a report for evaluation.
2. The project is evaluated for 100 marks in the semester by a committee consisting of head of the department, project mentor and one senior faculty member of the department.
3. A student shall acquire 2 credits assigned, when he/she secures 50% or more marks from the total of 100 marks.
4. In case, if a student fails, he/she shall resubmit the report.
5. There is no external evaluation for the socially relevant project.

Course Title	EMBEDDED SYSTEMS				B. Tech. ECE VI Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
1804601	**EC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	-	--	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**			

Course Objectives:

- The main objective of the course is to get students familiar with the typical problems and constraints that arise when designing and developing embedded systems
- The course will also introduce theoretical and practical solutions to these typical problems that the students are expected to master and be able to apply to realistic case studies.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the fundamental concepts of a embedded system.
CO 2	Get broad exposure to and understand various applications of embedded system in industry, medicine, and defence.
CO 3	Learn the embedded design models
CO 4	Learn the various case studies of embedded system like smart card, adaptive cruise control, mobile phone software.

UNIT I

Introduction: Embedded systems overview, Design challenge, Processor technology, IC technology, Design technology. RT-Level combinational logic, Sequential logic (RT-Level), Custom single purpose processor design (RT-Level), optimizing custom single purpose processors.

UNIT II

General Purpose Processors: Basic architecture, Operation, Programmer's View, Development environment, Application specific Instruction Set processors (ASIPs).

UNIT III

State Machine and Concurrent Process models: Introduction, Models Vs Languages, Finite State Machine with Data path model (FSMD), Using State Machines, Program State Machine (PSM),Concurrent Process Model, Concurrent Processes, Communication among processors, Synchronization among processes, Implementation, Data flow model, Real-time Systems.

UNIT IV

Design Technology: Introduction, Automation-The parallel evolution of complication and synthesis, Logic, RT, Behavioral synthesis, System synthesis and hardware/software codesign, Verification of hardware/software co-simulation, Reuse of intellectual property cores.

UNIT V

Embedded RTOS Concepts: Architecture of the Kernel, Tasks and Task Scheduler, interrupt service routines, Semaphores, Mutex, Mail boxes, Message Queues, Event Registers, Pipes, Signals.

Text Books:

1. Embedded Systems Design - A Unified Hardware/Software introduction by Frank Vahid, Tony D. Givargis, John Wiley & Sons. Inc.2002.
2. Embedded / Real-Time Systems: Concepts, Design and Programming Black Book by Dr. K.V.K.K. Prasad, Dreamtech Publications.

Reference Books:

1. Introduction to embedded systems - by Raj Kamal, TMH, 2002.
2. An Embedded Software primer, David E.Simon, 1st edition, Addison Wesley professional, 2007.

Course Title	DIGITAL COMMUNICATION				B. Tech. ECE VI Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
1804602	**EC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	--	--	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**			

Course Objectives:

- Introduce the fundamentals of digital communication systems.
- To understand the analysis of digital communications system and fundamentals of channel coding.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand various baseband digital transmission systems
CO 2	Analyze the different pulse digital modulation techniques.
CO 3	Evaluate channel capacity for distortion less data transmission and coding for data compression.
CO 4	Comprehend the different band pass digital transmission systems.
CO 5	Analyze and design error control techniques.

UNIT-I

Pulse-Digital Modulation: Review of sampling theorem, PCM system and its bandwidth requirement, Noise in PCM Systems, Quantization noise and SNR, Differential PCM, Delta modulation and Noise in delta modulation, Adaptive delta modulation, TDM, Asynchronous TDM, Comparison of TDM & FDM.

UNIT-II

Base band data transmission: Introduction, Matched filter, Inter-symbol Interference, Nyquist's Criterion for distortion less binary data, Correlative Level coding-Duobinary signaling, Modified Duobinary signaling, Partial response signaling, M-ary signaling scheme, Binary Vs M – ary, Equalization schemes, Eye diagrams.

UNIT-III

Band Pass Data Transmission: Model of band-pass data transmission systems, Gram-Schmidt Orthogonal Procedure, Geometric representation of signals, coherent detection of signals in the presence of noise, correlation receiver, matched filter receiver, Digital modulation schemes-ASK, FSK (coherent & Non Coherent), PSK, DPSK, Comparison of digital modulation schemes, M-ary signaling schemes- QPSK, 8/16PSK, and QAM.

UNIT-IV

Information theory: Introduction, Unit of information, Entropy, Rate of Information, Joint and conditional entropy, mutual information, channel models and channel capacity, Shannon's theorem-Continuous Channel, Channel capacity of a Gaussian channel (Shannon-Hartley theorem), Bandwidth vs S/N trade-off, source encoding of discrete memory less source- Shannon- Fano coding, Huffman coding.

UNIT-V

Error control coding: Linear block codes, matrix description, Hamming codes, Decoding, Binary cyclic codes, Algebraic structure, Encoding using shift register, syndrome calculation, Burst and random error correcting codes- Convolutional codes, code tree diagram, state diagram, trellis diagram Encoders and decoding algorithms.

Text Books:

1. Simon Haykin, "Communication Systems", 2nd & 4th Edition, Wiley Estern
2. Sam Shanmugam,, K "Analog & Digital Communication Systems", John Willey & Sons
3. R.P. Singh & S.D. Sapre, "Communication Systems, Analog & Digital", Tata McGraw-Hill

Reference Books:

1. B.P. Lathi, "Modern Digital and Analog Communication Systems", Oxford University Press, 2nd Edition, 1996
2.Taub, H & Schilling D.L.", Principles of Communication System, McGraw Hill, 3rd Edition, 2009.
3. Bernard Sklar, "Digital Communications", Prentice-Hall PTR, 2nd Edition, 2001.

Course Title	MICROWAVE ENGINEERING				B. Tech. ECE VI Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
1804603	**EC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	1	--	4	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**			

Course Objectives:

- To impart Knowledge about various microwave components, microwave junctions, microwave tubes and microwave signal characteristic measurements.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Use Wave guide and Microwave components for various applications.
CO 2	Analyze various micro Wave Oscillators and Amplifiers.
CO 3	Describe fabrication of striplines and MICs & microwave bench setup for various microwave measurements.
CO 4	Determine S – parameters of various microwave devices .
CO 5	Compute microwave signal parameters, power output and efficiency of microwave active devices..

UNIT-I

Waveguides: Introduction to microwave frequencies and band, Rectangular wave guides, Excitation of wave guides. Wave equations, rectangular and circular waveguides for TE and TM modes, Cutoff frequency and wave length, Group and phase velocity, Wave impedance, Guide attenuation, Rectangular and cylindrical resonators, Q of the cavity resonators.

Microwave Components: Microwave hybrid circuits-S-parameters of two port network, Attenuators, Phase shifters, Wave guide Tees and their S-matrices, Bends, Corners and twists.Two hole Directional coupler and its S-matrix, Ferrites-composition and characteristics, Faraday rotation, Gyrator, Isolators and circulators, S-matrix of circulator and isolator.

UNIT-II

Microwave tubes-I: Limitations and losses of conventional tubes at microwave frequencies. Microwave tubes-O type and M type classifications. O type tubes: Two cavity klystron-structure, Reentrant cavities, Velocity modulation process and Applegate diagram, Bunching process and small signal theory-Expressions for output power and efficiency. Reflex Klystron – structure, Velocity Modulation, Applegate diagram, Mathematical theory of bunching, Output power, efficiency, Oscillating modes and output characteristics, Effect of repeller Voltage on output Power, Illustrative Problems.

UNIT-III

Helix TWTS: Significance, Types and characteristics of slow wave structures; Structure of TWT and amplification process, Suppression of oscillations, gain considerations.
M -Type Tubes: Introduction, Magnetrons, Different types, Cylindrical magnetron-Hull cutoff and Hartree conditions, Modes of resonance and PI-mode operation, Separation of PI-mode, Output characteristics, Illustrative Problems.

UNIT-IV

Microwave Solid State Devices: Classification , applications, Tunnel diode, Gunn diode-principles, RWH theory, Characteristics, Basic modes of operation - Gunn oscillation modes, IMPATT diode, PIN diode, Varactor diode, Crystal diode, Schottky Barrier diode, Parametric amplifier.

UNIT-V

MicrowaveMeasurements: Measurement of frequency, Power, VSWR, Impedance, Reflection coefficient, Attenuation constant, S-parameters and Q of a cavity Resonator.
MicrowaveICs: Striplines and micro striplines, Advantages of MICs, Hybrid MICs, Monolithic MICs- advantages, materials and fabrication,

Text Books:

1. Samuel Y Liao, "Microwave devices and circuits", Prentice Hall, 1999.
2. M. Kulkarni, "Microwave and Radar Engineering", Umesh Publications, 1998.
3. Annapoorna Das and Sisir K. Das, "Microwave Engineering", Tata McGraw-Hill, 2000.

Reference Books:

1. Herbert J. Reich, J. G. Skalnik, P. F. Ordung and H. L. Krauss, "Microwave principles," CBS publishers and distributors, New Delhi, 2004.
2. R. E. Collin, "Foundations for microwave engineering," IEEE press, John Wiley, 2nd Edition, 2002.
3. Om. P. Gandhi, "Microwave Engineering and Applications," Pergamon, 1981.

Course Title	FIBER OPTIC COMMUNICATION				B. Tech. ECE VI Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
1804604	**PE**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	-	--	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**			

Course Objectives:

- To understand the functionality of each of the components of fiber optic communication system
- To understand the properties and principles of different types of optical fibers, and losses that occur in fibers.
- To understand the working and principle of optical sources (LED and LASER) and power launching schemes.
- To analyze the operation of various optical detectors (PIN & APD) and optical receiver.
- To understand the design of optical systems, WDM and Measurements

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Identify** the structures of Optical fibers based on modes, refractive index and fiber materials.
CO 2	**Analyze** the different kind of losses in fibers and optical fiber link design parameters.
CO 3	**Categorize** the types of optical sources and optical detectors on the basis of physical construction and principle of operation.
CO 4	**Explain** the necessity for using splices, couplers and connectors in energy transmission.
CO 5	**Discuss** WDM concepts, Optical Amplifiers, Optical System design and Measurements.

UNIT-I

Introduction and Optical fiber waveguides: Historical Development, The General System, Advantages of Optical Fiber Communications, Ray Theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew Rays, Cylindrical Fiber – Modes, V Number, Mode coupling, Step Index fibers, Graded Index Fibers Single mode fibers - Cut off wavelength, Mode Field Diameter, Effective Refractive Index.

UNIT-II

Fiber Materials - Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers, Mechanical Properties of Fibers, Fiber Optic Cables. **Transmission Characteristics of optical fibers** -Attenuation, Material Absorption Losses in Silica Glass Fibers, Linear Scattering Losses, Fiber Bend Loss, Dispersion, Chromatic dispersion, Intermodal dispersion, Overall fiber dispersion, Polarization – Fiber Birefringence, Polarization Mode Dispersion.

UNIT-III

Optical Sources: Light Emitting Diodes (LEDs) - LED Structures, Light Source Materials, Quantum efficiency and LED Power, Modulation of LED. **LASER Diodes**- Laser Diode Modes and Threshold Conditions, Laser Diode Rate Equations, External Quantum Efficiencies, Resonant Frequencies.**Photo Detectors: Physical principles of photo diodes-**

The PIN and Avalanche photo diode (APD), detector response time, structures for InGaAs APDs, temperature effect on avalanche gain, comparisons of photo detectors.

UNIT-IV

Power launching and Coupling-Source to Fiber Power Launching – Source output pattern, power coupling calculation, power launching versus wavelength, Equilibrium Numerical Aperture, **Lensing schemes for Coupling Improvement** -non imaging microsphere, Laser diode to fiber coupling, LED coupling to single mode fibers. **Fiber-to-fiber Joints** – Mechanical misalignments, Fiber related losses, Fiber end face preparation, **Fiber Splicing** – Splicing techniques, splicing single mode fibers, **Optical Fiber Connectors** – Connector types, Single mode fiber connectors- Connector return losses, **Passive components** – The 2 x 2 fiber coupler, Star couplers

UNIT-V

Optical receiver operation: Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, **Optical system design** - Point to point links, system considerations, Link Power budget, Rise time budget, Transmission distance, **Operational principles of WDM** - Types, Fiber grating filters. **Measurements** – Optical Time domain Reflectometer (OTDR). Attenuation Measurements, dispersion Measurements, EYE Patterns.

Text Books:

1. Gerdkeiser, "Optical fiber communications", McGraw Hill International Edition, 4th Edition, 2010.
2. John M. Senior , "Optical fiber communications", PHI, 3rd Edition, 2010.

Reference Books:

1. Max Ming-Kang Liu, "Principles and Applications of Optical Communications", TMH, 2010.
2. S. C. Gupta, "Text book on optical fiber communication and its applications", PHI, 2005.
3. Satish Kumar, " Fundamentals of Optical Fiber communications", , PHI, 2009.
4. DjaferKmynbaev Lowell L. Scheiner, "Fiberoptic communications Technology", Pearson Education pte. Ltd.

Course Title	DATA STRUCTURES AND ALGORITHMS				B. Tech. ECE VI Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
1804605	**PE**	3	-	--	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**			

Course Objectives:

- To develop skills and analyze linear and non linear data structures.
- To understand basic concepts about linked lists, stacks, queues.
- To study algorithms as they apply to trees and graphs.
- To study in detail about sorting, searching and hashing.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the variety of abstract data types and data structures.
CO 2	Analyze data structures such as linked list, Stacks and Queues.
CO 3	Apply and analyze tree traversal algorithms and graph traversal algorithms.
CO 4	Organize data in order using various sorting algorithms.
CO 5	Ability to understand the concept of hashing, B-Trees and B+-Trees.

UNIT-I

Introduction: Data structures, Primitive & Non Primitive data structures, Linear & Non Linear data structures, Linear Lists: Definition, Arrays: Definition, Linked Lists: Single Linked List-Definition, Insertion and Deletion operations, Doubly Linked List- Definition, Insertion and Deletion operations.

UNIT-II

Stacks: Definition, Array & Linked representations, Operations, Applications, Queues: Definition, Array & Linked representations, Operations, Circular Queues &Dequeues .

UNIT-III

Trees: Basic terminology, Binary Trees- Definition, Properties, Representation, Complete and Full Binary Tree, Tree Traversal Algorithm: In order, Preorder and Postorder, Priority Queues: Definition, Heaps, Leftist Trees, Binary Search Tree(BST): Definition, Operations & Implementations, BST with Duplicates, Indexed BST.

UNIT-IV

Balanced Search Trees: AVL, Red-Black & Splay Trees, Graphs: Terminology, Representations, Graph Traversal: Depth First Search (DFS), Breadth First Search (BFS), Minimum Spanning Tree.

UNIT-V

Sorting: Selection, Insertion, Bubble, Heap, Searching: Sequential & Binary Search. Hashing: Introduction, Hash Table representation, Hash Functions , Collisions: Introduction, Separate Chaining, Open Addressing , B-Trees, Operations on B-Trees, B+-Trees.

Text books:

1. An Introduction to Data Structures with applications, Jean Paul Trembley and Paul G. Sorenson, McGraw Hill.

2. Fundamentals of Data Structures in C, Horowitz, Sahni, Anderson Freed, Universities press.

3. Data Structures using C++, Varsha H.Patil, Oxford University Press.

Reference books:

1. Data Structures, Algorithms and Applications in C++, Ananda Rao Akepogu and Radhika Raju Palagiri, Pearson Education.

2. Data Structures and Algorithms in C++, S.Sahni, University Press (India) Private Limited, Second Edition.

3. Data Structures, Seymour Lipschutz, Schaum's Outlines, McGraw Hill.

Course Title	DIGITAL SIGNAL PROCESSORS & ARCHITECTURES				B. Tech. ECE VI Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
1804606	**PE**	3	-	--	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**			

Course Objectives:

- To Understand and analyze DSP algorithms & architectures

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand Aspects of architectures.
CO 2	Understand Memory mapped accelerators
CO 3	Analyze DSP algorithms.
CO 4	Map the algorithms to architectures

UNIT-I

DSP System Models: Introduction- Review of digital logic, Timing and Power in digital circuits, Quality metrics and bounds - Implementation Costs and Metrics, Architecture cost components, Examples of Architectures, Multi-objective Optimization.

Number representation- Scientific notation and Floating point

FIR and IIR Implementation: FIR filter, Serial FIR filter architectures, Simple programmable architecture, Block diagrams and SFGs, Dataflow Graphs, Iteration period, FIR filter iteration period, IIR filter iteration period, Computation Model.

UNIT-II

Dedicated hardware and transforms – Implementation, Constraint analysis for IPB computation, Motivational examples for IPB, General IPB computation, Sample period calculation, Parallel architecture, Odd-even register reuse, Power consumption, Pipelining, Pipelining FIR filter, Time-invariant systems, Valid pipelining examples, Feed forward cutsets, Balanced pipeline, Retiming basic concept, Example and uses of retiming

Resource sharing: adder example, Changing iteration period, Hardware assumptions and constraint analysis, Mathematical formulation, Examples with formulation, Example: Biquad filter, Hardware architecture, Review biquad folding sets, Complete biquad hardware,

UNIT-III

Scheduling: Obtaining a folding schedule, ASAP schedule, Utilization Efficiency, ALAP schedule, Iteration period bound and scheduling, Retiming for scheduling, Blocked schedules, Overlapped schedules, mproved blocked schedule, Allocation, Binding and Scheduling, Heuristic approaches to scheduling, Mathematical formulation, ILP formulation, List scheduling, Hardware model, Force Directed Scheduling.

UNIT-IV

Programmable Sytems: Software Compilation, Optimization Examples, Loop optimizations, Software pipelining, FFT Optimization, CPUs and FPGAs, FFT on FPGA board, Understanding ELF files

UNIT-V

Memory and Communication Systems: On-chip communication basics, Many-to-Many communication, AXI bus handshaking, HW accelerator for FPGA, DMA and arbitration, Network-on-chip basics, NoC - topologies and metrics, NoC– routing, NoC - switching and flow control,

Specialized Architectures: Systolic Arrays – Background, CORDIC algorithm, Parallel implementation of FIR filters, Unfolding Transformation, Look ahead Transformation, Introduction to GPUs and Matrix multiplication

Text Books:

1. KK Parhi, "VLSI Digital Signal Processing Systems: Design and Implementation", Wiley, NY, 1999.
2. Lars Wanhammar, Academic Press, 1999.

Reference Books:

1. Peter Pirsch, "Architectures for Digital Signal Processing", 2nd edition, John Weily, 2007
2. B. Venkataramani and M. Bhaskar, "Digital Signal Processors, Architecture, Programming and Applications", 2 Edition, TMH, 2004.
3. Jervis, "Digital Signal Processing- A practical approach", 4th edition, Pearson Education,2004.

Course Title	ANALOG IC DESIGN				B. Tech. ECE VI Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
1804607	**PE**	3	-	--	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**			

Course Objectives:

- To understandthe concepts of Analog MOS devices and current mirror circuits
- To Analyze the stability and frequency compensation techniques of Op-Amp Circuits

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the concepts of Analog MOS devices and current mirror circuits
CO 2	Design different configuration of Amplifiers and feedback circuits
CO 3	Describe the characteristics of frequency response of the amplifier and its noise.
CO 4	Analyze the stability and frequency compensation techniques of Op-Amp Circuits
CO5	Construct switched capacitor circuits and PLLs

Unit-I

Introduction to Analog IC Design and Current Mirrors: Concepts of Analog Design – General consideration of MOS devices – MOS I/V Characteristics – Second order effects – MOS device models. Basic current mirrors- Cascode current mirrors- Active current mirrors- Large and Small signal analysis- Common mode properties.

Unit-II

Amplifiers and Feedback: Basic Concepts – Common source stage- Source follower- Common gate stage- Cascode stage. Single ended and differential operation- Basic Differential pair- Common mode response- Differential pair with MOS loads- Gilbert Cell. Feedback- General Consideration of feedback circuits- Feedback topologies- Effect of loading- Effect of feedback on Noise.

Unit-III

Frequency Response of Amplifiers and Noise: General considerations- Miller Effect and Association of Poles with Nodes, Common source stage- Source followers- Common gate stage- Cascode stage- Differential pair. Noise- Statistical characteristics of noise- Types of noise- Representation of noise in circuits- Noise in single stage amplifiers- Noise in differential pairs- Noise Bandwidth.

Unit-IV

Operational Amplifier Stability and Frequency Compensation: General Considerations- One and Two Stage Op Amps- Gain Boosting- Comparison- Common mode feedback- Input range limitations- Slew rate- Power Supply Rejection- Noise in Op Amps- General consideration of stability and frequency compensation- Multi pole system- Phase margin-

Frequency compensation- Compensation of two stage op Amps- Other compensation techniques.

Unit-V

Switched Capacitor Circuits and PLLs: General Considerations- Sampling switches-Switched Capacitor Amplifiers-Switched Capacitor Integrator-Switched Capacitor Common mode feedback. Phase Locked Loops-Simple PLL-Charge pump PLLs-Non ideal Effects in PLLs-Delay locked loops- its Applications.

TEXT BOOK:

1. Behzad Razavi, Design of Analog CMOS Integrated Circuits‖, Tata McGraw Hill, 2001, 33rd re-print, 2016.

REFERENCES:

1. Phillip Allen and Douglas Holmberg, CMOS Analog Circuit Design‖ Second Edition, Oxford University Press, 2004.
2. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, Robert G. Meyer, Analysis and Design of Analog Integrated Circuits, 5th Edition, Wiley, 2009
3. Grebene, Bipolar and MOS Analog Integrated circuit design‖, John Wiley & sons, Inc., 2003

Course Title	INTRODUCTION TO MEMS				B. Tech. ECE VI Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1804608	PE	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	--	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs			

Course Objectives:

- Introduction to MEMS and micro fabrication
- To study the essential material properties
- To study various sensing and transduction technique
- To know various fabrication and machining process of MEMS
- To know about the polymer and optical MEMS

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Familiarized with the important concepts applicable to MEMS, their fabrication.
CO 2	Analysis and testing of MEMS.
CO 3	Apply the MEMS for differentapplications.

UNIT-I

INTRODUCTION TO MEMS AND MICROFABRICATION: History of MEMS Development, Characteristics of MEMS-miniaturization - Micro electronics integration - Mass fabrication with precision. Micro fabrication - Microelectronics fabrication process- Silicon based MEMS processes- new material and fabrication processing- points of consideration for processing.

UNIT-II

ELECTRICAL AND MECHANICAL PROPERTIES OFMEMSMATERIALS: Conductivity of semiconductors, crystal plane and orientation, stress and stain – definition – relationship between tensile stress and stain- mechanical properties of silicon and thin films, Flexural beam bending analysis under single loading condition- Types of beam- deflection of beam-longitudinal stain under pure bending- spring constant, torsional deflection, intrinsic stress, resonance and quality factor.

UNIT-III

SENSINGANDACTUATION: Electrostatic sensing and actuation-parallel plate capacitor – Application-Inertial, pressure and tactile sensor- parallel plate actuator- comb drive. Thermal sensing and Actuations-thermal sensors-Actuators- Applications- Inertial, Flow and Infrared sensors.Piezoresistive sensors- piezoresistive sensor material- stress in flexural cantilever and membrane- Application-Inertial, pressure, flow and tactile sensor.

PIEZOELECTRIC SENSING AND ACTUATION: piezoelectric material properties-quartz-PZT-PVDF –ZnO- Application-Inertial, Acoustic, tactile, flow-surface elastic waves.

Magnetic actuation- Micro magnetic actuation principle- deposition of magnetic materials- Design and fabrication of magnetic coil.

UNIT-IV

BULK ANDSURFACEMICROMACHINING: Anisotropic wet etching, Dry etching of silicon, Deep reactive ion etching (DRIE), Isotropic wet etching, Basic surface micromachining process- structural and sacrificial material, stiction and antistiction methods, Foundry process.

UNIT-V

POLYMER ANDOPTICALMEMS: Polymers in MEMS- polymide-SU-8 liquid crystal polymer(LCP)-PDMS-PMMA-Parylene- Flurocorbon, Application-Acceleration, pressure, flow and tactile sensors. Optical MEMS-passive MEMS optical components-lenses-mirrors-Actuation for active optical MEMS.

Text books:

1. Chang Liu, "Foundations of MEMS", Pearson International Edition, 2006.
2. Julian W.Gardner, Vijay K Varadhan, "Microsensors, MEMS and Smart devices", John Wiley & sons, 2001.

References:

1. Gaberiel M.Rebiz, "RF MEMS Theory,Design and Technology", John Wiley & Sons,2003.
2. Charles P.Poole, Frank J.Owens, "Introduction to nanotechnology" John Wiley & sons, 2003.

Course Title	ANALOG AND DIGITAL COMMUNICATION LAB				B. Tech. ECE VI Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1804609	EC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		-	-	3	1.5	50	50	100
					End Exam Duration: 3Hrs		

Course Objectives:

- Design and generation of AM,PM, FM,ASK,PSK, QPSK communication techniques.
- Usage of Communications test equipment.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Use the knowledge of Amplitude, Frequency and Pulse Modulation Systems in developing analog Communication systems
CO 2	Use the knowledge of TDM, PCM, Delta Modulation, FSK, PSK, DPSK,QPSK in developing Digital Communication systems
CO 3	Perform measurements like Sensitivity, Selectivity and Fidelity of Communication subsystems and systems
CO 4	Use test equipment to test various communication systems they develop
CO5	Use the knowledge of Amplitude, Frequency and Pulse Modulation Systems in developing analog Communication systems

Part- A: Analog Communication Lab:

1. Amplitude modulation and demodulation.
2. Frequency modulation and demodulation.
3. Characteristics of Mixer.
4. Pre-emphasis & de-emphasis.
5. Pulse Amplitude Modulation and demodulation.
6. Pulse Width Modulation and demodulation.
7. Pulse Position Modulation and demodulation.
8. Radio Receiver measurements – Sensitivity, Selectivity, & Fidelity.

Part- B: Digital Communication Lab:

1. Sampling Theorem – verification.
2. Time division multiplexing.
3. Pulse Code Modulation.
4. Delta modulation.
5. Frequency shift keying - Modulation and Demodulation.
6. Phase shift keying - Modulation and Demodulation.
7. Differential phase shift keying - Modulation and Demodulation.
8. QPSK - Modulation and Demodulation

Course Title	DIGITAL SIGNAL PROCESSING LAB				B. Tech. ECE VI Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1804610	EC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		-	--	3	1.5	50	50	100
					End Exam Duration: 3Hrs			

Course Objectives:

- To become familiar with MATLAB fundamentals
- To write MATLAB programme for basic DSP operations
- To understand the uses of TMS320C6748 processors
- To write C language code for basic DSP operations and executed using TMS processors

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Analyze discrete/digital signals using mat lab and the basic operations of signal processing.
CO 2	Obtain the spectral parameters of windowing functions.
CO 3	Design FIR and IIR filters for desired specifications
CO 4	Design and implement DSP algorithms in software using a computer language such as C with TMS320C6748 floating point processor.

List of Experiments: (Minimum of 5 experiments are to be conducted from each part)

Software Experiments (PART – A)

1. Generation and display of fundamental discrete-time sequences.
2. Finding Power and (or) Energy of a given discrete-time sequence.
3. Convolution of two discrete-time sequences with and without built in command.
4. Correlation between two discrete-time sequences with and without built in command.
5. DFT of a given signal with and without built in command.
6. Design of FIR filter using windowing technique.
7. Design of IIR filters using Impulse invariance or bilinear transformation.
8. Design of analog filters.

Using DSP Processor kits (Floating point) and Code Composure Studio (CCS) (PART – B)

1. Introduction to DSP Processors.
2. Generation of fundamental signals and plot the same as a waveform showing all the specifications.
3. Finding Power and (or) Energy of a given signal.
4. Convolution of two discrete-time sequences.
5. Correlation between two discrete-time sequences
6. DFT of a given signal

7. Design of FIR filter using windowing technique and verify the frequency response of the
   filter.
8. Design of IIR filter using any of the available methods and verify the frequency response of
   the filter.
9. Design of analog filters.

Equipment/Software Required:

1. Licensed MATLAB software with required tool boxes for 30 users.
2. DSP floating Processor Kits with Code Composure Studio (8 nos.)
3. Function generators
4. CROs
5. Regulated Power Supplies

Course Title	MICROWAVE & OPTICAL COMMUNICATIONS LAB				B. Tech. ECE VI Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
1824611	**EC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		--	--	2	1	50	50	100
						End Exam Duration: 3Hrs		

Course Objectives:

- To provide knowledge on various types of waveguides.
- To find the S-matrix of different Junctions and to obtain Gun Diode and RKO characteristics.
- To find numerical aperture and bending losses of given optical fiber.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Analyze** the characteristics of different microwave sources.
CO 2	**Measure** the parameters of wave guide and microwave junctions.
CO 3	**Examine** the characteristics of optical fiber and sources.
CO 4	**Verify** the characteristics of microwave antennas

Part – A (Any 7 Experiments):

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. VSWR Measurement.
6. Impedance Measurement.
7. Waveguide parameters measurement.
8. Scattering parameters of Directional Coupler.
9. Scattering parameters of Magic Tee.

Part – B (Any 5 Experiments):

1. Characterization of LED.
2. Characterization of Laser Diode.
3. Intensity modulation of Laser output through an optical fiber.
4. Measurement of Data rate for Digital Optical link.
5. Measurement of NA.
6. Measurement of losses for Analog Optical link.
7. Radiation Pattern Measurement of Antennas (at least two antennas).

Course Title	ORGANIZATIONAL BEHAVIOUR				B. Tech. ECE VI Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1899612	HSMC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	--	--	--	30	--	30
Mid Exam Duration: 90 min.					End Exam Duration: -		

Course Objectives:

- To provide a basic knowledge of main ideas and key theories relating to organizational behavior.
- To provide an understanding of the behavior of individuals and groups inside the organization using theoretical framework.
- To develop critical analytical skills that will help in diagnosing problems in the organization, assess strengths and weaknesses, and generate effective solutions to the problems.
- To facilitate a critical evaluation of organizational practices and their impact on work behaviors, attitudes and performance.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Remembering basic knowledge in concepts and theories of organizational behavior.
CO 2	Understanding of the behavior of individuals and groups decision making and team building techniques towards interpersonal relations
CO 3	Applying concepts, laws, methods, required skills in leadership and develop power cent
CO 4	Recognize culture and climate to change work and life.
CO 5	Apply the principles and concepts in balancing of work and life.

UNIT I

INTRODUCTION

Definition, Need and Importance of organizational behavior – Nature and scope – Framework – Organizational behavior models.

UNIT II

INDIVIDUAL BEHAVIOUR

Personality – types –Theories – Learning – Types of learning – The learning process – Learning theories – Misbehavior – Types –Emotions - Emotional Labour – Emotional Intelligence – Theories; Attitudes – Characteristics – Perceptions – Importance –

Factors influencing perception – Interpersonal perception- Impression Management; Motivation – importance – Types –Theories- Effects on work behavior.

UNIT III

GROUP BEHAVIOUR

Organization structure – Formation – Groups in organizations – Influence – Group dynamics – Emergence of informal leaders and working norms – Group decision making techniques – Team building - Interpersonal relations – Communication – Control.

UNIT IV

LEADERSHIP AND POWER

Meaning – Importance – Leadership styles – Theories – Leaders Vs Managers – Sources of power – Power centers – Power and Politics.

UNIT V

DYNAMICS OF ORGANIZATIONAL BEHAVIOUR

Organizational culture and climate – Factors affecting organizational climate – Importance; Job satisfaction – Determinants – Measurements – Influence on behavior; Stress – Work Stressors – Prevention and Management of stress – Balancing work and Life.

TEXT BOOKS:

- Stephen P. Robins (2008). Organizational Behavior (11th edition). PHI Learning / Pearson Education.
- Fred Luthans (2001). Organizational Behavior (11th edition). McGraw Hill.
- Subbarao.P, Management and Organizational Behaviour. PHI

REFERENCES:

- Schermerhorn, Hunt and Osborn (2008). Organizational behavior (9th Edition). John Wiley.
- Udai Pareek (2004). Understanding Organizational Behaviour (2nd Edition). Oxford Higher Education.

Course Title	INTERNET OF THINGS (IOT)				B. Tech. ECE VII Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1804701	EC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	--	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs			

Course Objectives:

- This course imparts knowledge on, introduction to IoT, its complete architecture & internet Protocols involved enabling IoT communication over the network.
- The course also offers an introduction to IoT platforms, end devices, networks and cloud services.
- Using case analysis, assignments, Labs & projects students will acquire skills necessary to identify building blocks of an IoT application.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand IoT architecture, internet & network topologies and Different Cloud storage services.
CO 2	Apply appropriate hardware and software tools for IoT applications.
CO 3	Analyze TCP/IP protocol, various Programming Concepts
CO 4	Compare cloud storage services, various libraries, addressing modes and IoT devices
CO 5	Design a basic systems using IoT for various applications

UNIT-I

Introduction & Overview of Internet of things: Introduction to The Internet of things today, Vision of internet of things, An IoT architecture outline, Functional blocks of IoT, industrial IoT, Challenges in IOT,Hardware and Software tools required for IoT application development.

Case Study: SimpleLink ™ Wi-Fi ® Enabled Electronic Smart Lock.

UNIT-II

Internet/Web and Networking Basics: Introduction to internet & network topologies,TCP/IP protocol, TCP/IP Layers and their relative Protocols, IP addressing(IPV4), IP Address Classification & Subnet, Local IP, Gateway IP and DNS,TCP & UDP Communication, Overview of MAC Address, Energia, WiFi Library API's .

Case Study: Connected microcontrollers essential to automation in buildings

UNIT-III

MSP 432 processor: MSP 432 processorfeatures, Architecture, its Booster Packs, Development Environment, Libraries, Fundamental Programming Concepts**,** TM4C123G Launchpad, Sensor hub Booster pack, CC3220 SF Launchpad.

UNIT-IV

Cloud Communication in IOT: IOTdevice to cloud storage communication Model, need of Cloud services in IOT, Different Cloud storage services, Cloud Data processing and frame format, Introduction to clouds like Temboo, Blynk, Pubnub etc.

Case Study: Advances in bio-inspired sensing help people lead healthier lives.

UNIT-V

IOT Platform and Application development: IoT applications in home, infrastructures, Healthcare, Transport, buildings, security, Industries, and other IoT electronic equipment, Adapting IPV6 for IOT Requirement(overview).

Text Books:

1. Internet of Things: Converging Technologies for Smart Environments and Integrate Ecosystems, Dr. Ovidiu Vermesan, Dr. Peter Friess, River Publishers.
2. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach.
3. Mazidi, Muhammad Ali, "TI MSP432 ARM Programming for Embedded Systems (ARM books)" Volume 4, MicroDigitalEd, 2016.

Reference Books:

1. Embedded Ethernet And Internet Complete (Designing and Programming Small Devices for Networking)by Jan Axelson.
2. Interconnecting Smart Objects with IP: The Next Internet, Jean-Philippe Vasseur,Adam Dunkels, Morgan Kuffmann.

1. http://www.ti.com/ww/en/internet_of_things/iot-overview.html.
2. http://energia.nu/reference/
3. Internet of Things (IoT): A vision, architectural elements, and future directions Jayavardhana Gubbia, Rajkumar Buyyab,∗ , Slaven Marusic a, Marimuthu Palaniswami a
4. http://www.ti.com/wireless-connectivity/simplelink-solutions/overview/overview.html.
5. https://www.hivemq.com/blog/mqtt-essentials-part2-publish-subscribe.
6. *Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010*

Course Title	ELECTRONIC MEASUREMENTS AND INSTRUMENTATION				B. Tech. ECE VII Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1804702	EC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	--	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs		

Course Objectives:

- The presentation of fundamental measurement concepts and measurement methodologies including the description of basic instruments that are the technological implementation of general methodologies.
- Understanding about the transducers and to help the students analyze various signals using CRO.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Define the performance characteristics of an instrument.
CO 2	Understand the principle of analog, digital voltmeters and wave analyzers
CO 3	Explain different types of oscilloscopes
CO 4	Use AC and DC bridges for relevant parameter measurement.
CO 5	Apply the complete knowledge of various electronic transducers to measure the physical Quantities in the field of science and technology

UNIT I

Performance characteristics of Instruments: Static characteristics, Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Errors in Measurement, Dynamic Characteristics-speed of response, Fidelity, Lag and Dynamic error.

Analog Instruments: Transistor Voltmeter, Micro Voltmeter (Chopper type) – DC Differential voltmeter – AC voltmeters – Multi meter -wave analyzers (AF & RF) – Harmonic distortion analyzer- Spectrum analyzer-Applications.

UNIT II

Bridges: Wheat stone bridge, Kelvin Bridge, Measurement of inductance- Maxwell's bridge, Anderson Bridge. Measurement of capacitance-Schearing Bridge, Wien Bridge Errors and precautions in using bridges- Q meter and measurement methods

UNIT III

Cathode Ray Oscilloscopes: Motion of electron in electronic field and in magnetic field-Block diagram of CRO, CRT, Electrostatic deflection sensitivity – Vertical and Horizontal deflection systems – Principle of operation of dual beam, dual trace, sampling and storage CRO's.

UNIT IV

Digital Instruments: Digital Voltmeters (Ramp, Dual slope, stair case, successive approximation types) Digital multi meter, Universal counter, Digital tachometer, Digital Phase meter.

UNIT V

Transducers: Active & passive transducers, Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors. Measurement of physical parameters force, pressure, velocity, humidity, moisture, speed, proximity and displacement.Data acquisition systems.

Text Books:

1. Electronic instrumentation, second edition - H.S. Kalsi, Tata McGraw Hill, 2004.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.

References:

1. Electronic Instrumentation & Measurements - David A. Bell, PHI (OUP), 2nd Edition, 2003.
2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education, 2nd Ed., 2004.
3. Electronic Measurements & Instrumentations by K. Lal Kishore, Pearson Education – 2005.

Course Title	INFORMATION THEORY AND CODING				B. Tech. ECE VII Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
1804703	**PE**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	--	--	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**		

Course Objectives:

- To know various information measures.
- To understand various information channels.
- To explain different source code algorithms.
- To familiarize quantization and transform coding.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand various information measures
CO 2	Describe various information channels.
CO 3	Use different source code algorithms.
CO 4	Analyze quantization and transform coding.

UNIT-I

Information Theory: Introduction to Information Theory and Coding, Definition of Information Measure and Entropy, Extension of An Information Source and Markov Source, Adjoint of An Information Source, Joint and Conditional Information Measure, Properties of Joint and Conditional Information Measures and A Morkov Source Properties of Joint and Conditional Information measures and a Markov source.

UNIT-II

Source Coding: Source coding theorem, Prefix Codes, Kraft McMillan Inequality property, Encoding of the Source Output, Shannon's Encoding Algorithm, Shannon Fano Encoding Algorithm, Huffman codes, Extended Huffman coding, Arithmetic Coding.

UNIT-III

Information Channels I: Introduction to Information Channels, Equivocation and Mutual Information, Properties of Different Information Channels, Reduction of Information Channels, Properties of Mutual Information and Introduction to Channel Capacity, Calculation of Channel Capacity for Different Information Channels, Shannon's Second Theorem.

UNIT-IV

Information Channels II: Error Free Communication Over Noisy Channel, Error Free Communication Over A Binary Symmetric Channel and Introduction to Continuous Sources and Channels, Differential Entropy and Evaluation of Mutual Information for Continuous Sources and Channels, Channel Capacity of A Band Limited Continuous Channel

UNIT-V

Quantization: Introduction to Quantization, Lloyd-Max Quantizer, Companded Quantization, Variable Length Coding and Problem Solving in Quantizer Design, Vector Quantization, Transform Coding-Idea of Transform Coding, Choosing the weights of basis vector, forward transform, Energy preserving, Optimal bit allocation .

Text books:

1. T. M. Cover, J. A, Thomas, "Elements of information theory," Wiely Interscience, 2 nd Edition, 2006
2. R. W. Hamming, "Coding and information theory," Prentice Hall Inc., 1980.

Reference Books:

1. Bose, "Information Theory, Coding and Cryptography", Mc graw hill Education
2. S. Gravano, "Introduction to Error Control Codes", OUP Oxford (24 May 2001)
3. Robert B. Ash, "Information Theory", Dover Publications (November 1, 1990)
4. Todd k Moon, "Error Correction Coding: Mathematical Methods and Algorithms", Wiley, 2005.

Course Title	REAL TIME OPERATING SYSTEMS				B. Tech. ECE VII Sem			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
1804704	**PE**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	--	--	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**			

Course Objectives:

The objective of this course is to

- Develop an understanding of various Real Time systems Application
- Obtain a broad understanding of the technologies and applications for the emerging and exciting domain of real-time systems
- Get in-depth in designing and developing a real operational system

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Explain the fundamentals of interaction of OS with a computer and user computation
CO 2	Understand the fundamental concepts of creating and OS controlling devices
CO 3	Describe the programming logic of modelling process based on the OS features
CO 4	Develop the concepts of inter-process communications
CO 5	Design application development of RTOS.

UNIT-I

INTRODUCTION: Introduction to Operating System: Computer Hardware Organization, BIOS and Boot Process, Multithreading concepts, Processes, Threads, Scheduling.

UNIT-II

BASICS OF REAL-TIME CONCEPTS: Terminology: RTOS concepts and definitions, real-time design issues, examples, Hardware Considerations: logic states, CPU, memory, I/O, Architectures, RTOS building blocks, Real-Time Kernel.

UNIT-III

PROCESS MANAGEMENT: Concepts, scheduling, IPC, RPC, CPU Scheduling, scheduling criteria, scheduling algorithms Threads: Multi-threading models, threading issues, thread libraries, synchronization Mutex: creating, deleting, prioritizing mutex, mutex internals.

UNIT-IV

INTER-PROCESS COMMUNICATION: Messages, Buffers, mailboxes, queues, semaphores, deadlock, priority inversion, PIPES MEMORY MANAGEMENT:- Process stack management, run-time buffer size, swapping, overlays, block/page management, replacement algorithms, real-time garbage collection.

UNIT-V

CASE STUDIES: Case study Linux POSIX system, RTLinux / RTAI, Windows system, Vxworks, uItron Kernel Design Issues: structure, process states, data structures, inter-task communication mechanism, Linux Scheduling.

Text Books:

1. Jane W. S. Liu, Real Time Systems, – Pearson Education Publication.
2. J. J Labrosse, "MicroC/OS-II: The Real –Time Kernel", Newnes, 2002.

Reference Books:

1. W. Richard Stevens, "Advanced Programming in the UNIX® Environment", 2nd Edition, Pearson Education India, 2011.
2. Philips A. Laplante, "Real-Time System Design and Analysis", 3rd Edition, John Wley& Sons, 2004
3. Doug Abbott, "Linux for Embedded and Real-Time Applications", Newnes, 2nd Edition, 2011.

Course Title	SCIENTIFIC COMPUTING				B. Tech. ECE Vll Sem		
Course Code	**Category**	**Hours/Week**		**Credits**	**Maximum Marks**		
1804705	**PE**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	--	--	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**		

Course Objectives:

- To make students familiar with the concepts of programming and the get them accustomed with high-level languages like Matlab, Mathematica, etc.
- To provide an overview of some of the issues and problems that arise in scientific computation, such as (non-)linear systems
- To provide an overview of numerical and symbolic integration, differential equations and simulation.
- To provide an overview of initial value problems,two point boundary value problems, optimization and eigenvalue problems.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand various commands in MATLABS and algebraic equations using MATLAB
CO 2	Explain the programs for curve fitting and roots of equations
CO 3	Develop the programs for Numerical Differentiation and integration.
CO 4	List the various methods for initial value problem and two point boundary value problem
CO 5	Solve optimization and Eigen value problems

UNIT-I

Introduction to MATLAB: Introduction to MATLAB, Data Types and Variables, Arrays, Cells, Strings, Operators, Flow Control, Loops, Functions, Input/Output, Array Manipulation, Plotting.

Systems of Linear Algebraic Equations: Introduction, Gauss Elimination Method, LU Decomposition Methods, Symmetric and Banded Coefficient Matrices, Pivoting, Matrix Inversion, Iterative Methods-Gauss–Seidel Method, Conjugate Gradient Method.

UNIT -II

Interpolation and Curve Fitting: Introduction, Polynomial Interpolation-Lagrange's Method, Newton's Method, Neville's Method, Limitations of Polynomial Interpolation, Interpolation with Cubic Spline, Least-Squares Fit.

Roots of Equations: Introduction, Incremental Search Method, Method of Bisection, Brent's Method, Newton–Raphson Method, Systems of Equations, Zeros of Polynomials.

UNIT- III

Numerical Differentiation: Introduction, Finite Difference Approximations, Richardson Extrapolation, Derivatives by Interpolation.

Numerical Integration: Introduction, Newton–Cotes Formulas, Romberg Integration, Gaussian Integration, Multiple Integrals.

UNIT IV

Initial Value Problems: Introduction, Taylor Series Method, Runge–Kutta Methods, Stability and Stiffness, Adaptive Runge–Kutta Method, Bulirsch–Stoer Method.

Two-Point Boundary Value Problems: Introduction, Shooting Method, Finite Difference Method.

UNIT -V

Symmetric Matrix Eigenvalue Problems: Introduction, Jacobi Method, Inverse Power and Power Methods, Householder Reduction to Tridiagonal Form, Eigenvalues of Symmetric Tridiagonal Matrices.

Introduction to Optimization : Introduction, Minimization Along a Line, Conjugate Gradient Methods.

Text Books:

1. Jaan Kiusalaas, "NUMERICAL METHODS IN ENGINEERING WITH MATLAB", Cambridge university press, 2005.
2. Stephen J. Chapman, "MATLAB Programming for Engineers", Thomson learning, 4th edition.

Reference Books:

1. Ian Gladwell, Warren Ferguson Jr., James G. Nagy, "Introduction to Scientific Computing Using MATLAB", Lulu Publishing, 2011.
2. Alfio Quarteroni,Fausto Saleri, Paola Gervasio, "Scientific Computing with MATLAB and Octave", Springer International Publishing, 4 th edition, 2014.

NPTEL Link:

https://onlinecourses.nptel.ac.in/noc20_ma40/preview
https://nptel.ac.in/courses/111/102/111102137/

Course Title	CMOS DESIGN					B. Tech. ECE VII Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1804706	PE	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	--	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs			

Course Objectives:

- To provide rigorous foundation in MOS and CMOS digital circuits
- To train the students in transistor budgets, clock speeds and the growing challenges of power consumption and productivity

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Analyze the CMOS circuit and its use
CO 2	Estimate the circuit Performance
CO 3	Design Various CMOS logic design circuits
CO 4	Understand the design of a systems and its methods
CO 5	Design various subsystems

UNIT-I

INTRODUCTION TO CMOS CIRCUITS

MOS Transistors, MOS Transistors switches, CMOS logic circuit and System representations, MOS Transistor theory – Introduction MOS device design equation, the complementary CMOS inverter – DC characteristics, Static Load MOS inverters, The differential inverter, The transmission gate, The Tri state inverter, Bipolar Devices**.**

UNIT-II

CIRCUIT CHARACTERISATION AND PERFORMANCE ESTIMATION

Introduction, Resistance estimation, Capacitance estimation, Inductance estimation, Switching characteristics of CMOS gate Transistor, Sizing, Power Dissipation, Sizing Routing conductors, Charge sharing, Design Margining, Reliability.

UNIT-III

CMOS CIRCUIT AND LOGIC DESIGN

CMOs Logic Gate design, Basic Physical Design of simple gate, CMOS Logic structures clocking strategies, i/o Structures, Low Power Design.

UNIT-IV

SYSTEMS DESIGN AND DESIGN METHOD

Design Strategies CMOS chip Design options, Design Methods, Design Capture Tools, Design Verification Tools, Design Economics, and Data Sheets. CMOS Testing –

Manufacturing Test Principles, Design Strategies for Test, Chip level Test Techniques, System Level Test Techniques, and Layout Design for Improved Testability.

UNIT-V

CMOS SUB SYSTEM DESIGN 1

Data path operations – Addition/Subtraction party generators, Comparators. Zero/one Detectors, Binary Counters, ALU's, Multiplication shifters, Memory Elements, Control FSM, Control Logic Implementation**.**

Text Books:

1. N.H.E.Weste&D. Harris, "CMOS VLSI Design: A Circuits and Systems Perspective", 4th Edition, Pearson, 2011.
2. J.Rabey& B. Nikolic, "Digital Integrated circuits", 2 ndEdition,Pearson, 2003.1

Reference Books:

1**.** P.E.Allen&D.R. Holberg, "CMOS Analog Circuit Design", 3rd Edition, Oxford University Press, 2011. 2. R. Jacob Baker, "CMOS Circuit Design, Layout, and Simulation", 3rd Edition, Wiley, 2010

Course Title	ELECTROMAGNETIC INTERFERENCE & COMPATIBILITY				B. Tech. ECE VII Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
1804707	**PE**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	-	--	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**		

Course Objectives:

- To acquire knowledge of non linearloads.
- To acquire knowledge of different converter circuits used in powersystems
- To walk around the various applications and stability analysis in powersystems.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand EMC regulation and methods of eliminating interferences.
CO 2	Explain about the methods of grounding of cable shield.
CO 3	Understand the concept of filtering and shielding.
CO 4	Explain about the types of digital circuit noises.
CO 5	Learning about electrostatic discharge and standards.

UNIT-I

INTRODUCTION: Sources of EMI, Conducted and radiated interference- Characteristics - Designing for electromagnetic compatibility (EMC)- EMC regulation- typical noise path- use of network theory- methods of eliminating interference.

UNIT-II

METHOD OF HARDENING: Cabling –capacitive coupling- inductive coupling- shielding to prevent magnetic radiation- shield transfer impedance, Grounding – safety grounds – signal grounds- single point and multipoint ground systems- hybrid grounds- functional ground layout –grounding of cable shields- ground loops-guard shields.

UNIT-III

BALANCING, FILTERING AND SHIELDING : Power supply decouples- decoupling filters- amplifier filtering –high frequency filtering shielding – near and far fields- shielding effectiveness- absorption and reflection loss, Shielding with magnetic material- conductive gaskets, windows and coatings- grounding of shields.

UNIT-IV

DIGITAL CIRCUIT NOISE AND LAYOUT: Frequency versus time domain- analog versus digital circuits- digital logic noise- internal noise sources- digital circuit ground noise –power distribution-noise voltage objectives- measuring noise voltages-unused inputs-logic families.

UNIT-V

ELECTROSTATIC DISCHARGE,STANDARDS AND LABORATORY TECHNIQUES: Static Generation- human body model- static discharges-ED protection in equipment design- ESD versus EMC, Industrial and Government standards – FCC requirements – CISPR recommendations-Laboratory techniques- Measurement methods for field strength-EMI.

TEXT BOOKS:

1. Henry W.Ott, " Noise reduction techniques in electronic systems", John Wiley & Sons,1989.
2. Bernhard Keiser, "Principles of Electro-magnetic Compatibility", Artech House, Inc. (685 canton street, Norwood, MA 020062 USA)1987.

REFERENCE BOOKS:

1. Bridges, J.E Milleta J. and Ricketts.L.W., "EMP Radiation and Protective techniques", John Wiley and sons, USA1976.
2. IEEE National Symposium on "Electromagnetic Compatibility", IEEE, 445, hoes Lane, Piscataiway, NJ08855.

Course Title	RADAR AND SATELLITE COMMUNICATION				B. Tech. ECE Vll Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
1804708	**PE**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	0	--	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**		

Course Objectives:

- The goal of the course is to introduce students to the fundamentals of radar and satellite communication.
- To provide an understanding of the basic concepts, operation, and modern radar systems.
- To familiarize with basic concepts related to satellite Communication. Understand Sub-Systems of Satellites and Launches.
- To know about the parameters affecting the Satellite System Performance.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand about radar technology.
CO 2	Explain different types of radar.
CO 3	Develop the communication satellite mechanics.
CO 4	Compare Earth station technology and Satellite spacecraft.
CO 5	Analyze and evaluate various parameters to design the power budget for satellite links

UNIT-I

Introduction to Radar: Introduction to radar, Radar block diagram and operation, Radar frequencies, Applications of radar, Radar range equation, Prediction of range performance, Minimum detectable signal, Receiver noise, Probability density function, SNR, Integration of radar pulses, Radar cross-section of targets, PRF and range ambiguities,

UNIT -II

Radar Technology: Doppler Effect, CW radar, FM CW radar, Multiple frequency CW radar. MTI radar- Delay line canceller, Range gated doppler filters, Blind speeds, Staggered PRF, Tracking radar-sequential lobing, conical scan, Monopulse: amplitude comparison and phase comparison methods, Radar displays.

UNIT- III

Orbital aspects of Satellite Communication: Introduction to geo-synchronous and geo-stationary satellites, Kepler's laws, Locating the satellite with respect to the earth, Sub-

satellite point, Look angles, Mechanics of launching a synchronous satellite, Orbital effects, Indian scenario in communication satellites

UNIT -IV

Spacecraft and Earth station: Satellite subsystems- Attitude and Orbit control systems, Telemetry, Tracking and command control system, Power supply system, Spacecraft antennas, Multiple access techniques, comparison of FDMA, TDMA, and CDMA. Earth station equipments, tracking systems

UNIT -V

Satellite link design: Introduction to satellite link design, basic transmission theory, system noise temperature and G/T ratio, design of downlink and uplink, design of satellite links for specified C/N

Text Books:

1. Merrill I.Skolnik, "Introduction to Radar Systems", 2nd edition-TMH 1980.
2. Pratt, John Wiley, "Satellite communications",3rd edition.
3. Robert M.Gagliardi, - satellite communication systems, CBS Publications

Reference Books:

1. Dennis Roddy, "Satellite Communications", 2nd Edition, 1996,
2. M Richharia "Satellite Communication System", CBS Publications
3. K. K Sharma "Introduction to Radar Systems", 3rd edition.

Course Title	COMPUTER SYSTEM ARCHITECTURE				B. Tech. ECE VII Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
1804709	**PE**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	-	--	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**		

Course Objectives:

- To learn about the evolution of computer architecture and its performance measuring parameters.
- To provide knowledge about instruction sets of different processors.
- To teach multiprocessors system interconnections.
- To know the instruction pipeline designs.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand different parallel computer models
CO 2	Describe the advanced processor technologies
CO 3	Interpret memory hierarchy and mechanisms for enforcing cache coherence
CO 4	Compare different multiprocessor system interconnecting mechanisms
CO 5	Analyze different pipelining techniques

UNIT-I

Introduction: Parallel computer models – Evolution of Computer Architecture, System Attributes to performance, Amdahl's law for a fixed workload. Multiprocessors andMulticomputers, Multi-vector and SIMD computers, Architectural development tracks, Conditions of parallelism.

UNIT-II

Processors and memory hierarchy: Advanced processor technology- Design Space of processors, Instruction Set Architectures, CISC Scalar Processors, RISC Scalar Processors, Superscalar and vector processors, Memory hierarchy technology.

UNIT-III

Multiprocessors system interconnects: Hierarchical bus systems, Cross bar switch and multi-port memory, Multistage and combining networks. Cache Coherence and Synchronization Mechanisms, Cache Coherence Problem, Snoopy Bus Protocol, Directory Based Protocol, Hardware Synchronization Problem

UNIT-IV

Message Passing Mechanisms: Message Routing schemes, Flow control Strategies, Multicast Routing Algorithms. Pipelining and Superscalar techniques – Linear Pipeline processors and Nonlinear pipeline processors

UNIT-V

Instruction pipeline design: Arithmetic pipeline deign - Super Scalar Pipeline Design.Multithreaded and data flow architectures - Latency hiding techniques, Principles of multithreading - Multithreading Issues and Solutions, Multiple context Processors, Fine-grainMulticomputer- Fine-grain Parallelism. Dataflow and hybrid architecture

Text Books:

1. K. Hwang and Naresh Jotwani, Advanced Computer Architecture, Parallelism, Scalability, Programmability, TMH, 2010.

References:

1. H P Hayes, “Computer Architecture and Organization”, McGraw Hill, 1978.
2. K. Hwang & Briggs , “Computer Architecture and Parallel Processing”, McGraw Hill International, 1986
3. M J Flynn, “Computer Architecture: Pipelined and Parallel Processor Design”, Narosa Publishing House, 2012.
4. M Sasikumar, D Shikkare and P Raviprakash, “Introduction to Parallel Processing”, PHI, 2014.
5. P M Kogge, “The Architecture of Pipelined Computer”, McGraw Hill, 1981.
6. P V S Rao , Computer System Architecture, PHI, 2009.
7. Patterson D. A. and Hennessy J. L., Morgan Kaufmann „,Computer Organization and Design:The Hardware/Software Interface“, Morgan Kaufmann Pub, 4/e, 2010.

Course Title	DIGITAL IMAGE AND VIDEO PROCESSING				B. Tech. ECE VII Sem			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
1804710	**PE**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	-	--	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**			

Course Objectives:

- To study the image fundamentals and transforms necessary for image processing
- To learn the concepts of filtering in spatial and frequency domain
- To study different image compression techniques
- To understand image segmentation algorithms and Object recognition.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Define various image and video processing parameters
CO 2	Explain image filtering, segmentation, restoration and compression
CO 3	Compare different Color models, enhancement techniques, motion estimation and image restoration techniques
CO 4	Apply the concepts of image and video processing techniques in various applications.
CO 5	Analyze mathematical operations, coding, filtering and motion estimation methods in image and video processing.

UNIT-I

Introduction: Fundamentals of Image Processing: Digital image fundamentals, Applications of image processing, Image Sampling and Quantization, relationship between pixels. Relationship between pixels - neighbours of a pixel, Adjacency, Connectivity, Regions and boundaries, distance measures, Mathematical tools in digital image processing – Array versus matrix operations, Linear and Nonlinear Operations, Arithmetic operations, geometrical spatial transformations and image registration.

Color Images,Color models–RGB, CMYK, HSI;

UNIT-II

Image Enhancement: Spatial domain methods: Point processing, Histogram processing, Fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters.

Frequency domain methods: Basics of filtering in frequency domain, General approach for operating in the linear transform domain, 2-D DFT and Properties, image smoothing, image sharpening, Homomorphic filtering, LOG filters.

UNIT-III

Image Compression: Redundancies in images, Fidelity criteria, Image compression models, Error free compression – Variable length coding, Huffman coding, Arithmetic coding, LZW coding, Bit-plane coding, loss less and lossy predictive coding, Discrete cosine Transform, Transform coding, Image Compression standards.

UNIT-IV

Image Restoration: Degradation model, Noise models, Restoration in the presence of noise only – spatial filtering, Periodic noise reduction by frequency domain filtering, Linear position-Invariant degradation, Inverse filtering, least mean square (Wiener) filters, Constrained Least Squares filtering.

Image Segmentation: Point, Line and Edge detection, Edge linking and boundary detection, Thresholding, Region based segmentation – Region growing, Region splitting and merging.

UNIT-V

Video Processing: Definition of video signal, Analog and digital video, Spatial and temporal sampling, Video formats, Frame types, Video subsampling, Video compression, Motion estimation algorithms – Gradient techniques, Pel – recursive techniques, Block Matching Techniques, Search algorithms for Block Matching in motion estimation – Full search algorithm, Three step search algorithm.

Text Books:

1. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Second Edition, Pearson Education 3rd edition 2008.

2. Anil Kumar Jain, Fundamentals of Digital Image Processing, Prentice Hall of India.2nd edition 2004.

3. Jayaraman, S. Esakkirajan and T. Veerakumar, Digital Image Processing, Tata McGraw Hill Education, 2011.

Reference Books:

1. Scotte Umbaugh, Digital Image Processing and Analysis - Human and Computer Vision Application with CVIP Tools –2nd Ed, CRC Press, 2011.
2. M. Tekalp , Digital Video Processing – Prentice Hall International
3. Ed. Al Bovik ,"Handbook of Image and Video Processing", 2nd Edition, Academic Press, 2000.
4. Vipula Singh, Digital Image Processing with MATLAB and LabView, Elsevier.

Course Title	DIGITAL IC DESIGN				B. Tech. ECE VII Sem		
Course Code	**Category**	**Hours/Week**		**Credits**	**Maximum Marks**		
1804711	**PE**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	-	--	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**		

Course Objectives

- To Understand the basics of MOS Design.
- To Understand the basics of Combinational MOS Logic Circuits and the basics of Sequential MOS Logic Circuits.
- To Understand concepts of different interconnection techniques.
- To Describe concepts of Semiconductor memories and RAM array Organization.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the basics of MOS Design
CO 2	Understand the basics of Combinational MOS Logic Circuits and the basics of Sequential MOS Logic Circuits
CO 3	Analyze concepts digital integrated circuits and its applications
CO 4	Understand concepts of different interconnection techniques
CO 5	Describe concepts of Semiconductor memories and RAM array Organization

UNIT-I

MOS Design: Pseudo NMOS Logic – Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT-II

Combinational MOS Logic Circuits: MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates, AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates, Multiplers.

UNIT-III

Sequential MOS Logic Circuits: Behaviour of bi stable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

UNIT-IV

Dynamic Logic Circuits: Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits. Interconnect:Capacitive Parasitics, Resistive Parasitics, InductiveParasitics, Advanced Interconncet Techniques, clock distribution networks , clock delays, clock skew and Jitter.

UNIT-V

Flash Memory, RAM array organization. Semiconductor Memories: Memory Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory-NOR flash and NAND flash.

TEXT BOOKS:

1. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd Ed., PHI.
2. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.
3. Modern VLSI Design-Wayne Wolf, fourth edition, copyrights 2009.

Course Title	COGNITIVE RADIO				B. Tech. ECE VII Sem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1804712	PE	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	--	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs		

Course Objectives:

- Providehighlyreliablecommunicationswheneverandwhereverneededandtoutilizetheradiospectrumefficientlybyintelligently exploitinglicensedspectrum.
- Toobtainusefulinformationabouttheirsurroundingenvironmentwiththeprimaryusersandtheappearanceof spectrum holes.
- Tomaximizeprobabilityofdetection, throughputandfalsealarmandtominimizesensingtime.
- To find the optimal path from the source of data to its destination and to improve thethroughputandQOSmetrics.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	UnderstandthebasicsofSDRandhowitevolvesfromSoftwareDefinedRadio toCognitiveRadio.
CO 2	Interpretthebasicsofvariousspectrumsensingtechniques and Algorithms
CO 3	Recognize the concepts of cooperative spectrum sensing and handoffprocess
CO 4	Understand the functions of MAC layer and Network layer and its variousprotocols
CO 5	Interpret the basics of security management and the various attacks &its counter measures.

UNIT I

Introduction to Cognitive Radio

Introduction –Software Defined Radio: Architecture–Digital Signal Processor and SDR Baseband architecture – Reconfigurable Wireless Communication Systems – Digital Radio Processing –Cognitive Radio: Cognitive radio Framework – Functions – Paradigms of Cognitive Radio

UNIT II

Spectrum Sensing

Introduction –Spectrum Sensing – Multiband Spectrum Sensing – Sensing Techniques – Other algorithms– Comparison – Performance Measure & Design Trade-Offs : Receiver operating characteristics – Throughput Performance measure –Fundamental limits and trade-offs

UNIT III

Cooperative Spectrum Acquisition

Basics of cooperative spectrum sensing–Examples of spectrum acquisition techniques – cooperative transmission techniques – sensing strategies– Acquisition in the Presence of Interference: Chase- combining HARQ –Regenerative cooperative Diversity– spectrum overlay– spectrum handoff

UNIT IV

MAC Protocols and Network Layer Design

Functionality of MAC protocol in spectrum access –classification –Interframe spacing and MAC challenges– QOS – Spectrum sharing in CRAHN –CRAHN models – CSMA/CA based MAC protocols for CRAHN – Routing in CRN– Centralized and Distributed protocols – Geographical Protocol

UNIT V

Trusted Cognitive Radio Networks

Trust for CRN :Fundamentals – Models – Effects of Trust Management –Security properties in CRN –Route Disruption attacks –Jamming attacks –PU Emulation attacks

TextBooks

1. Mohamed Ibnkahla, "Cooperative Cognitive RadioNetworks: The completeSpectrum Cycle"Iedition.
2. AhamedKhattab,DmitriPerkins, BagdyByoumi, "CognitiveRadioNetworksfromTheorytopractice"2013th edition.

ReferenceBooks

1. Kwang–ChengChenandRamjeePrasad,"Cognitive RadioNetworks,WileyPub
2. AlexanderM.Wyglinski, MaziarNekovee,ThomasHou,"CognitiveRadioCommunicationsandNetworks". Iedition.

OnlineResource

www.vtt.fi//muut/2008/CHESS_Research_Report.pdf

www.cs.cmu.edu/~prs/NSF_CRN_Repot_Final.pdf

Course Title	INTERNET OF THINGS (IOT) LAB				B. Tech. ECE VII Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1804713	EC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		--	-	2	1	50	50	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs			

Course Objectives:

- This course imparts knowledge on, introduction to IoT, its complete architecture & internet Protocols involved enabling IoT communication over the network.
- The course also offers an introduction to IoT platforms, end devices, networks and cloud services.
- Using case analysis, assignments, Labs & projects students will acquire skills necessary to identify building blocks of an IoT application.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Identify issues and design challenges in IoT applications.
CO 2	Select appropriate hardware and software components for IoT applications.
CO 3	Conceptual knowledge will help students to build IoT applications
CO 4	Understanding of the communication protocols in IoT communications
CO 5	Familiarize with application program interfaces for IoT

Hardware required : TM4C123G Launchpad, Sensor hub Boosterpack,CC3220 SF Launchpad.**Softwares required :** Energia v17,Code Composer studio, CC3100 SDK,CC3220 SDK & a Serial terminal software**.**

Lab 1.

a) Program the TM4C123G Launchpad for Led blink, switch usage, ADC, pwm generation & serial communication**.**

b) Write a program by using WiFi libraries,to connect your launchpad with the availabe Encrypted/non_encrypted WiFi network.

Lab 2.

a) Write a program to Connect the launchpad with WiFi & print IPAddress, GatewayIP, Subnetmask on Serial Monitor.

b) Write a program to assign a static IP, Gateway & Subnet to a WiFi Connected controller.

Lab 3.

a) Design a Client server model between two WiFi modules and establish the communication between the two.

b) Write a program to design client server model based on TCP & UDP communication Protocols.

Lab 4. Design a HTTP based web server to manipulate the GPIO's of WiFi Module and monitor Sensor data connected with WiFi Module.

Lab 5. Use Blynk API's and write a program to control your Launchpad with Mobile Application.

Lab 6. Using temboo credientials connect your launchpad with Yahoo weather to recieve weather details in serial terminal.

Lab 7. With the help of Temboo services,generate Code for CC3220SF launchpad and upload it from TI CCS Cloud.

Lab 8. Design a Simple MQTT Based communication model to retrieve sensor data from a cloud Storage.

Lab 9.Getting Started with WLAN Access point & Station using CC3100SDK using CCS and Simplink WiFi Library.

Lab 10. Import and executeEmail Send Application using CC3100 SDK in CCS and understand Simplink API usage.

Course Title	HUMAN VALUES AND PROFESSIONAL ETHICS				B. Tech. ECE VII Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
18244715	**MC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		--	-	3	-	30	-	30
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**		

Course Objectives:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Develop appropriate technologies and management patterns to create harmony in professional and personal life
CO 2	Ensure students sustained happiness through identifying the essentials of human values and skills
CO 3	Get awareness of types of ethical challenges and dilemmas confronting members of a range Of professions (business, media, police, law, medicines, research)
CO 4	Bring to bear ethical analysis and reasoning in the light of normative ethics frameworks on a selection of ethical challenges and dilemmas across the chosen range of professions
CO 5	Relate ethical concepts and materials to ethical problems in specific professions and professionalism.
CO 6	Enhance awareness on ethical issues to face the difficulties in life.

UNIT I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario

- Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

UNIT II

Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs. dealing with disease.

UNIT III

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family):Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

UNIT IV

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature

- Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
- Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
- Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Text Book

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and

Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in

Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi,

2019. ISBN 978-93-87034-53-2

Reference Books

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amar kantak, 1999.

2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.

3. The Story of Stuff (Book).

4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"

5. E. FSchumacher. “Small is Beautiful”

6. Slow is Beautiful –Cecile Andrews

7. J C Kumarappa “Economy of Permanence”

8. PanditSunderlal “Bharat Mein Angreji Raj”

9. Dharampal, “Rediscovering India”

10. Mohandas K. Gandhi, “Hind Swaraj or Indian Home Rule”

11. India Wins Freedom - Maulana Abdul Kalam Azad

12. Vivekananda - RomainRolland(English)

13. Gandhi - Romain Rolland (English)

Course Title	MANAGEMENT SIENCE				B. Tech. ECE VIII Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1825801	HSMC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	-	-	2	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs			

Course Objectives:

- Provide a basic understanding of management science including analytical problem solving and communications skills.
- Prepare for practice in a field that sees rapid changes in tools, problems and opportunities.
- Prepare for graduate study and self-development over an entire career.
- Provide ability to use the techniques, skills and modern engineering tools necessary for engineering practices.
- The broad education necessary to understand the impact of engineering solutions in a global and societal context.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the principles,functions, approaches and theories of management.Compare and contrast organization structure designs and charts diligently
CO 2	Analyze the concept of strategic planning and implementation and apply on the decisions in strategic management.
CO 3	Apply the techniques of inventory control.
CO 4	Examine the process of Work study and to apply the techniques of Statistical Quality Control.
CO 5	Evaluate and Review the Projects in order to control cost and time

UNIT I

INTRODUCTION TO MANGEMENT:

Concept of Management: Administration – Organization - Functions of Management - Evolution of Management Thought -Henry Fayol, FW Taylor, Maslow's Theory, Theory X and Theory Y and Contingency Theory. Organization: Principles of Organization – Types - Organization charts-managerial objectives and Social responsibilities of Management.

UNIT II

STRATEGIC MANAGEMENT:

Corporate Planning-mission, objectives, strategy and programmes-SWOT Analysis- Strategy Formulation and Implementation.-Plant location and Plant Layout concepts.

UNIT III

HRM AND INVENTORY MANAGEMENT:

Human Resource Management –Basic functions of HRM, Manpower Planning Job Evaluation and Merit Rating - Incentive plans.

Inventory Management: Need for Inventory Control; EOQ, ABC Analysis, Purchase Procedure.

UNIT IV

OPERARIONS MANAGEMENT:

Productivity- Job, Batch and Mass Production-Work Study-Basic procedure involved in Method Study and Work Measurement. Statistical Quality Control : c - chart, p - chart, R – chart - Acceptance sampling - Deming's contribution to Quality.

UNIT V

PROJECT MANAGEMENT:

Network Analysis to project management- PERT/CPM- Application of network techniques to engineering problems-Cost Analysis-Project Crashing.

TEXT BOOKS:

1.Koontz& Weihrich, "Essentials of Management",6/e,TMH,2005

2.Kanishka Bedi, "Production and Oerations Management",Oxford University Press,2004

3.Parnell, "Strategic Management",Biztantra,2003.

4.LS Srinath, " PERT/CPM",Affiliated East-West Press,2005

Course Title	WIRELESS COMMUNICATION				B. Tech. ECE VIII Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1804802	PE	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	-	-	2	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs			

Course Objectives:

- To understand the design of a Wireless Communication system Concepts.
- To understand BroadbandWirelessChannelModeling, fundamentals of UWB.
- To study the various digital signaling techniques and Cellular mobile communication.
- To understand the concepts of OFDM and MIMO.
- To understand the multiple Access techniques and architecturefordifferent Wireless Systems.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand 3G/4G Standards, Diversity, Cellular Communication. OFDM, MIMO OFDM.
CO 2	Apply basic principles to compute BER, Codes for CDMA and channel capacity.
CO 3	Analyze the characteristics of various Wireless Communication channels, Various channel models,
CO 4	Compare various channel characteristics, Multiple access schemes, various receivers and 3G/4G standards.
CO 5	DesignChannel models, Receivers and MIMO Diversity

UNIT-I

Wireless Communications and Diversity: Introduction to 3G/4G Standards, Wireless Channel and Fading,Rayleigh Fading andBER of Wired Communication,BER for Wireless Communication,Introduction toDiversity,Multi-antenna Maximal Ratio Combiner,BER with Diversity,Spatial Diversityand Diversity Order,

UNIT-II

Broadband Wireless Channel Modeling: Wireless Channel and Delay Spread,Coherence Bandwidth of the Wireless Channel,ISI and Doppler in WirelessCommunications.

UWB (Ultra wide Band): UWB Definition and Features, UWB Wireless Channels, UWB Data Modulation, Uniform Pulse Train, Bit-Error Rate Performance of UWB.

UNIT-III

Cellular Communication: Introduction to Cellular Communications, Frequency reuse, Multiple Access Technologies, Cellular Processes - Call Setup, Handover etc., Telegraphic Theory.

CDMA: Introduction to CDMA, Walsh codes, Variable tree OVSF, PN Sequences, Multipath diversity, RAKE Receiver, CDMA Receiver Synchronization.

UNIT-IV

OFDM: Introduction to OFDM, Multicarrier Modulation and Cyclic Prefix, Channel model and SNR performance, OFDM Issues – PAPR, Frequency and Timing Offset Issues.

MIMO: Introduction to MIMO, MIMO Channel Capacity, SVD and Eigen modes of the, MIMO Channel , MIMO Spatial Multiplexing – BLAST, MIMO Diversity – Alamouti, OSTBC, MRT, MIMO - OFDM.

UNIT-V

3G and 4G Wireless Standards- GSM, GPRS, WCDMA, LTE, WiMAX

Text Books:

1. Aditya K. Jagannatham, “Principles of Modern Wireless Communication Systems”, Publisher-McGraw Hill..

2. William C. Y. Lee, “Mobile Communications Engineering”, Mc Graw Hill Publications

References:

1. Theodore Rapp port, “ Wireless Communications: Principles and Practice”, Prentice Hall.

2. Ezio Biglieri, “MIMO Wireless Communications”, Cambridge University Press.

1. David Tse and Pramod Viswanath, “ Fundamentals of Wireless Communications”, Publisher - Cambridge University Press.

2. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press.

Course Title	SOC ARCHITECTURE				B. Tech. ECE VIII Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1804803	PE	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	-	--	2	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs		

Course Objectives:

The students will be able to

- Understand the components of system, hardware and software.
- Know the basic concepts of processor architecture and instructions.
- Describe external and internal memory of SOC & Bus models.
- Understand SOC customization and reconfiguration technologies.
- Explain SOC design approach.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Memorize the system architecture, components of system hardware and software.
CO 2	Know the basic concepts of processor architecture and instructions and delays
CO 3	Describe memory & bus models of SOC.
CO 4	Know SOC customization and reconfiguration technologies.
CO 5	Apply the knowledge of SOC design in real time applications.

UNIT-I

Introduction to the System Approach: System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, an approach for SOC Design, System Architecture and Complexity.

UNIT-II

Processors: Introduction , Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

UNIT-III

Memory Design for SOC: Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation , SOC Memory System, Models of Simple Processor – memory interaction.

Interconnect: Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses , Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time.

UNIT-IV

SOC Customization: An overview, Customizing Instruction Processor, Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance Specific design, Customizable Soft Processor, Reconfiguration – overhead analysis and trade-off analysis on reconfigurable Parallelism.

UNIT-V

Application Studies / Case Studies: SOC Design approach, AES algorithms, Design and evaluation, Image compression – JPEG compression.

Text Books:

1. Michael J. Flynn and Wayne Luk, "Computer System Design System-on-Chip", Wiley India Pvt. Ltd.
2. Steve Furber, "ARM System on Chip Architecture ", 2nd Edition, 2000, Addison Wesley Professional.

Reference Books:

1. Ricardo Reis, "Design of System on a Chip: Devices and Components", 1st Edition, 2004, Springer
2. Jason Andrews, "Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology)", Newnes, BK and CDROM.
3. Prakash Rashinkar, Peter Paterson and Leena Singh L, "System on Chip Verification – Methodologies and Techniques", 2001, Kluwer Academic Publishers.

Course Title	SPEECH PROCESSING				B. Tech. ECE VIIISem		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
1804804	PE	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	-	--	2	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs		

Course Objectives:

- To study the basic principles of speech production and modelling
- To study the time domain and frequency domain processing of speech.
- To compute the LPC coefficients for speech modelling
- To study the concepts of speech recognition, speaker verification and identification system.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Define speech parameters such as pitch, formant, silence, etc.
CO 2	Describe Speech Production Mechanism, feature extraction techniques in time and frequency domain
CO 3	Apply LPC coefficients for Pitch, Formant detection and extraction of coefficients in speech and speaker identification and verification
CO 4	Analyze and determine feature extraction parameters in time and frequency domain

UNIT-I

Fundamentals of Digital Speech Processing: Fundamentals of Digital Speech Processing: Process of speech production – Mechanisms of speech production, Acoustic phonetics, the acoustic theory of speech production – Sound propagation, Effects of losses in the vocal tract, Effects of radiation at the lips. Vocal tract transfer functions for vowels, the effect of nasal coupling, Excitation of sounds in the vocal tract, Models based upon the acoustic theory, Digital models for speech signal – Vocal tract, Radiation, Excitation, The complete model

UNIT-II

Time Domain Methods for Speech Processing: Time Domain Methods for Speech Processing: Time dependent processing of speech, Short time energy and Average magnitude, Short time average zero crossing rate, Speech vs silence discrimination using energy and zero crossings, Pitch period estimation using a parallel processing approach, The short time auto correlation function, The short time average magnitude difference equation, Pitch period estimation using autocorrelation function

UNIT-III

Frequency Domain Methods for Speech Processing: Short time Fourier analysis, Definitions and properties, Design of digital filter banks, Fiter bank design using using IIR

filters, Filter bank design using FIR filters, Implementation of the filter bank summation method using the fast Fourier transform, Pitch Detection.

UNIT-IV

Linear predictive Coding (LPC) for Speech: Basic principles of linear predictive analysis, Computation of the gain for the model, Solution of the LPC equations- Cholesky decomposition solution for the covariance method. Durbins recursive solution for the autocorrelation equations, Comparision between the methods of solution of the LPC analysis equations, Frequency domain interpretation of Linear predictive analysis.

UNIT-V

Voice response systems – General considerations in the design of voice response system, A multiple output digital voice response system, Speech synthesis by concatenation of formant coded words, typical applications of computer voice response systems,

Speaker recognition systems – speaker verification systems, speaker identification systems, Speech recognition systems – Isolated digit recognition system, Continuous digit recognition system, LPC distance measures.

Text Books:

3. L.R. Rabiner and S. W. Schafer, Digital Processing of Speech Signals, Pearson Education.
4. Douglas O' Shaughnessy, Speech Communications: Human & Machine, 2nd Ed., Wiley-IEEE Press.

Reference Books:

1. 1. Thomas F. Quatieri, Discrete Time Speech Signal Processing: Principles and Practice, 1st Ed., Pearson Education.
2. Ben Gold & Nelson Morgan, Speech and Audio Signal Processing: Processing and Perception of Speech and Music , 1st Ed., Wiley.

Course Title	LOW POWER VLSI DESIGN				B. Tech. ECE VIII Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
1804805	PE	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		2	-	--	2	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs		

Course Objectives:

- To study the concepts of device behavior and modeling
- To study the concepts of low voltage, low power logic circuits.
- To identify the power dissipation mechanisms in various MOS logic styles
- To familiarize suitable techniques to reduce power dissipation, power optimization and power estimation.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand leakage sources and reduction techniques.
CO 2	Characterize and model power consumption & understand the basic analysis methods.
CO 3	Identify the sources of power dissipation in digital IC systems & understand the impact of power on system performance and reliability.

UNIT-I

Technology & Circuit Design Levels: Sources of power dissipation in digital ICs, degree of freedom, recurring themes in low-power, emerging low power approaches, dynamic dissipation in CMOS, effects of Vdd & Vt on speed, constraints on Vt reduction, transistor sizing & optimal gate oxide thickness, impact of technology scaling, technology innovations.

UNIT-II

Low Power Circuit Techniques: Power consumption in circuits, flip-flops & latches, high capacitance nodes, energy recovery, reversible pipelines, high performance approaches.

UNIT-III

Low Power Clock Distribution: Power dissipation in clock distribution, single driverVersus distributed buffers, buffers & device sizing under process variations, zero skew Vs.Tolerable skew, chip & package co-design of clock network.

UNIT-IV

Logic Synthesis for Low Power estimation techniques: Power minimization techniques, low power arithmetic components- circuit design styles, adders, multipliers.

UNIT-V

Low Power Memory Design: Sources & reduction of power dissipation in memory subsystem, sources of power dissipation in DRAM & SRAM, low power DRAM circuits, low power SRAM circuits.

Text Books

1. P. Rashinkar, Paterson and L. Singh, “Low Power Design Methodologies”, KluwerAcademic, 2002
2. Kaushik Roy, Sharat Prasad, “Low power CMOS VLSI circuit design”, John WileysonsInc.,2000.
3. J.B.Kulo and J.H Lou, “Low voltage CMOS VLSI Circuits”, Wiley, 1999.

Reference Books:

1. A.P.Chandrasekaran and R.W.Broadersen, “Low power digital CMOS design”,Kluwer,1995
2. Gary Yeap, “Practical low power digital VLSI design”, Kluwer, 1998.

Course Title	RF SYSTEM DESIGN				B. Tech. ECE VllI Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
1804806	**PE**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		2	-	--	2	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**		

Course Objectives:

- To learn the importance and issues in the design of RF
- To design RF filter and RF amplifier
- To study about the characteristics of oscillators, mixers, PLL, wireless synthesizers and detector

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand different RF Components such as Passive components, Microstrip Transmission Line.
CO 2	Design RF Amplifiers-High gain, Low gain Minimum Noise Amplifiers.
CO 3	Design of RF Oscillators.
CO 4	Design of RF Converters, Mixers.
CO 5	Design of Matching networks for RF Circuits.

UNIT-I

RF systems: basic architectures, Transmission media and reflections, Maximum power transfer, Passive RLC Networks - Parallel RLC tank, Q, Series RLC networks, matching, Pi match, T match, Passive IC Components, Interconnects and skin Effect, Resistors, capacitors, Inductors

UNIT -II

Review of MOS devices: Distributed Systems- transmission lines, reflection coefficient, The wave equation, examples, Lossy transmission lines, Smith charts – plotting gammaTime Domain Methods for Speech Processing: Time domain parameters of speech, methods for extracting the parameters: Zero crossings, Auto-correlation function, pitch estimation. Analysis and Synthesis of Pole-Zero Speech Models

UNIT- III

High Frequency Amplifier Design: Bandwidth estimation using open-circuit time constants, Bandwidth estimation using short-circuit time constants, Rise time, delay and bandwidth, Zeros to enhance bandwidth, Shunt-series amplifiers, tuned amplifiers, Cascaded amplifiers. Noise- Thermal noise, flicker noise review, Noise figure, LNA Design - Intrinsic MOS noise

Parametes, Power match versus noise match, Large signal performance, design examples & Multiplier based mixers. Mixer Design – Sub sampling mixers.

UNIT -IV

RF Power Amplifiers: Class A, AB, B, C Amplifiers, Class D, E, F amplifiers, RF Power amplifier design examples. Voltage controlled oscillators – Resonators, Negative resistance Oscillators.

UNIT -V

Phase locked Loop: Linearized PLL models, Phase detectors, charge Pumps, Loop filters, PLL design Examples. Frequency synthesis and oscillators - Frequency division, integer-N synthesis, Fractional frequency synthesis. Phase noise - General considerations, Circuit examples. Radio architectures - GSM radio architectures, CDMA, UMTS radio architectures

Text Books:

1. Thomas H. Lee, "The Design of CMOS Radio-Frequency Integrated Circuits", Cambridge University Press, 2004.
2. Behzad Razavi, "RF Microelectronics", Prentice Hall, 1997.

Reference Books:

1. Ellinger, Frank, "Radio Frequency Integrated Circuits and Technologies", Springer, 2008.

2. Cam Nguyen, "Radio-Frequency Integrated-Circuit Engineering",John Wiley & Sons, 2015.

Open Electives

S. No.	Subject code	Subject	Category	L	T	P	IM	EM	Credits
1	18OE401	Overview of Microcontrollers	OE	3	0	0	30	70	3
2	18OE402	Industrial electronics	OE	3	0	0	30	70	3
3	18OE403	Introduction to VLSI	OE	3	0	0	30	70	3
4	18OE404	Principles of Communication	OE	3	0	0	30	70	3
5	18OE405	Electronic Instrumentation and measurements	OE	3	0	0	30	70	3
6	18OE406	Introduction to IOT	OE	3	0	0	30	70	3
7	18OE407	Nano Electronics	OE	3	0	0	30	70	3
8	18OE408	Fundamentals of RADAR Engineering.	OE	3	0	0	30	70	3

Course Title	OVERVIEW OF MICROCONTROLLERS				B. Tech. ECE VI Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
18OE401	**OE**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	-	-	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**			
Course Objectives: To become familiar with 8051, MSP 430, PIC and ARM controllers.								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	**Understand** the types of Microcontrollers.							
CO 2	**Define** various components and list out various features of microcontrollers.							
CO 3	**Describe** the various blocks of 8051, MSP 430, PIC and ARM microcontrollers							

UNIT I

Introduction: Microcontrollers, Vonneumann Vs Harvard, CISC vs RISC, Types of Microcontrollers, Examples of Microcontrollers, Selection of a microcontroller, Microcontroller resources, Applications.

UNIT II

The 8051 Architecture: Introduction, architecture of 8051, pin diagram, internal RAM memory organization, Special Function Registers, external memory interfacing-ROM & RAM, stack, timers and interrupts.

UNIT III

MSP 430 Microcontroller: The Outside View—Pin-Out, The Inside View—Functional Block Diagram, Memory, Central Processing Unit, Memory-Mapped Input and Output, Clock Generator, Exceptions: Interrupts and Resets.

UNIT IV

PIC Microcontrollers: Overview and Features, Architecture Details of PIC 16C6X/7X, I/O Ports, Interrupts, Timer, ADC, Features of 16F8XX series.

UNIT V

ARM Architecture: RISC Design philosophy, ARM Design philosophy, Registers, Program Status Register, Instruction pipeline, Interrupts and vector table.

Text Books:

1. Raj Kamal, "Microcontrollers- Architecture, Programming, Interfacing and System Design"- Second Edition, Pearson, 2012.
2. John H Davis, "MSP 430 Microcontroller Basics", Newnes publishers, 2008.
3. Andrew N.Sloss, Dominic Symes, Chris Wright "ARM System Developer's Guide-Designing and Optimizing system software", Elsevier, 2008.
4. Ajay V Deshmukh, "Microcontrollers: Theory and Applications", TMH, 2005.

Reference Books:

1. Mazidi Muhammad Ali, Mazidi Janice Gillespie &McKinlayRolin D, The 8051Microcontroller and Embedded Systems, 2nd Edition, Pearson Education, 2008.
2. Design with PIC Microcontrollers – John B. Peatman, Pearson Education, 2005.
3. PIC User MANUAL
4. ARM User MANUAL.

Course Title	INDUSTRIAL ELECTRONICS					B. Tech. ECE VI Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
18OE402	OE	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	-	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs			

Course Objectives:

- To understand working of semiconductor devices.
- To gain the knowledge of AC to DC, AC to AC and DC to DC converters.

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

CO 1	**Understand** the basics of PowerElectronics.
CO 2	**Learn** the details of power semiconductor switches (Construction, Characteristics and operation)
CO 3	**Understand** the working of various types of converters.
CO 4	**Learn** how to analyze the converters and design the components of them, under various load types.
CO 5	**Learn** about the control of various converters

UNIT I

Power Semiconductor devices: Constructional features, Operating Principle, Characteristics and specification of power semiconductor diode, Power Bipolar Junction transistor (BJT), Thyristors and Triacs, Gate Turn off Thyristors (GTO), Metal oxide semiconductor field effect transistor (MOSFET), Insulate Gate Bipolar transistor (IGBT), Hard and soft switching of Power semiconductors.

UNIT II

AC to DC Convertors: Single Phase uncontrolled rectifier, Single Phase fully controlled rectifier, single phase half controlled bridge rectifier, Operation and analysis of three phase fully controlled bridge converter, Operation and analysis of three phase half controlled converter, Effect of source Inductance on the performance of AC to DC converters, Power factor improvement, Harmonic reduction, filter.

UNIT III

DC to DC Converters: Types of basic DC-DC converters, Analysis of Buck converter (DC-DC) circuit, Commutation of thyristor based circuits, Introduction to switched mode power supply (SMPS) circuits, Fly-back type switched mode power supply, Forward type switched mode power supply, Design of transformer for switched mode power supply circuits.

UNIT IV

AC to AC Voltage converter: Three phase AC regulators, Phase angle control in Traic based single Phase AC regulators, Introduction to cyclo converters, three phases to single

phase cyclo converters, three phase to three phase cyclo converters, Control circuit for three phase to three phase converter.

UNIT V

Introduction to voltage source Inverters, Analysis of 1-Phase square wave voltage source Inverter, 3-Phase voltage source with square wave output. 3-phase pulse width modulated inverter. Sine PWM and its realization, current source Inverter, Load commutated current source inverter.

Text Books:

1. M. D. Singh and K. B. Khanchandani," Power Electronics".
2. Ned Mohan, Tore M. Undeland, and William P. Robbins,"Power Electronics: Converters, Applications And Design, Media Enhanced (With CD)".
3. John G. Kassakian, Martin F. Schlecht, and George C. Verghese,"Principles Of Power Electronics".

Reference Books:

1. G. K. Mithal, Maneesha Gupta, "Industrial and Power Electronics", Khanna Publishers,1987.
2. George M. Chute, R. D. Chute, "Electronics in Industry", McGraw-Hill School Pub Co, 5th Edition,

Course Title	INTRODUCTION TO VLSI				B. Tech. ECE VII Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
18OE403	OE	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	-	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs		

Course Objectives:

- To introduce the concepts of IC fabrication technologies.
- To understand scaling techniques of CMOS devices and their effects.
- To study the methods to design the basic Gate level designs and draws their corresponding Layouts.
- To provide basic idea of Subsystem design, PLDs and CMOS testing.

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

CO 1	**Understand** the operation of a MOS transistor down to the physical level.
CO 2	**Implement** various logic gates and circuits using MOS transistors.
CO 3	**Analyze** PLD and FPGA families for logic design.
CO 4	**Analyze** various CMOS testing schemes.

UNIT I

Introduction to VLSI: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS technologies- Oxidation, Lithography, Diffusion, Ion implantation, Metallization, Encapsulation.

UNIT II

Basic Electrical Properties: Basic Electrical Properties of MOS Circuits: Ids Vs Vds relationships, MOS transistor threshold Voltage, gm, gds, Figure of merit, Pass transistor, NMOS Inverter, CMOS Inverter analysis and Bi-CMOS Inverters.

UNIT III

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2μ CMOS Design rules for wires, Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

UNIT IV

Subsystem Design: Basic circuit concepts: Sheet resistance, area capacitance and delay calculation,Subsystem Design, Shifters, Adders, ALUs, Multipliers, High Density Memory Elements.

UNIT V

Semiconductor IC Design and CMOS testing: PLAs, FPGAs, CPLDs, Standard Cells, ach. CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Layout Design for improved Testability.

Text Books:

1. Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, Essentials of VLSI circuits and systems, PHI, 2005 Edition.
2. Weste and Eshraghian, Principles of CMOS VLSI Design, Pearson Education, 1999.

Reference Books:

1. John .P. Uyemura, Introduction to VLSI Circuits and Systems, JohnWiley, 2003.
2. Wayne Wolf, Pearson Education, Modern VLSI Design, 3rd Edition, 1997.
3. S.M. SZE, VLSI Technology, 2nd Edition, TMH, 2003.

Course Title	PRINCIPLES OF COMMUNICATION				B. Tech. ECE VII Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
18OE404	OE	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	-	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs		

Course Objectives:

- To understand the Basics of Telecommunication Engineering.
- To introduce the Elements of Telecommunication systems.
- To provide Knowledge about various communication systems

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

CO 1	**Understand** the fundamental concepts of Telecommunication Engineering.
CO 2	**Understand** use of different modulation techniques used in Analog and Digital Communication
CO 3	**Understand** different Telecommunication systems like Satellite communication, Optical Fiber communication, Wireless communication, Mobile communication etc. and its applications.
CO 4	**Compare** and contrast advantages and limitations of various Telecommunication systems.

UNIT I

Basics of Telecommunication Engineering: Definition of Telecommunication, Examples of telecommunications and evolution, various types of telecommunication systems such as telephone network, Radio broadcasting system, Computer networks, Internet.

UNIT I

Basic Elements of Telecommunication systems General Block schematic of communication system, Communication channels, Analog versus digital communication systems, Need of modulation, Types of analog modulation such as AM and FM, Types of digital modulation such as Pulse code modulation, delta modulation, Continuous wave modulation such as ASK, FSK, PSK.

UNIT III

Introduction to Optical Fiber Communication: Use of optical fiber in communication, Principle and working of OFC system, Block diagram, Types of optical fibers, various elements required in designing OFC system, Applications such as long distance transmission links, Computer communication networks.

UNIT IV

Introduction to Satellite Communication: Use of satellite in telecommunications, Launching of Satellite from earth station, Types of satellite

orbits, Classification of satellite according to applications, Satellite communication link blockdiagram.

UNIT V

Some concepts in Wireless communications: Wireless Standards: Overview of 2G and 3G, 4G cellular standards, Multiple access schemes-FDMA, TDMA, CDMA and OFDM, Modulation schemes- BPSK, QPSK. GSM, Wi-Fi & Wi-Max, Bluetooth, Recent Trends/Developments.

Text Books:

1) Simon Haykin," Communication Systems", 4th Edition, John WileyPublication.

2) George Kenndey, " Electronics Communication systems", 4thEdition

3) John G. Proakis," Digital Communication", Tata McGrawHill

4) T . Prat, C.W. Bostian," Satellite Communication", WiellyPublication

Reference Books:

1. S. Rappaport," Wireless communication – Principles and Practice", PearsonEducation.

2. John M. Senior,"Optical Fiber Communication Principles and Practice",, PearsonEducation.

Course Title	ELECTRONIC INSTRUMENTATION AND MEASUREMENTS				B. Tech. ECE VII Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
18OE405	**OE**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	-	-	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**		

Course Objectives:

- To study Performance characteristics of Instruments.
- To understand the principles in Analog and Digital Instruments.
- To understand the working of CROs, Transducers and bridges.

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

CO 1	**Understand** the performance characteristics of an instrument.
CO 2	**Understand** the principle of analog, digital voltmeters and wave analyzers
CO 3	**Explain** different types of oscilloscopes
CO 4	**Use** AC and DC bridges for relevant parameter measurement.
CO 5	**Apply** the complete knowledge of various electronic transducers to measure the physical Quantities in the field of science and technology

UNIT I

Performance characteristics of Instruments : Static characteristics, Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Errors in Measurement, Dynamic Characteristics- speed of response, Fidelity, Lag and Dynamic error.

Analog Instruments: Transistor Voltmeter, Micro Voltmeter (Chopper type) – DC Differential voltmeter – AC voltmeters – Multi meter -wave analyzers (AF & RF) – Harmonic distortion analyzer- Spectrum analyzer.

UNIT II

Digital Instruments: Digital Voltmeters (Ramp, Dual slope, stair case, successive approximation types) Digital multi meter, Universal counter, Digital tachometer, Digital Phase meter.

UNIT III

Cathode Ray Oscilloscopes: Motion of electron in electronic field and in magnetic field- Block diagram of CRO, CRT, Electrostatic deflection sensitivity – Vertical and Horizontal deflection systems – Principle of operation of dual beam, dual trace, sampling and storage CRO's- Measurements with CRO (Voltage, Current, time, frequency, Phase angle, lissajous figures).

UNIT IV

Bridges: Wheat stone bridge, Kelvin Bridge, Measurement of inductance- Maxwell's bridge, Anderson Bridge. Measurement of capacitance-Schearing Bridge, Wien Bridge

Errors and precautions in using bridges- Q meter and measurement methods.

UNIT V

Transducers: Active & passive transducers**,** Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors. Measurement of physical parameters force, pressure, velocity, humidity, moisture, speed, proximity and displacement.Data acquisition systems.

Text Books:

1. H.S. Kalsi," Electronic instrumentation", second edition, Tata McGraw Hill,2004.
2. A.D. Helfrick and W.D. Cooper,"Modern Electronic Instrumentation andMeasurement Techniques",PHI, 5th Edition,2002.

References:

1. David A. Bell, "Electronic Instrumentation & Measurements", PHI (OUP), 2nd Edition, 2003.
2. Robert A.Witte, "Electronic Test Instruments, Analog and Digital Measurements", Pearson Education, 2nd Ed.,2004.
3. K. Lal Kishore, "Electronic Measurements & Instrumentations", by Pearson Education – 2005.

Course Title	INTRODUCTION TO IOT					B. Tech. ECE VII Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
18OE406	OE	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	-	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs			

Course Objectives:

- To understand the basics of IOT.
- To study the Programming Using Arduino.
- To provide the knowledge about sensors and transducers.

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

CO 1	**Understand** about IoT, its Architecture and its Applications, basic electronics used in IoT & its role.
CO 2	**Develop** applications with C using Arduino IDE.
CO 3	**Analyze** about sensors and actuators.
CO 4	**Design** IoT in real time applications using today's internet & wireless technologies.

UNIT I

INTRODUCTION: Introduction to IoT: Evolution of IoT – Definition & Characteristics of IoT - Architecture of IoT – Technologies for IoT – Developing IoT Applications Applications of IoT – Industrial IoT – Security in IoT.

UNIT II

BASIC ELECTRONICS FOR IoT: Basic Electronics for IoT: Electric Charge, Resistance, Current and Voltage – Binary Calculations – Logic Chips – Microcontrollers – Multipurpose Computers – Electronic Signals – A/D and D/A Conversion – Pulse Width Modulation.

UNIT III

PROGRAMMING USING ARDUINO: Programming Fundamentals with C using Arduino IDE: Installing and Setting up the Arduino IDE – Basic Syntax – Data Types/ Variables/ Constant – Operators – Conditional Statements and Loops – Using Arduino C Library Functions for Serial, delay and other invoking Functions – Strings and Mathematics Library Functions.

UNIT IV

SENSORS AND ACTUATORS: Analog and Digital Sensors – Interfacing temperature sensor, ultrasound sensor and infrared (IR) sensor with Arduino – Interfacing LED and Buzzer with Arduino.

UNIT V

SENSOR DATA IN INTERNET: Sending Sensor Data Over Internet: Introduction to ESP8266 NODEMCU WiFi Module – Programming NODEMCU using Arduino IDE –

Using WiFi and NODEMCU to transmit data from temperature sensor to Open Source IoT cloud platform (ThingSpeak).

Text Books

1.Arshdeep Bahga, Vijay Madisetti, “Internet of Things: A Hands-On Approach”, 2014. ISBN: 978-0996025515.

2. Boris Adryan, Dominik Obermaier, Paul Fremantle, “The Technical Foundations of IoT”, Artech Houser Publishers, 2017.

Reference Books

1. Michael Margolis, “Arduino Cookbook”, O‟Reilly, 2011.

2. Marco Schwartz, “Internet of Things with ESP8266”, Packt Publishing, 2016.

3. Dhivya Bala, “ESP8266: Step by Step Tutorial for ESP8266 IoT, Arduino NODEMCU Dev. Kit”, 2018.

Course Title	NANO ELECTRONICS				B. Tech. ECE VIII Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
18OE407	OE	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	-	3	30	70	100
Mid Exam Duration: 2Hrs					End Exam Duration: 3Hrs		

Course Objectives:

- To understand the principles of tunneling, lithography and scaling of physical systems.
- To provide the knowledge about MEMS and NEMS

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

CO 1	**Understand** the divers electronic and device fabrication.
CO 2	**Demonstrate** the applications of FET and MOSFET
CO 3	**Describe** lithography.
CO 4	**Analyze** MEMS and NEMS

UNIT I

Tunnel junction and applications of tunneling, Tunneling Through a Potential Barrier, Metal—Insulator, Metal-Semiconductor, and Metal-Insulator-Metal Junctions, Coulomb Blockade, Tunnel Junctions, Tunnel Junction Excited by a Current Source. Spintronics and Foundations of nano-photonics.

UNIT II

Field Emission, Gate—Oxide Tunneling and Hot Electron Effects in nano MOSFETs, Theory of Scanning Tunneling Microscope, Double Barrier Tunneling and the Resonant Tunneling Diode.

UNIT III

Introduction to lithography- Contact, proximity printing and Projection Printing, Resolution Enhancement techniques, overlay-accuracies, Mask-Error enhancement factor (MEEF), Positive and negative photoresists, Electron Lithography, Projection Printing, Direct writing, Electron resists. Lithography based on Surface Instabilities: Wetting, De-wetting, Adhesion, Limitations, Resolution and Achievable / line widths etc. Lift off process, Bulk Micro machining.

UNIT IV

Introduction to MEMS and NEMS, working principles, as micro sensors (acoustic wave sensor, biomedical and biosensor, chemical sensor, optical sensor, capacitive sensor, pressure sensor and thermal sensor), micro actuation (thermal actuation, piezoelectric actuation and electrostatic actuation–micro gripers, motors, valves, pumps, accelerometers, fluidics and capillary electrophoresis, active and passive micro fluidic devices, Piezoresistivity, Piezoelectricity and thermoelectricity, MEMS/NEMS design, processing, Oxidation, Sputter deposition, Evaporation, Chemical vapor deposition etc.

UNIT V

Introduction – Scaling of physical systems – Geometric scaling & Electrical system scaling. The Single-Electron Transistor: The Single- Electron Transistor Single-Electron Transistor

Logic, Other SET and FET Structures, Carbon Nanotube Transistors (FETs and SETs), Semiconductor Nanowire FETs and SETs,Coulomb Blockade in a Nanocapacitor, Molecular SETs and Molecular Electronics.

Text Book:

1. Stephen D. Sentaria, Microsystem Design, Kluwer Academic Press
2. Marc Madou, Fundamentals of microfabrication & Nanofabrication.
3. T. Fukada & W.Mens, Micro Mechanical system Principle & Technology, Elsevier, 1998.
4. Julian W.Gardnes, Vijay K. Varda, Micro sensors MEMS & Smart Devices, 2001.

Reference Books:

1. WR Fahrner, "Nano Terchnology and Nano Electronics – Materials, devices and measurement
Techniques",Springer.
2. T.Pradeep, "Nano: The Essentials – Understanding Nano Scinece and Nanotechnology", Tata Mc.Graw Hill.
3. M. Ziese and M.J. Thornton, "Spin Electronics"
4. Karl Goser, Peter Glosekotter, Jan Dienstuhl, "Nanoelectronics and Nanosystems – From Transistor to Molecular and Quantum Devices".

Course Title	FUNDAMENTALS OF RADAR ENGINEERING				B. Tech. ECE VIII Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
		L	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
18OE408	**OE**	3	-	-	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**			

Course Objectives:

- To gain the knowledge about radar subsystems, their performance and key functions.
- To provide the in depth knowledge and issues related various tracking radars.

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

CO 1	**Understand** the essential principles of operation of radar systems.
CO 2	**Describe** the various Radar components
CO 3	**Analyze** different Radar systems
CO 4	**Analyze** the different Tracking methods

UNIT I

Fundamentals: Nature of Radar, Maximum Unambiguous Range, Radar Waveforms, Radar block diagram and operation, Radar frequencies, Applications of Radar, simple form of radar range equation. Integration of Radar pulses, Radar cross-Section of targets, PRF.

UNIT II

Radar components: RF amplifier, TWT, CFA, Modulators, Mixers-Conversion loss, Noise figure, Types of Mixers, Duplexers-Branch type, Balanced and Solid state Duplexers, Displays-CRT displays, A, B, C, E-scopes, PPI, RHI.

UNIT III

Radar systems: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar, FMCW radar, multiple frequency C.W radar.

UNIT-IV

MTI and Pulse Doppler radar: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance. Non-coherent MTI, MTI versus Pulse Doppler radar.

UNIT V

Tracking Radar: Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one- and two- coordinates), Phase

Comparison Monopulse. Target Reflection Characteristics and Angular Accuracy. Tracking in Range, Acquisition and Scanning Patterns. Comparison of Trackers.

Text Books:

1. Merrill I.Skolnik, "Introduction to Radar Systems", 2nd edition-TMH 1980.

2. N.S. Nagaraja, "Elements of electronic navigation, 2nd edition-TMH 1996.