SREEPATHY INSTITUTE OF MANAGEMENT AND TECHNOLOGY

COURSE HANDBOOK

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER III

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

VISION

To transform students into motivated, competent and socially committed engineering professionals in the core domains of Electronics & Communication through quality education and research orientation with emphasis on holistic approach.

MISSION

- To nurture young individuals into knowledgeable, skillful and ethical professionals in their pursuit of Electronics & Communication Engineering.
- To empower budding engineers with the state of art technology, team work and leadership qualities to stride forth as resourceful citizens.
- To develop industry interaction for innovation and product development to solve real time problems.

B-TECH PROGRAMME

PROGRAMME EDUCATIONAL OBJECTIVES (PEO):

After successful completion of the program, the graduates will be

PEO1: Able to exhibit their innovative ideas and management skills to analyze, design, develop and implement electronic systems or equipment

PEO2: Able to apply knowledge in mathematics, science and computing to the field of Electronics & Communication Engineering either in industry, academics or research career with creativity and commitment

PEO3: Receptive to new technologies and attain professional competence through lifelong learning.

PEO4: Able to embody a commitment to professional ethics, diversity and social awareness in their professional career.

PROGRAM OUTCOMES (PO):

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

2. 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.

3. 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.

4. 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.

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

6. 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.

7. 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.

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

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

10. 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.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering 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.

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

PROGRAM SPECIFIC OUTCOMES (PSOS):

Electronics and Communication Engineering graduates will be able to:

PSO1 – have the capacity to apply the concepts of Electronics, Communications, Signal processing, VLSI, Control systems, Cryptography etc., in the analysis, design**,** development and implementation of integrated electronic systems as well as to interpret and synthesize the experimental data leading to valid conclusions

PSO2 – have competence in using latest hardware and software tools, along with analytical and managerial skills for the design and analysis of complex electronic systems in furtherance to research activities.

PSO3 – be an acquaintance of social and environmental awareness with ethical responsibilities to have a successful career in real-world applications by keeping in trend with technological changes.

MA201 LINEAR ALGEBRA AND COMPLEX ANALYSIS

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree :**B-Tech**
Course**: Linear Algebra and Complex Analysis**	Course code**: MA201**
L-T-P**:3-0-1**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Complex differentiation Text 1[13.3,13.4] Limit, continuity and derivative of complex functions Analytic Functions Cauchy–Riemann Equation(Proof of sufficient condition of analyticity & C R Equations in polar form not required)- Laplace's Equation Harmonic functions, Harmonic Conjugate	9	15

II	Conformal mapping: Text 1[17.1-17.4] Geometry of Analytic functions Conformal Mapping, Mapping $w = z^2$ conformality of $w = e^z$. The mapping z w z 1 Properties of z w 1 Circles and straight lines, extended complex plane, fixed points Special linear fractional Transformations, Cross Ratio, Cross Ratio property- Mapping of disks and half planes Conformal mapping by w sinz & w cos z (Assignment: Application of analytic functions in Engineering)	10	15
III	Complex Integration. Text 1[14.1-14.4] [15.4&16.1] Definition Complex Line Integrals, First Evaluation Method, Second Evaluation Method Cauchy's Integral Theorem(without proof), Independence of path(without proof), Cauchy's Integral Theorem for Multiply Connected Domains (without proof) Cauchy's Integral Formula- Derivatives of Analytic Functions(without proof)Application of derivative of Analytical Functions Taylor and Maclaurin series(without proof), Power series as Taylor series, Practical methods(without proof) Laurent's series (without proof)	10	15
IV	Residue Integration Text 1 [16.2-16.4] Singularities, Zeros, Poles, Essential singularity, Zeros of analytic functions Residue Integration Method, Formulas for Residues, Several singularities inside the contour Residue Theorem. Evaluation of Real Integrals (i) Integrals of rational functions of sinT and cosT (ii)Integrals of the type ³ f f f (x)dx (Type I, Integrals from 0 to f) (Assignment : Application of Complex integration in Engineering)	9	15
V	Linear system of Equations Text 1(7.3-7.5) Linear systems of Equations, Coefficient Matrix, Augmented Matrix Gauss Elimination and back substitution, Elementary row operations, Row equivalent systems, Gauss elimination-Three possible cases, Row Echelon form and Information from it. Linear independence-rank of a matrix Vector Space-Dimension-basis-vector spaceR3 Solution of linear systems, Fundamental theorem of nonhomogeneous linear systems(Without proof)-Homogeneous linear systems (Theory only	9	20

VI	Matrix Eigen value Problem Text 1.(8.1,8.3 &8.4) Determination of Eigen values and Eigen vectors- Eigen space Symmetric, Skew Symmetric and Orthogonal matrices – simple properties (without proof) Basis of Eigen vectors- Similar matrices Diagonalization of a matrixQuadratic forms- Principal axis theorem(without proof) (Assignment-Some applications of Eigen values(8.2))	9	20

TEXT BOOKS:

1	Erwin Kreyszig: Advanced Engineering Mathematics, 10th ed. Wiley

REFERENCES:

1	Dennis g Zill&Patric D Shanahan-A first Course in Complex Analysis with Applications- Jones&Bartlet Publishers
2	B. S. Grewal. Higher Engineering Mathematics, Khanna Publishers, New Delhi
3	Lipschutz, Linear Algebra,3e (Schaums Series)McGraw Hill Education India 2005
4	Complex variables introduction and applications-second edition-Mark.J.Owitz-Cambridge Publication

PREREQUISITE: Nil

COURSE OBJECTIVES:

1	To equip the students with methods of solving a general system of linear equations
2	To familiarize them with the concept of Eigen values and diagonalization of a matrix which have many applications in Engineering
3	To understand the basic theory of functions of a complex variable and conformal Transformations

COURSE OUTCOMES:

After successful completion of the course, the students should be able to:

CO's	DESCRIPTION
1	Solve any given system of linear equations

2	Find the Eigen values of a matrix and how to diagonalise a matrix
3	Identify analytic functions and harmonic functions
4	Evaluate real definite Integrals as application of Cauchy integral theorem
5	Evaluate real definite Integrals as application of Residue Theorem
6	Identify conformal mappings(vi) find regions that are mapped under certain Transformations

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2	3	3										
CO3	3	3										
CO4	3	3										
CO5	3	3										
CO6	3	3										

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems
	PO2	**3**	Identify, formulate and analyze engineering problems using first principle of mathematics and engineering sciences
CO2	**PO**	**3**	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering

	1		problems
	PO 2	**3**	Identify, formulate and analyze engineering problems using first principle of mathematics and engineering sciences
CO 3	**PO 1**	**3**	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems
	PO 2	**3**	Identify, formulate and analyze engineering problems using first principle of mathematics and engineering sciences
CO 4	**PO 1**	**3**	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems
	PO 1	**3**	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems
CO5	**PO 2**	**3**	Identify, formulate and analyze engineering problems using first principle of mathematics and engineering sciences
CO 6	**PO 1**	**3**	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems
	PO 2	**3**	Identify, formulate and analyze engineering problems using first principle of mathematics and engineering sciences

EC 201 Network Theory

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Network Theory**	Course code**: EC 201**
L-T-P**:3-1-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction to circuit variables and circuit elements, Review of Kirchhoff's Laws, Independent and dependent Sources, Source transformations. Network topology, Network graphs, Trees, Incidence matrix, Tie-set matrix and Cut-set matrix. Solution methods applied to dc and phasor circuits: Mesh and node analysis of network containing independent and dependent sources.	8	15
II	Network theorems applied to dc and phasor circuits: Thevenin's theorem, Norton's theorem, Superposition theorem, Reciprocity theorem, Millman's theorem, Maximum power transfer theorem. Laplace transform, properties Laplace Transforms and inverse Laplace transform of common functions, Important theorems: Time shifting theorem, Frequency shifting theorem, Time differentiation theorem, Time integration theorem, s domain differentiation theorem, s domain integration theorem, Initial value theorem, Final value theorem	10	15
III	Partial Fraction expansions for inverse Laplace transforms,Solution of differential equations using Laplace transforms Transformation of basic signals and circuits into s-domain Transient analysis of RL, RC, and RLC networks with impulse, step, pulse, exponential and sinusoidal inputs Analysis of networks with transformed impedance and dependent sources.	11	15
IV	Network functions for the single port and two ports, properties of driving point and transfer functions, Poles and Zeros of network functions, Significance of	7	15

	Poles and Zeros. Time domain response from pole zero plot, Impulse Response Network functions in the sinusoidal steady state, Magnitude and Phase response		
V	Parameters of two port network: impedance, admittance, transmission and hybrid parameters, Interrelationship among parameter sets. Series and parallel connections of two port networks Reciprocal and Symmetrical two port network Characteristic impedance, Image impedance and propagation constant (derivation not required).	11	20
VI	Resonance: Series resonance, bandwidth, Q factor and Selectivity, Parallel resonance Coupled circuits: single tuned and double tuned circuits, dot convention, coefficient of coupling, Analysis of coupled circuits.	7	20

TEXT BOOKS:

1	Ravish R., Network Analysis and Synthesis, 2/e, McGraw-Hill,2015.
2	Valkenburg V., Network Analysis, 3/e, PHI,2011.

REFERENCES:

1	Sudhakar A,S. P. Shyammohan, Circuits and Networks- Analysis and Synthesis, 5/e, McGraw-Hill, 2015.
2	Choudhary R., Networks and Systems, 2/e, New Age International,2013.
3	Franklin F. Kuo, Network Analysis and Synthesis, 2/e, Wiley India,2012.
4	Pandey S. K., Fundamentals of Network Analysis and Synthesis, 1/e, S. Chand, 2012.

5	Edminister, Electric Circuits – Schaum's Outline Series, McGraw-Hill,2009.

PREREQUISITES:

NIL

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To make the students capable of analyzing any linear time invariant electrical network.
2	To study time domain, phasor and Laplace transform methods of linear circuit analysis.
3	To study the transient response of networks subject to test signals.
4	To develop understanding of the concept of resonance, coupled circuits and two port networks

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Apply the knowledge of basic circuital law and **simplify/analyze** the network using Kirchhoff's law and Network simplification theorems for both DC and phasor linear time invariant circuits.
2	**Apply** the Laplace transform to linear circuit analysis.
3	To **formulate, solve** the differential equations for RL, RC, and RLC circuits and carry out the transient **analysis** using Laplace transform
4	**Infer and evaluate** network functions time domain responses using pole, zero concept.
5	**Analyze** simple two-port circuit
6	**Analyze** the series and parallel resonant circuit and electromagnetically coupled circuits.

CO-PO-PSO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2		PSO 1	PSO 2	PSO 3

CO1	3	**3**	**2**	**1**								**2**		**3**		
CO2	**3**	**3**	**2**									**1**		**3**		
CO3	**3**	**2**	**1**											**1**		
CO4	**2**	**2**												**1**		
CO5	**3**	**1**												**1**		
CO6	**2**	**1**												**1**		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Design and analysis of linear time invariant circuits requires and develops Engineering knowledge using mathematics.
	PO2	3	Design and analysis of linear time invariant circuits included problem solving
	PO3	2	Design and analysis of linear time invariant circuits requires design and development of solutions under different conditions.
	PO4	1	Theorems are fundamentals to investigate complex problems and for finding solutions
	PO12	2	The basic laws and theorems, help in analysis of various types of electrical and electronic circuits is fundamental tool for development of solutions
CO2	PO1	3	Laplace transform is a basic tool in mathematics for transformation
	PO2	3	Complex problems can be easily solved using Laplace transform
	PO3	2	Complex problems solutions are found using LT
	PO12	1	The fundamentals of Laplace Transforms help in analysis of various types of electrical and electronic circuits
CO3	PO1	3	Apply the mathematical knowledge for performing the transient analysis of RL, RC, and RLC circuits

	PO2	**2**	Analysis of RL, RC, and RLC circuits using Laplace transform
	PO3	**1**	Design solutions for RL, RC, and RLC circuits for different input and carry out the transient analysis using Laplace transform
CO4	**PO1**	**2**	Apply the knowledge of pole, zero concepts for finding the solution of time domain responses.
	PO2	**2**	Perform analysis of electrical and electronic circuits using pole, zero concept
CO5	**PO1**	**3**	Apply the knowledge of basic circuital law to analyse two port networks.
	PO2	**1**	Identify and Analyse two port networks
CO6	**PO1**	**2**	Understand the fundamentals of series and parallel resonant circuit using basic circuit theorems
	PO2	**1**	Analysis of electromagnetically coupled circuits.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Understand and apply the basics into analysis of circuits and complex systems
CO2	**PSO1**	**3**	Apply Laplace Transform as transformation tool for design and development of complex integrated systems
CO3	**PSO1**	**1**	Transient response of systems developed can be identified
CO4	**PSO1**	**1**	Concepts of poles and zeros are used to analyse the behavior of systems
CO5	**PSO1**	**1**	Two port network analysis of different system can be done

CO6	**PSO1**	**1**	Understand the concepts of resonance and apply it to develop complex systems

EC 203 SOLID STATE DEVICES

COURSE INFORMATION SHEET:

Program: Electronics And Communication engineering	Degree : B-Tech
Course : SOLID STATE DEVICES	Course code: EC 203
L-T-P:3-1-0	Credit:3

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Elemental and compound semiconductors, Fermi-Dirac distribution, Equilibrium and steady state conditions, Equilibrium concentration of electrons and holes, Temperature dependence of carrier concentration Carrier transport in semiconductors, drift, conductivity and mobility, variation of mobility with temperature and doping, High Field Effects, Hall effect	9	15
II	Excess carriers in semiconductors: Generation and recombination mechanisms of excess carriers, quasi Fermi levels, diffusion, Einstein relations, Continuity equations, Diffusion length, Gradient of quasi Fermi level	9	15
III	PN junctions : Contact potential, Electrical Field, Potential and Charge density at the junction, Energy band diagram, Minority carrier distribution, Ideal diode equation, Electron and hole component of current in forward biased p-n junction, piecewise linear model of a diode effect of temperature on V-I characteristics	9	15

IV	Diode capacitances, switching transients, Electrical Breakdown in PN junctions, Zener and avalanche break down (abrupt PN junctions only), Tunnel Diode basics only, Metal Semiconductor contacts, Ohmic and Rectifying Contacts, current voltage characteristics	9	15
V	Bipolar junction transistor , current components, Minority carrier distributions, basic parameters, Evaluation of terminal currents (based on physical dimensions),Transistor action, Base width modulation fading and diversity techniques, Introduction to MIMO system.	9	20
VI	Metal Insulator semiconductor devices: The ideal MOS capacitor, band diagrams at equilibrium, accumulation, depletion and inversion, surface potential, CV characteristics, effects of real surfaces, work function difference, interface charge, threshold voltageMOSFET: Output characteristics, transfer characteristics, sub threshold characteristics, MOSFET scaling (basic concepts)	9	20

TEXT BOOKS:

1	Ben G. Streetman and Sanjay Kumar Banerjee, Solid State Electronic Devices, Pearson, 6/e, 2010
2	Achuthan, K N Bhat, Fundamentals of Semiconductor Devices, 1e, McGraw Hill,2015

REFERENCES:

1	Tyagi M.S., Introduction to Semiconductor Materials and Devices, Wiley India, 5/e, 2008
2	Sze S.M., Physics of Semiconductor Devices, John Wiley, 3/e, 2005
3	Neamen, Semiconductor Physics and Devices, McGraw Hill, 4/e, 2012
4	Pierret, Semiconductor Devices Fundamentals, Pearson, 2006
5	Rita John, Solid State Devices, McGraw-Hill, 2014
6	Bhattacharya .Sharma, Solid State Electronic Devices, Oxford University Press, 2012
7	Dasgupta and Dasgupta , Semiconductor Devices : Modelling and Technology (PHI)

PREREQUISITES:

Nil

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To provide an insight into the basic semiconductor concept
2	To provide a sound understanding of current semiconductor devices and technology to appreciate its applications to electronics circuits and systems

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Understand the various concepts in semiconductor physics including Hall Effect.
2	Summarize various generation and recombination processes in semiconductors.
3	Analyze the structure, creation of electric field and working of PN junction semiconductor diodes and illustrate the minority carrier distribution across PN junction semiconductor diodes.
4	Summarize various electrical break down mechanisms.
5	Summarize various current components in BJTs and analyze energy band diagram of PN junction diodes, BJTs, metal semiconductor junctions,
6	Analyze the structure of MOS capacitors and MOSFETS

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	**3**	**2**												**3**	**2**	
CO2	**3**	**2**												**3**	**2**	
CO3	**3**	**2**			**2**									**3**	**2**	
CO4	**3**	**2**												**3**	**2**	
CO5	**3**	**2**			**2**									**3**	**2**	

CO6	**3**	**2**			**2**									**3**	**2**	**3**

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Apply the knowledge of semiconductor physics including Hall Effect to real world applications.
	PO2	**2**	Analyze the equilibrium and state conditions of semiconductor Physics.
CO2	**PO1**	**3**	Apply the knowledge of various generation and recombination processes in semiconductors to real world applications
	PO2	**2**	Analyze the various generation and recombination processes in semiconductors
CO3	**PO1**	**3**	Apply the knowledge on the working of PN junction semiconductor diodes to real world applications to real world applications.
	PO2	**2**	Analyze the process of minority carrier distribution across PN junction semiconductor diodes.
	PO5	**2**	Apply modern tools of simulation to study the characteristics of PN junction semiconductor diodes.
CO4	**PO1**	**3**	Apply the effect of various electrical breaks down mechanisms in PN junctions to real world applications.
	PO2	**3**	Analyze the various electrical break down mechanisms.
CO5	**PO1**	**3**	Apply the knowledge of BJTs to real world applications
	PO2	**2**	Analyze the various modes of operation in PN junction diodes, BJTs.
	PO5	**3**	Use modern simulation tools to simulate the characteristics of BJT.
CO6	**PO1**	**3**	Apply the knowledge of, MOS capacitors and MOSFETS to real world applications.
	PO2	**1**	Analyze the various modes of operation in, MOS capacitors and MOSFETS
	PO5	**2**	Use modern simulation tools to simulate the characteristics of MOSFET.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Graduates will be able to provide novel approaches to semiconductor physics including Hall Effect.
	PS02	**2**	Graduates will able to apply the learnt knowledge to identify various properties of semiconductor physics including Hall Effect.
CO2	**PSO1**	**3**	Graduates will able to apply the learnt knowledge to identify various properties of semiconductor physics including Hall Effect.
	PS02	**2**	Graduates will be aware about the various contributions that can be made to real world using various generation and recombination processes in semiconductors
CO3	**PSO1**	**3**	Graduates will Identify various types of PN junction semiconductor diodes
	PS02	**2**	Graduates will able to apply the learnt knowledge about PN junction semiconductor diodes to real world applications
CO4	**PSO1**	**3**	Graduates will be able to provide novel approaches to different types of electrical break down mechanisms in PN junctions to real world applications
	PSO2	**2**	Graduates will able to apply the learnt knowledge about the electrical break down mechanisms in PN junctions to real world applications
CO5	**PSO1**	**3**	Graduates will be able to provide novel approaches about BJTs, metal semiconductor junctions,
	PS02	**2**	Graduates will able to apply the learnt knowledge about the BJTs, metal semiconductor junctions to real world applications
CO6	**PSO1**	**3**	Graduates will be able to provide novel approaches about, MOS capacitors and MOSFETS
	PS02	**2**	Graduates will able to apply the learnt knowledge about the MOS capacitors and MOSFETS to real world applications

EC205 ELECTRONIC CIRCUITS

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Electronic Circuits**	Course code**: EC 205**
L-T-P**:3-1-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	RC Circuits: Response of high pass and low pass RC circuits to sine, step, pulse and square wave inputs, Differentiator, Integrator BJT biasing circuits: Types, Q point, Bias stability, Stability factors, RC coupled amplifier and effect of various components, Concept of DC and AC load lines, Fixing of operating point ,Classification of amplifiers	10	15
II	Small signal analysis of CE, CB and CC configurations using small signal hybrid π model (gain, input and output impedance). Small signal analysis of BJT amplifier circuits, Cascade amplifier	7	15
III	High frequency equivalent circuits of BJT, Short circuit current gain, cutoff frequency, Miller effect, Analysis of high frequency response of CE, CB and CC amplifiers Wide band amplifier: Broad banding techniques, low frequency and high frequency compensation, Cascode amplifier.	8	15
IV	Feedback amplifiers: Effect of positive and negative feedback on gain, frequency response and distortion, Feedback topologies and its effect on input and output impedance, Feedback amplifier circuits in each feedback topologies (no analysis required) Oscillators & Tuned Amplifiers: Classification of oscillators, Barkhausen criterion, Analysis of RC phase shift and Wien bridge oscillators, Working of Hartley, Colpitts and Crystal oscillators; Tuned amplifiers, synchronous and stagger tuning	9	15
V	Power amplifiers: Classification, Transformer coupled class A power amplifier, push pull class B and class AB power amplifiers, efficiency and distortion, Transformer-	11	20

	less class B and Class AB power amplifiers, Class C power amplifier (no analysis required) Switching Circuits: Simple sweep circuit, Bootstrap sweep circuit, Astable, Bistable, and Monostable multivibrators, Schmitt Trigger		
VI	Transistor based voltage regulator: Design and analysis of shunt and series voltage regulator, load and line regulation, Short circuit protection MOSFET amplifiers: Biasing of MOSFET amplifier, DC analysis of single stage MOSFET amplifier, small signal equivalent circuit. Small signal voltage and current gain, input and output impedances of CS configuration, MOSFET Cascade amplifier	9	20

TEXT BOOKS:

1	Sedra A. S. and K. C. Smith, Microelectronic Circuits, 6/e, Oxford University Press, 2013 · Millman J. and C. Halkias, Integrated Electronics, 2/e, McGraw-Hill, 2010

REFERENCES:

1	Neamen D., Electronic Circuits - Analysis and Design, 3/e, TMH, 2007.
2	Rashid M. H., Microelectronic Circuits - Analysis and Design, Cengage Learning, 2/e, 2011.
3	Spencer R. R. and M. S. Ghausi, Introduction to Electronic Circuit Design, Pearson, 2003.
4	Razavi B., Fundamentals of Microelectronics, Wiley, 2015

PREREQUISITES:

Nil

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objective:

1	To understand concept of RC circuits

2	To provide insight into the working , analysis and design of basic analog circuits using BJT
3	To understand different types of power amplifiers, feedback amplifiers& Oscillators
4	To understand concepts of switching circuits
5	To provide insight into the working , analysis and design of different types of voltage regulator
6	To provide insight into the working , analysis and design of basic analog circuits using MOSFET

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Student has knowledge about the working of RC circuits & working of amplifier using BJT
2	Student has knowledge about BJT with different configurations and its small signal analysis
3	Student has knowledge about BJT with high frequency analysis
4	Student has knowledge about BJT with high frequency analysis
5	Student has knowledge about power amplifiers& switching circuits
6	Student has knowledge about Design & analysis of voltage regulator. Student has knowledge about working of amplifier using MOSFET &its small signal analysis

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	3	3	2										3		

CO2	**3**	**3**	**3**	**2**									**3**		
CO3	**3**	**3**	**3**	**2**									**3**		
CO4	**3**	**3**	**3**	**2**									**3**		
CO5	**3**	**3**	**3**	**2**									**3**		
CO6	**3**	**3**	**3**	**2**									**3**		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Working of RC circuits/ BJT derivation require mathematical background
	PO2	**3**	Working of RC circuits/ BJT derivation require mathematical background
	PO3	**3**	Design of Integrator & Differentiator
	PO4	**3**	Design/problems of RC Circuit
CO2	**PO1**	**3**	Analysis of CB/CC/ CE config: BJT require mathematical background
	PO2	**2**	Analysis of CB/CC/ CE config: BJT
	PO3	**1**	Design of circuit – amplifier-bjt
	PO4	**1**	Design / Design/problems of circuit amplifier bjt
CO3	**PO1**	**3**	High frequency Analysis of CB/CC/ CE config: - BJT require mathematical background
	PO2	**3**	High frequency Analysis of CB/CC/ CE config: - BJT
	PO3	**3**	Amplifier design(HF)
	PO4	**2**	Amplifier design/problem (HF)

CO4	**PO1**	**3**	Feedback amplifier/Oscillators - derivation
	PO2	**2**	Feedback amplifier/Oscillators - derivation
	PO3	**1**	Circuit design Feedback amplifier/Oscillators
	PO4	**1**	Circuit design/problems Feedback amplifier/Oscillators
CO5	**PO1**	**3**	power amplifier/Multi vibrators - derivation
	PO2	**3**	power amplifier/Multi vibrators - derivation
	PO3	**3**	Circuit design power amplifier/Multi vibrators
	PO4	**2**	Circuit design/problems power amplifier/Multi vibrators
CO6	**PO1**	**3**	Voltage Regulators/MOS FET – derivation, Analysis
	PO2	**2**	Voltage Regulators/MOS FET – derivation, Analysis
	PO3	**1**	Circuit design Voltage Regulators/MOS FET
	PO4	**1**	Circuit design/problems Voltage Regulators/MOS FET – amplifier

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Design & demonstration of RC circuits involves circuit implementation, testing & troubleshooting
CO2	**PSO1**	**3**	With prior knowledge of EDA tools, students can use their knowledge to simulate, experiment & develop newer applications
CO3	**PSO1**	**3**	Design & demonstration of RC circuits involves circuit implementation, testing & troubleshooting
CO4	**PSO1**	**3**	Design & demonstration of RC circuits involves circuit implementation, testing & troubleshooting
CO5	**PSO1**	**3**	Design & demonstration of RC circuits involves circuit implementation, testing & troubleshooting

C06	**PSO1**	**3**	Design & demonstration of RC circuits involves circuit implementation, testing & troubleshooting

EC 207 LOGIC CIRCUIT DESIGN

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Logic Circuit Design**	Course code**: EC 207**
L-T-P**:4-1-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Number systems- decimal, binary, octal, hexa decimal, base conversion 1's and 2's complement, signed number representation Binary arithmetic, binary subtraction using 2's complement. Binary codes (grey, BCD and Excess-3), Error detection and correcting codes : Parity(odd, even), Hamming code (7,4), Alphanumeric codes :ASCII	6	15
II	Logic expressions, Boolean laws, Duality, De Morgan's law, Logic functions and gates. Canonical forms: SOP, POS, Realization of logic expressions using K- map (2, 3, 4 variables). Design of combinational circuits – adder, subtractor, 4 bit 4 adder/subtractor, BCD adder, MUX, DEMUX, Decoder, BCD to 7 segment decoder, Encoder, Priority encoder, Comparator (2/3 bits)	8	15
III	Introduction to HDL: Logic descriptions using HDL, basics of modeling (only for assignments). Logic families and its characteristics: Logic levels, propagation delay, fan in, fan out, noise immunity , power dissipation, TTL subfamilies NAND in TTL (totem pole, open collector and tri-state), 2 CMOS:NAND, NOR, and NOT in CMOS, Comparison of logic families (TTL,ECL,CMOS) in terms of fan-in, fan-out, supply voltage, propagation delay, logic voltage and current levels, power dissipation and noise margin Programmable Logic devices - ROM, PLA, PAL, implementation of simple circuits using PLA	7	15
IV	Sequential circuits - latch, flip flop (SR, JK, T, D),	8	15

	master slave JK FF, conversion of FFs, excitation table and characteristic equations Asynchronous and synchronous counter design, mod N counters, random sequence generator		
V	Shift Registers - SIPO, SISO, PISO, PIPO, Shift registers with parallel LOAD/SHIFT Shift register counter - Ring Counter and Johnson Counter Mealy and Moore models, state machine ,notations, state diagram, state table, transition table, excitation table, state equations	6	20
VI	Construction of state diagram – up down counter, sequence detector Synchronous sequential circuit design - State equivalence State reduction – equivalence classes, implication chart	7	20

TEXT BOOKS:

1	Donald D Givone, Digital Principles and Design, Tata McGraw Hill, 2003
2	John F Wakerly, Digital Design Principles and Practices, Pearson Prentice Hall, 2007

REFERENCES:

1	Ronald J Tocci, Digital Systems, Pearson Education, 11th edition,2010
2	Thomas L Floyd, Digital Fundamentals, Pearson Education, 8th edition 2009
3	Moris Mano, Digital Design, Prentice Hall of India, 3rd edition, 2002
4	John M Yarbrough, Digital Logic Applications and Design, Cenage learning, 2009
5	David Money Harris, Sarah L Harris, Digital Design and Computer Architecture,Morgan Kaufmann – Elsevier, 2009

PREREQUISITES:

Nil

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To work with a positional number system and numeric representations
2	To introduce basic postulates of Boolean algebra and show the correlation between Boolean expression
3	To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits

4	To study the fundamentals of HDL
5	To design and implement combinational circuits using basic programmable blocks
6	To design and implement synchronous sequential circuits

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Ability to understand basic principles of digital circuits and different number systems.
2	Ability to derive and analyze logic expressions and circuits using Boolean laws and K-map.
3	Ability to design and analyze combinational circuits like adders, multiplexers, Encoders, PLA, ROM etc.
4	Ability to analyse sequential circuits and design various counter circuits.
5	Ability design various counter circuits.
6	Ability to design Synchronous sequential circuits and state reduction

CO-PO-PSO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2		PSO 1	PSO 2	PSO 3
CO 1	**3**	**2**	**2**	**1**								**2**		**2**	**2**	
CO 2	**2**	**1**	**3**											**2**		
CO 3	**3**	**2**	**3**	**2**										**2**	**2**	
CO 4	**3**	**2**	**3**	**2**										**2**	**2**	
CO	**2**		**2**											**2**	**1**	

5																
CO 6	**2**		**2**											**2**	**1**	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Knowledge in logic circuit design helps to find solutions for complex engineering problems
	PO2	**2**	Knowledge in logic circuit design helps to analyze complex engineering problems
	PO3	**2**	Basic principles of digital design help to develop solutions for complex Engineering problems
	PO4	**1**	Basic principles of digital design help to do analysis and interpretation of data in digital domain.
CO2	**PO1**	**3**	Concepts of Boolean Algebra aids in finding solutions for complex engineering problems
	PO2	**2**	Concepts of Boolean Algebra helps to analyze complex engineering problems
	PO3	**1**	Concepts of Boolean Algebra help to develop solutions for complex Engineering problems
CO3	**PO1**	**3**	Knowledge in combinational circuits helps to find solutions for complex engineering problems in digital electronics
	PO2	**1**	Knowledge in combinational circuits helps digital electronics engineers to analyze complex engineering problems
	PO3	**2**	Knowledge in combinational circuits helps digital electronics engineers to develop solutions for complex Engineering problems
	PO4	**1**	Knowledge in combinational circuits help to do analysis and interpretation of data in digital domain
CO4	**PO1**	**3**	Knowledge in sequential circuits helps to find solutions for complex engineering problems in digital electronics
	PO2	**2**	Knowledge in sequential circuits helps digital electronics engineers to analyze complex engineering problems
	PO3	**1**	Knowledge in sequential circuits helps digital electronics engineers to

			develop solutions for complex Engineering problems
	PO4	**1**	Knowledge in sequential circuits help to do analysis and interpretation of data in digital domain
CO5	**PO1**	**2**	Knowledge in counter design helps to find solutions for complex engineering problems in digital electronics
	PO2	**2**	Knowledge in counter design helps digital electronics engineers to develop solutions for complex Engineering problems
CO6	**PO1**	**2**	Knowledge in synchronous sequential circuits design helps to find solutions for complex engineering problems in digital electronics
	PO2	**2**	Knowledge in synchronous sequential circuits design helps digital electronics engineers to develop solutions for complex Engineering problems

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**2**	Fundamentals of logic circuits helps electronics engineers to design and develop electronic systems
	PSO2	**2**	Fundamentals of logic circuits serves the digital electronics industry and research
CO2	**PSO1**	**2**	Concepts of Boolean Algebra helps electronics engineers to design and develop efficient electronic systems
CO3	**PSO1**	**2**	Fundamentals of combinational circuits helps electronics engineers to design and develop electronic systems
	PSO2	**2**	Concepts of combinational circuits serves the digital electronics industry and research
CO4	**PSO1**	**2**	Fundamentals of sequential circuits helps electronics engineers to design and develop electronic systems
	PSO2	**2**	Concepts of sequential circuits serves the digital electronics industry and research

CO5	**PSO1**	**2**	Fundamentals of counter circuits helps electronics engineers to design and develop electronic systems
	PSO2	**1**	Concepts of counter circuits serves the Embedded system industry
.-C06	**PSO1**	**2**	Fundamentals of synchronous sequential circuits helps electronics engineers to design and develop electronic systems
	PSO2	**1**	Concepts of state reduction serves to minimize digital circuits

HS200 BUSINESS ECONOMICS

COURSE INFORMATION SHEET:

Program: Electronics And Communication engineering	Degree :B-Tech
Course: Business Economics	Course code: HS200
L-T-P:3-0-0	Credit:3

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Nature of Economics Definitions of Economics and their limitations, Economic Problems, Economic Systems, meaning of Business or Managerial Economics and its role and relevance in managerial decision making in an industrial setting.	6	15
II	Demand and Supply Analysis Demand Curve, Demand function, Elasticity of demand and its estimation , Supply curve, equilibrium price and price mechanism	6	15
III	Production Economics Economies of Scale and Diseconomies of Scale, Production and Cost Functions. Factors of Production Law of Diminishing marginal Productivity. Construction and analysis of Break Even Charts.	6	15
IV	Market Structure and Price-Output Decisions Price and output determination under Perfect Competition, Monopoly and Monopolistic Competition .Collusion and Cartel, Nash Equilibrium.	6	15

V	Money, National Income and Taxation Money, Emerging Bit Coin concept, Quantity Theory of Money, Interest Rate Management , Open Market Operations by RBI, Selective Credit Controls, SLR, CRR, Definition & Measurement of National Income, methods, sectors of economy, inflation, deflation, trade cycles-Value-added Tax .	9	20
VI	Investment Decisions and Balance Sheet Analysis Capital Budgeting, Investment Analysis – NPV, IRR, Profitability Index, ARR, Payback Period , Depreciation, Time value of money. Business Forecasting– Elementary techniques. Balance sheet preparation principles and interpretation.	9	20

TEXT BOOKS:

1	Yogesh, Maheswari, Management Economics , PHI learning, NewDelhi, 2012

REFERENCES:

1	Dornbusch, Fischer and Startz, Macroeconomics, McGraw Hill, 11th edition, 2010.
2	Khan M Y, Indian Financial System, Tata McGraw Hill, 7th edition, 2011
3	Samuelson, Managerial Economics, 6th edition, Wiley
4	Snyder C and Nicholson W, Fundamentals of Microeconomics, Cengage Learning (India), 2010
5	Truett, Managerial Economics: Analysis, Problems, Cases, 8th Edition, Wiley Welch, Economics:Theory and Practice 7th Edition, Wiley

PREREQUISITE: Nil

COURSE OBJECTIVES:

1	To familiarize the prospective engineers with elementary Principles of Economics and Business Economics.
2	To acquaint the students with tools and techniques that is useful in their profession in Business Decision Making which will enhance their employability;
3	To apply business analysis to the “firm” under different market conditions;
4	To apply economic models to examine current economic scenario and evaluate policy options for addressing economic issues

5	To gain understanding of some Macroeconomic concepts to improve their ability to understand the business climate;
6	To prepare and analyze various business tools like balance sheet, cost benefit analysis and rate of returns at an elementary level

COURSE OUTCOMES:

After successful completion of the course, the students should be able to:

CO's	DESCRIPTION
1	Familiarize the elementary perspectives of economics
2	Acquaint the students about the concepts of demand, supply and general production theory related to economics
3	Apply business analysis to the firm under different market conditions
4	Apply economic models to examine current economic scenario and to solve the economic issues
5	Apply various economic tools for analyzing the projects and decision making process
6	Analyze the various economic tools like balance sheet, tax, forecasting, and international concepts like FDI, FPI, and FII

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1											**3**	
CO2	2										**2**	**3**
CO3	2										**2**	
CO4								**3**				**2**
CO5	3										**2**	
CO6	2										**3**	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION

CO1	PO11	3	To know about the elementary principles in business economics helps them to understand the management as well as the business practices in economics
CO2	PO2	2	Simple kind of mathematical equations are used to identify the degree of elasticities related to demand and supply and production function
	PO11	2	With help of management and business practices students can analyze the changing patterns of demand, supply and production function
	PO12	3	The demand and supply functions are lifelong learning concepts
CO3	PO2	2	To analyze the market conditions of a firm, break even concepts is used. It is a mathematical concept.
	PO11	2	The marketing functions are highly correlated with the business practices and principles in economics
CO4	PO8	3	To analyze the current economic scenario it necessary to take into consider the social and legal procedures and programmed related to them
	PO12	2	Corrective action related to economic scenario helps the students to analyze the various economic conditions faced throughout their life
CO5	PO1	3	The decision making and evaluation of projects are based on different economic tools which are used mathematical and statistical equations.
	PO11	2	Some kind of decision making functions are based on the principles that is used in economics like risk, uncertainty etc
CO6	PO1	2	Mathematical tools are used to analyze the various economic tools. Eg, trend projection method, balance sheet
	PO12	3	These are helpful to students to identify the various opportunities in their life within and outside the nation.

EC 231 Electronic Devices and Circuits Lab

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Electronic Devices and Circuits Lab**	Course code**: EC 231**
	Credit**:1**

L-T-P**: 0-0-3**	

SYLLABUS:

List of Experiments: (12 Mandatory Experiments)

1. VI Characteristics of rectifier and zener diodes
2. RC integrating and differentiating circuits (Transient analysis with different inputs and frequency response)
3. Clipping and clamping circuits (Transients and transfer characteristics)
4. Fullwave Rectifier -with and without filter- ripple factor and regulation
5. Simple Zener voltage regulator (load and line regulation)
6. Characteristics of BJT in CE configuration and evaluation of parameters
7. Characteristics of MOSFET in CS configuration and evaluation of parameters
8. RC coupled CE amplifier - frequency response characteristics
9. MOSFET amplifier (CS) - frequency response characteristics
10. Cascade amplifier – gain and frequency response
11. Cascode amplifier -frequency response
12. Feedback amplifiers (current series, voltage series) - gain and frequency response 13. Low frequency oscillators –RC phaseshift, Wien bridge,
14. High frequency oscillators –Colpitt's and Hartley
15. Power amplifiers (transformer less) - Class B and Class AB
16. Transistor series voltage regulator (load and line regulation)
17. Tuned amplifier - frequency response
18. Bootstrap sweep circuit
19. Multivibrators -Astable, Monostable and Bistable
20. Schmitt trigger

PREREQUISITES:

1. EC205 Electronic Circuits

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To provide working knowledge of the working of analogue electronic circuits
2	To provide experience in design and implementation of analogue circuits using discrete electronic components

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Student should be able to understand the working of analog circuits like rectifiers, clippers, clampers etc.
2	Student should be able to design and implement circuits like RC coupled amplifier, tuned amplifier, Schmitt trigger etc.
3	Student should be able to design and demonstrate the functioning of regulators, oscillators and power amplifiers.
4	Students should be able to analyze and interpret the characteristics of diodes and transistors.

CO-PO-PSO MAPPING:

	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12		PSO 1	PSO 2	PSO 3
CO 1	3	3	3											3		
CO 2	3	3	3											3	2	
CO 3	3	3	3											3		
CO 4	3	3	3											3		

CO-PO-PSO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12		PSO 1	PSO 2	PSO 3
CO1	3	3	3	2										3		
CO2	3	3	3	2										3		
CO3	3	3	3	2										3		
CO4	3	3	3	2										3		

CO5	**3**	**3**	**3**	**2**									**3**		
CO6	**3**	**3**	**3**	**2**									**3**		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Analog circuits can be designed and modified to provide solutions to real-life problems
	PO2	**3**	Design & demonstration of experiments will help to identify the problems and lead to modifications
	PO3	**3**	Design of the circuits
CO2	**PO1**	**3**	amplifier circuits can be designed and modified to provide solutions to real-life problems
	PO2	**3**	Analysis of the amplifier circuits
	PO3	**3**	Design of the circuits
CO3	**PO1**	**3**	Knowledge about working of regulator and amplifier and circuits
	PO2	**3**	Analysis of the circuits
	PO3	**3**	Design of the circuits
CO4	**PO1**	**3**	Knowledge about working of analog circuits
	PO2	**3**	Analysis of the circuits
	PO3	**3**	Design of the circuits

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Design and testing of circuits

CO2	**PSO1**	**3**	Design and testing of circuits
CO3	**PSO1**	**3**	Design and testing of circuits
CO4	**PSO1**	**3**	Design and testing of circuits

EC 233 ELECTRONIC DESIGN AND AUTOMATION LAB

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: ELECTRONIC DESIGN AND AUTOMATION LAB**	Course code**: EC 233**
L-T-P**: 0-0-3**	Credit**:1**

SYLLABUS:

1. **Introduction to SPICE**

List of Experiments using SPICE [Six experiments mandatory]

Simulation of following circuits using SPICE [Schematic entry of circuits using standard package, Analysis –Transient, AC, DC]

1. Potential divider network
2. RC integrating and differentiating circuits
3. Diode, BJT and MOSFET characteristics
4. Diode Circuits (Clipping, Clamping, Rectifiers)
5. RC coupled amplifier (Single & two stages)
6. RC oscillator (RC phase shift / Wien Bridge)
7. Astable multivibrator
8. Truth table verification of basic and universal gates
9. Half adder /full adder circuits using gates
10. 4 bit adder/BCD adder
11. Encoder/Multiplexers

2. Introduction to MATLAB

List of Experiments [Four experiments mandatory]

Write program and obtain the solutions

1. Solve /plot the mathematical equations containing complex numbers, array, matrix multiplication and quadratic equations etc
2. Obtain different types of plots (2D/3D, surface plot, polar plot)

3. Generate and plot various signals like sine square, pulse in same window.
4. Plot the diode/transistor characteristics.
5. Solve node, mesh and loop equations of simple electrical/network circuits.
6. Find the poles and zeros hence plot the transfer functions/polynomials
7. Sort numbers in ascending order and save to another text file using text read and sort function after reading n floating point numbers from a formatted text file stored in the system.
8. Plot a full wave rectified waveform using Fourier series

3. Introduction to HDL

List of Experiments using HDL

Write the HDL code to realise and simulate the following circuits: (at least 4 of the following)

1. Basic gates/universal gates
2. Combinational Circuits (Half adder/Half subtractor)
3. Full adder in 3 modelling styles (Dataflow/structural/Behavioural)
4. Multiplexer/De-multiplexer
5. Decoder/Encoder
6. 4 bit adder/BCD adder
7. Flipflops (SR,JK,T,D)
8. Binary Counters
9. Finite state machines

PREREQUISITES:

NIL

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

The primary objective of this course is to familiarize the students, how to simulate the electronics/digital circuits, signals and systems using the soft-wares which are available for the modern design methodologies for the rapid design and verification of complex electronic systems

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Use various EDA tools such as PSPICE, MATLAB & Xilinx ISE for solving engineering problems

2	Gain expertise in using EDA tools such as PSPICE, MATLAB & Xilinx ISE
3	Analyze circuit operation & characteristics from simulation results
4	Generate different plots using MATLAB or PSPICE

CO-PO-PSO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12		PSO 1	PSO 2	PSO 3
CO 1	3	2			3									3	2	
CO 2	3	2			3									3	2	
CO 3	3	2			3									3	2	
CO 4	3	2			3									3	2	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Apply the knowledge of various EDA tools such as PSPICE, MATLAB & Xilinx ISE for solving engineering problems
	PO2	**2**	Analyze the engineering problems using various EDA tools such as PSPICE, MATLAB & Xilinx ISE for solving engineering problems
	PO5	**3**	Create, Select and apply modern simulation tools such as PSPICE, MATLAB & Xilinx ISE to complex circuits for ease of analysis
CO2	**PO1**	**3**	Apply the expertise gained in various EDA tools such as PSPICE, MATLAB & Xilinx ISE for solving engineering problems
	PO2	**2**	Analyze the engineering problems using expertise gained in various EDA tools such as PSPICE, MATLAB & Xilinx ISE for solving engineering problems

	PO5	**3**	Create, Select and apply the expertise gained in modern simulation tools such as PSPICE, MATLAB & Xilinx ISE to complex circuits for ease of analysis
CO3	**PO1**	**3**	Apply the knowledge of simulation software to understand the circuit operation & characteristics
	PO2	**2**	Analyze the circuit operation & characteristics from simulation results
	PO5	**3**	Select and Apply modern tools of simulation to study the circuit operation & characteristics
CO4	**PO1**	**3**	Apply the knowledge of MATLAB or PSPICE to generate different plots
	PO2	**2**	Analyze the different plots using MATLAB or PSPICE
	PO5	**3**	Select and Apply modern tools of simulation to generate different plots using MATLAB or PSPICE

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Graduates will be able to provide novel approaches to various EDA tools such as PSPICE, MATLAB & Xilinx ISE for solving engineering problems
	PSO2	**2**	Graduates will able to apply the learnt knowledge of various EDA tools such as PSPICE, MATLAB & Xilinx ISE for solving engineering problems
CO2	**PSO1**	**3**	Graduates will be able to provide novel approaches to various EDA tools such as PSPICE, MATLAB & Xilinx ISE using its gained expertise for solving engineering problems
	PSO2	**2**	Graduates will able to apply the learnt expert knowledge of various EDA tools such as PSPICE, MATLAB & Xilinx ISE for solving engineering problems
CO3	**PSO1**	**3**	Graduates will be able to analyse the circuit operation & characteristics from simulation results
	PSO2	**2**	Graduates will able to apply the learnt knowledge about various simulation softwares to analyse circuit operation & characteristics

CO4	**PSO1**	**3**	Graduates will be able to provide novel approaches to different types of electrical break down mechanisms in PN junctions to real world applications
	PSO2	**2**	Graduates will able to apply the learnt knowledge about the electrical break down mechanisms in PN junctions to real world applications
CO5	**PSO1**	**3**	Graduates will be able to provide novel approaches about different plots using MATLAB or PSPICE
	PSO2	**2**	Graduates will able to apply the learnt knowledge about MATLAB or PSPICE to generate different plots

SREEPATHY INSTITUTE OF MANAGEMENT AND TECHNOLOGY

COURSE HANDBOOK

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER IV

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

VISION

To transform students into motivated, competent and socially committed engineering professionals in the core domains of Electronics & Communication through quality education and research orientation with emphasis on holistic approach.

MISSION

- To nurture young individuals into knowledgeable, skillful and ethical professionals in their pursuit of Electronics & Communication Engineering.
- To empower budding engineers with the state of art technology, team work and leadership qualities to stride forth as resourceful citizens.
- To develop industry interaction for innovation and product development to solve real time problems.

B-TECH PROGRAMME

PROGRAMME EDUCATIONAL OBJECTIVES (PEO):

After successful completion of the program, the graduates will be

PEO1: Able to exhibit their innovative ideas and management skills to analyze, design, develop and implement electronic systems or equipment

PEO2: Able to apply knowledge in mathematics, science and computing to the field of Electronics & Communication Engineering either in industry, academics or research career with creativity and commitment

PEO3: Receptive to new technologies and attain professional competence through lifelong learning.

PEO4: Able to embody a commitment to professional ethics, diversity and social awareness in their professional career.

PROGRAM OUTCOMES (PO):

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

2. 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.

3. 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.

4. 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.

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

6. 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.

7. 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.

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

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

10. 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.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering 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.

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

PROGRAM SPECIFIC OUTCOMES (PSOS):

Electronics and Communication Engineering graduates will be able to:

PSO1 – have the capacity to apply the concepts of Electronics, Communications, Signal processing, VLSI, Control systems, Cryptography etc., in the analysis, design**,** development and implementation of integrated electronic systems as well as to interpret and synthesize the experimental data leading to valid conclusions

PSO2 – have competence in using latest hardware and software tools, along with analytical and managerial skills for the design and analysis of complex electronic systems in furtherance to research activities.

PSO3 – be an acquaintance of social and environmental awareness with ethical responsibilities to have a successful career in real-world applications by keeping in trend with technological changes.

MA 204 Probability Distributions, Random Process& Numerical Methods

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Probability Distributions, Random Process& Numerical Methods**	Course code**: MA 204**
L-T-P**:3-1-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Discrete random variables [Text 1: Relevant portions of sections 2.1, 2.2,2.3, 2.5, 3.3 and 3.4] Discrete random variables, probability mass function, cumulative distribution function, expected value, mean and variance. Binomial random variable-, mean, variance. Poisson random variable, mean, variance, approximation of binomial by Poisson. Distribution fitting-binomial and Poisson.	9	15
II	Continuous random variables [Text 1: Relevant portions of sections 2.4, 2.5, 3.7, 3.8 and 3.11] Continuous random variables, Probability density function, expected value, mean and variance. Uniform random variable-, mean, variance. Exponential random variable-mean, variance, memoryless property. Normal random variable-Properties of Normal curve mean, variance (without proof), Use of Normal tables.	9	15
III	Joint distributions [Text 1: Relevant portions of sections 4.1, 4.2, 4.4 4.7and 4.10] Joint probability distributions-discrete and continuous, marginal distributions, independent random variables. Expectation involving two or more random variables, covariance of pairs of random variables. Central limit theorem (without proof)	9	15

IV	Random processes [Text 1: Relevant portions of sections 5.1, 5.2, 5.3 and 6.2] Random processes, types of random processes, Mean, correlation and covariance functions of random processes, Wide Sense Stationary (WSS) process, Properties of autocorrelationand auto covariance functions of WSS processes. Power spectral density and its properties.	8	15
V	Special random processes [Text 1: Relevant portions of sections 5.5, 5.5.1, 5.5.2, 5.5.3,5.5.4) and 5.6] Poisson process-properties, probability distribution of inter arrival times. Discrete time Markov chain- Transition probability matrix, Chapman Kolmogorov theorem (without proof), computation of probability distribution and higher order transition probabilities, stationary distribution.	9	20
VI	Numerical Methods [Text 2: Relevant portions of sections 19.2, 19.3, 19.5 and 21.1] (Derivation of formulae not required in this module) Finding roots of equations-Newton-Raphson method. Interpolation-Newton's forward and backward difference formula, Lagrange's interpolation method. Numerical Integration-trapezoidal rule, Simpson's 1/3rd rule. Numerical solution of first order ODE-Euler method, Runge-Kutta fourth order (classical method).	12	20

TEXT BOOKS:

1	V.Sundarapandian, “Probability, Statistics and Queueing theory”, PHI Learning, 2009
2	Erwin Kreyszig, “Advanced Engineering Mathematics”, 10th edition, Wiley, 2015.

REFERENCES:

1	HosseinPishro-Nik, “Introduction to Probability, Statistics and Random Processes”, Kappa Research, 2014 (Also available online at www.probabilitycourse.com)
2	OliverC.Ibe,FundamentalsofAppliedProbabilityandRandomProcesses”Elsevier,2005.
3	T Veerarajan “Probability Statistics and Random Process” Third edition-McGraw Hill
4	Ward-Cheney , Numerical Mathematical and computing,Cengage Learning-7 th Edition

PREREQUISITES:

1. Probability and Numerical techniques

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To introduce the modern theory of probability and its applications to modeling and analysis and processing of random process and signals
2	To learn most of the important models of discrete and continuous probability distributions and widely used models of random process such as poisson process and Markov chains
3	To understand some basic numerical methods for interpolation and integration and also for finding roots of equations and solutions of ODE's.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Quantifying and analyzing random phenomenon using various models of probability distributions such as discrete random variables case.
2	Quantifying and analyzing random phenomenon using various models of probability distributions such as continuous random variables case
3	Quantifying and analyzing random phenomenon using Joint probability which is the probability of two events happening together
4	The concepts of autocorrelation and power spectral density which are useful in the analysis of random signals
5	When predicting the value of an asset, Markov chains can be used to model the randomness. The price is set by a random factor which can be determined by a Markov chain.
6	Fundamental numerical methods help them to solve a variety of mathematical problems by the use of computers when analytical methods fail or are difficult.

CO-PO-PSO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12		PSO 1	PSO 2	PSO 3
CO 1	3	3														
CO 2	3				2	2						1				
CO 3	3	3	3	2		1					1	1				
CO 4	3															
CO 5	3															
CO 6	3															

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems
	PO2	2	Identify, formulate and analyze engineering problems using first principle of mathematics and engineering sciences
CO2	PO1	3	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems.
	PO5	2	Apply appropriate techniques and modern engineering to complex engineering activities
	PO6	2	Apply reasoning informed by the contextual knowledge to assess society practices and consequent responsibilities
	PO12	1	Independent lifelong learning to technological change
CO3	PO1	3	Apply the knowledge of ,mathematics, science and engineering fundamentals and

			engineering specialization to the complex engineering problems
	PO2	**3**	Identify, formulate and analyze engineering problems using first principle of mathematics and engineering sciences
	PO3	**3**	Design solutions for complex engineering problems to meet the specifications with consideration for the public
	PO4	**2**	Use research based knowledge including analysis ,design and interpretation of data
	PO6	**1**	Apply reasoning informed by the contextual knowledge to assess society practices and consequent responsibilities
	PO11	**1**	Demonstrate knowledge and understanding of engineering and management principles
	PO12	**1**	Independent lifelong learning to technological change
CO4	**PO1**	**3**	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems
CO5	**PO1**	**3**	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems
CO6	**PO1**	**3**	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems

HS210 LIFE SKILLS

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: LIFE SKILLS**	Course code**: HS210**
L-T-P**:2-0-0**	Credit**:2**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Need for Effective Communication, Levels of communication; Flow of communication; Use of language in communication; Communication networks; Significance of technical communication, Types of barriers; Miscommunication; Noise; Overcoming measures, Listening as an active skill; Types of Listeners; Listening for general content; Listening to fill up information; Intensive Listening; Listening for specific information; Developing effective listening skills; Barriers to effective listening skills. Technical Writing: Differences between technical and literary style, Elements of style; Common Errors, Letter Writing: Formal, informal and demi-official letters; business letters, Job Application: Cover letter, Differences between bio-data, CV and Resume, Report Writing: Basics of Report Writing; Structure of a report; Types of reports. Non-verbal Communication and Body Language: Forms of non-verbal communication; Interpreting body-language cues; Kinesics; Proxemics; Chronemics; Effective use of body language Interview Skills: Types of Interviews; Ensuring success in job interviews; Appropriate use of non-verbal communication, Group Discussion: Differences between group discussion and debate; Ensuring success in group discussions, Presentation Skills: Oral presentation and public speaking skills; business presentations, Technology-based Communication: Netiquettes: effective e-mail messages; power-point presentation; enhancing editing skills using computer software	15	

II	Need for Creativity in the 21st century, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths of creativity Critical thinking Vs Creative thinking, Functions of Left Brain & Right brain, Convergent & Divergent Thinking, Critical reading & Multiple Intelligence. Steps in problem solving, Problem Solving Techniques, Problem Solving through Six Thinking Hats, Mind Mapping, Forced Connections. Problem Solving strategies, Analytical Thinking and quantitative reasoning expressed in written form, Numeric, symbolic, and graphic reasoning, Solving application problems.	8	
III	Introduction to Groups and Teams, Team Composition, Managing Team Performance, Importance of Group, Stages of Group, Group Cycle, Group thinking, getting acquainted, Clarifying expectations. Group Problem Solving, Achieving Group Consensus. Group Dynamics techniques, Group vs Team, Team Dynamics, Teams for enhancing productivity, Building & Managing Successful Virtual Teams. Managing Team Performance & Managing Conflict in Teams. Working Together in Teams, Team Decision-Making, Team Culture & Power, Team Leader Development.	10	
IV	Morals, Values and Ethics, Integrity, Work Ethic, Service Learning, Civic Virtue, Respect for Others, Living Peacefully. Caring, Sharing, Honesty, Courage, Valuing Time, Cooperation, Commitment, Empathy, Self-Confidence, Character Spirituality, Senses of 'Engineering Ethics', variety of moral issued, Types of inquiry, moral dilemmas, moral autonomy, Kohlberg's theory, Gilligan's theory, Consensus and controversy, Models of Professional Roles, Theories about right action, Self-interest, customs and religion, application of ethical theories. Engineering as experimentation, engineers as responsible experimenters, Codes of ethics, Balanced outlook on. The challenger case study, Multinational corporations, Environmental ethics, computer ethics, Weapons development, engineers as managers, consulting engineers, engineers as expert witnesses and advisors, moral leadership, sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE), India, etc.	16	
V	Introduction, a framework for considering leadership, entrepreneurial and moral leadership, vision, people	10	

	selection and development, cultural dimensions of leadership, style, followers, crises. Growing as a leader, turnaround leadership, gaining control, trust, managing diverse stakeholders, crisis management Implications of national culture and multicultural leadership Types of Leadership, Leadership Traits. Leadership Styles, VUCA Leadership, DART Leadership, Transactional vs Transformational Leaders, Leadership Grid, Effective Leaders, making of a Leader, Formulate Leadership		

EVALUATION SCHEME

Internal Evaluation (Conducted by the College)

Total Marks: 100

Part – A (To be started after completion of Module 1 and to be completed by 30th working day of the semester)

1. Group Discussion – Create groups of about 10 students each and engage them on a GD on a suitable topic for about 20 minutes. Parameters to be used for evaluation is as follows;

(i) Communication Skills – 10 marks

(ii) Subject Clarity – 10 marks

(iii) Group Dynamics - 10 marks

(iv) Behaviors & Mannerisms - 10 marks (Marks: 40)

Part – B (To be started from 31st working day and to be completed before 60th working day of the semester)

2. Presentation Skills – Identify a suitable topic and ask the students to prepare a presentation (preferably a power point presentation) for about 10 minutes. Parameters to be used for evaluation is as follows;

(i) Communication Skills* - 10 marks

(ii) Platform Skills - 10 marks**

(iii) Subject Clarity/Knowledge - 10 marks (Marks: 30)

* Language fluency, auditability, voice modulation, rate of speech, listening, summarizes key learnings etc.

** Postures/Gestures, Smiles/Expressions, Movements, usage of floor area etc.

Part – C

(To be conducted before the termination of semester)

3. Sample Letter writing or report writing following the guidelines and procedures. Parameters to be used for evaluation is as follows;

(i) Usage of English & Grammar - 10 marks

(ii) Following the format - 10 marks

(iii) Content clarity - 10 marks (Marks: 30)

External Evaluation (Conducted by the University)

Total Marks: 50 **Time: 2 hrs.**

Part – A

Short Answer questions

There will be one question from each area (five questions in total). Each question should be written in about maximum of 400 words. Parameters to be used for evaluation are as follows;

(i) Content Clarity/Subject Knowledge

(ii) Presentation style

(iii) Organization of content

(Marks: 5 x 6 = 30)

Part – B

Case Study

The students will be given a case study with questions at the end the students have to analyze the case and answer the question at the end. Parameters to be used for evaluation are as follows;

(i) Analyze the case situation

(ii) Key players/characters of the case

(iii) Identification of the problem (both major & minor if exists)

(iv) Bring out alternatives

(v) Analyze each alternative against the problem

(vi) Choose the best alternative

(vii) Implement as solution

(viii) Conclusion

(ix) Answer the question at the end of the case (Marks: 1 x 20 = 20)

TEXT BOOKS:

1	Life Skills for Engineers, Complied by ICT Academy of Kerala, McGraw Hill Education (India) Private Ltd., 2016

REFERENCES:

1	Barun K. Mitra; (2011), "Personality Development & Soft Skills", First Edition; Oxford Publishers.
2	Kalyana; (2015) "Soft Skill for Managers"; First Edition; Wiley Publishing Ltd
3	Larry James (2016); "The First Book of Life Skills"; First Edition; Embassy Books.
4	Shalini Verma (2014); "Development of Life Skills and Professional Practice"; First Edition; Sultan Chand (G/L) & Company
5	John C. Maxwell (2014); "The 5 Levels of Leadership", Centre Street, A division of Hachette Book Group Inc.

PREREQUISITES:

Nil

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To develop communication competence in prospective engineers
2	To enable them to convey thoughts and ideas with clarity and focus.
3	To develop report writing skills
4	To equip them to face interview & Group Discussion.
5	To equip them to face interview
6	To inculcate critical thinking process.
7	To prepare them on problem solving skills.
8	To provide symbolic, verbal, and graphical interpretations of statements in a problem description.
9	To create an awareness on Engineering Ethics and Human Values.
10	To understand team dynamics & effectiveness.
11	To instill Moral and Social Values, Loyalty and also to learn to appreciate the rights of• others.

12	To learn leadership qualities and practice them.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	students will be able to realize the important factors involved in verbal/non-verbal communication in professional context.
2	students will be able to apply creative and critical thinking while approaching different types of problems.
3	Students should be able to become an adaptable team member as well as a leader who could successfully manage any team/group.
4	students in future would become a professional who has inculcated integrity , values , ethics and realize his/her commitment to the society.
5	students will realize the factors involved in the growth of an effective leader and become one in the future.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1							**3**					
CO2		**1**										
CO3						**3**						
CO4								**3**	**3**	**1**	**1**	
CO5						**3**						

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO7**	**3**	Students must be able to communicate with clients and colleagues alike through effective communication platforms like group discussion, debate, interviews, presentation with suitable kinesics, proxemics and chronemics
CO2	**PO2**	**1**	Students should be able to apply their creative and critical thought process to solve complex problems.
CO3	**PO6**	**3**	Students are familiarized with the stages of group formation , types of groups and teams , their differences, team performance management and group problem solving methods.
CO4	**PO8**	**3**	Students are familiarized with many case studies which effectively conveys the role of an engineer in a society and the paramount importance of public health and safety an engineer should be concerned with.
	PO9	**3**	Students should not ignore the importance of ethics and morality as professionals.
	PO10	**1**	Environmental ethics ,computer ethics professional ethics professed by certain professional associations are to be familiarized by students.
	PO11	**1**	Students must understand the theory of moral development as well as the responsibilities of an engineer as a manager, expert witness and consulting engineer.
CO5	**PO6**	**3**	Different leadership styles based on different contexts and the growing stages of a leader must be familiarized by the students.

EC202 Signals and Systems

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Signals and Systems**	Course code**: EC202**
L-T-P**:3-1-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Elementary Signals, Classification and representation of continuous time and discrete time signals, Signal operations Continuous time and discrete time systems - Classification, Properties. Representation of systems: Differential equation representation of continuous time systems. Difference equation representation of discrete systems	5	15
II	Continuous time LTI systems and convolution integral. Discrete time LTI systems and linear convolution. Stability and causality of LTI systems. Correlation between signals, Orthoganality of signals.	9	15
III	Frequency domain representation of continuous time signals- continuous time Fourier series and its properties. Convergence, Continuous time fourier transform and its properties. Laplace Transform, ROC, Inverse transform, properties, unilateral Laplace transform. Relation between Fourier and Laplace transforms.	11	15
IV	Analysis of LTI systems using Laplace and Fourier transforms. Concept of transfer function, Frequency response, Magnitude and phase response. Sampling of continuous time signals, Sampling theorem for lowpass signals, aliasing.	7	15
V	Z transform, ROC , Inverse transform, properties, Unilateral Z transform. Frequency domain representation of discrete time signals, Discrete time fourier series and its properties. Discrete time fourier transform (DTFT) and its properties	12	20
VI	Relation between DTFT and Z-Transform, Analysis of discrete time LTI systems using Z transforms and DTFT, Transfer function, Magnitude and phase response.	6	20

TEXT BOOKS:

1	Alan V. Oppenheim and Alan Willsky, Signals and Systems, PHI, 2/e, 2009
2	Simon Haykin, Signals & Systems, John Wiley, 2/e, 2003

REFERENCES:

1	Anand Kumar, Signals and Systems, PHI, 3/e, 2013.
2	B P. Lathi, Priciples of Signal Processing & Linear systems, Oxford University Press.
3	Gurung, Signals and System, PHI.
4	Mahmood Nahvi, Signals and System, Mc Graw Hill (India), 2015.
5	P Ramakrishna Rao, Shankar Prakriya, Signals and System, MC Graw Hill Edn 2013.
6	Rodger E. Ziemer, Signals & Systems - Continuous and Discrete, Pearson, 4/e, 2013

PREREQUISITES:

Nil

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objective:

1	To train students for an intermediate level of fluency with signals and systems in both continuous time and discrete time, in preparation for more advanced subjects in digital signal processing, image processing, communication theory and control systems.
2	To study continuous and discrete-time signals and systems, their properties and representations and methods those are necessary for the analysis of continuous and discrete- time signals and systems.
3	To familiarize with techniques suitable for analyzing and synthesizing both continuous-time and discrete time systems.
4	To gain knowledge of time-domain representation and analysis concepts as they relate to

	differential equations, difference equations, impulse response and convolution, etc.
5	To study frequency-domain representation and analysis concepts using Fourier analysis tools, Laplace Transform and Z-transform. To study concepts of the sampling process, reconstruction of signals and interpolation

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Classify and characterize basic properties of continuous and discrete time signals and systems.
2	Formulate the relation between convolutions, correlation and to describe the orthogonality of signals.
3	Characterize the CT signals in Fourier series and interpret the properties of Fourier transform and Laplace transform
4	Understand the concept of transfer function and determine the magnitude and phase response of LTI systems and define sampling theorem and techniques for sampling and reconstruction.
5	Apply the concepts of z transforms, inverse z transforms and analyze LTI systems using z transform

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	3			2									3	2	
CO2	3	3			2									3	2	

CO3	**3**	**3**			**2**									**3**	**2**	
CO4	**3**	**3**			**2**									**3**	**2**	
CO5	**3**	**3**			**2**									**3**	**2**	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Apply the knowledge of various signals and systems
	PO2	**3**	Analyze the various types of signals and systems
	PO5	**2**	Create,select and apply modern system classificationmethods for various engineering activities
CO2	**PO1**	**3**	Apply the knowledge of convolutions, correlation and to describe the orthogonality of signals.
	PO2	**3**	Analyze the various methods of convolution process
	PO5	**2**	Create ,select and apply modern tools like MATLAB for performing convolution and correlation of signals
CO3	**PO1**	**3**	Apply the knowledge of Fourier series and Laplace transform and interpret its properties
	PO2	**3**	Analyze the various properties of Fourier series and Laplace transform
	PO5	**2**	Apply moderntools for the computation of Fourier series and Laplace transform
CO4	**PO1**	**3**	Apply the concept of transfer function to determine the magnitude and phase response of LTI systems.
	PO2	**3**	Analyze the various techniques for sampling and reconstruction
	PO5	**2**	Create transfer function to determine the magnitude and phase response of LTI systems for various engineering activities
CO5	**PO1**	**3**	Apply the knowledge of concepts of z transforms, inverse z transforms

			and analyze LTI systems using z transform
	PO2	**3**	Analyze the various properties of Z transform
	PO5	**2**	Apply the properties of Z transform forvarious engineering activities

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Graduates will be able to provide novel approaches to identify various categories of signals and systems.
	PSO2	**2**	Graduates will able to apply the learnt knowledge to identify various categories of signals and systems.
CO2	**PSO1**	**3**	Graduates will apply the learnt knowledge about convolutions, correlation and orthogonality of signals.throughout their life for developing new ideas
	PSO2	**2**	Graduates will be aware about the various contributions that can be made to real world using the correlation and orthogonality.
CO3	**PSO1**	**3**	Graduates will Identify various frequency domain transformations
	PSO2	**2**	Graduates will able to apply the learnt knowledge about transforms to real world applications
CO4	**PSO1**	**3**	Graduates will be able to provide novel approaches to different types of sampling and reconstruction methods to real world applications
	PSO2	**2**	Graduates will able to apply the learnt knowledge about the computation of magnitude and phase response to real world applications
CO5	**PSO1**	**3**	Graduates will be able to provide novel approaches about applications of Z transform
	PSO2	**2**	Graduates will able to apply the learnt knowledge about the transformation in digital domain to real world applications
C06	**PSO1**	**3**	Graduates will be able to provide novel approaches to identify various categories of signals and systems.

	PSO2	**2**	Graduates will able to apply the learnt knowledge to identify various categories of signals and systems.

EC204 Analog Integrated Circuits

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Analog Integrated Circuits**	Course code**: EC204**
L-T-P**:4-0-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Differential amplifiers: Differential amplifier configurations using BJT, Large and small signal operations, Input resistance, Voltage gain, CMRR, Non-ideal characteristics of differential amplifier. Frequency response of differential amplifiers, Current sources, Active load, Concept of current mirror circuits, Wilson current mirror circuits (Analysis using hybrid 'pi' model only). Operational amplifiers: Introduction, Block diagram, Ideal op-amp parameters, Equivalent circuit, Voltage transfer curve, Open loop op-amp configurations, Effect of finite open loop gain, Bandwidth and slew rate on circuit performance	11	15
II	Op-amp with negative feedback: Introduction, Feedback configurations, Voltage series feedback, Voltage shunt feedback, Properties of practical op-amp. Op-amp applications: Inverting and non inverting amplifier, DC and AC amplifiers, Summing, Scaling and averaging amplifiers, Instrumentation amplifier	7	15
III	Op-amp applications: Voltage to current converter, Current to voltage converter, Integrator, Differentiator, Precision rectifiers, Log and antilog amplifier, Phase shift and Wien bridge oscillators	7	15
IV	Astable and monostable multivibrators, Triangular and saw tooth wave generators, Comparators, Zero crossing detector, Schmitt trigger Active filters: Advantages, First and second order low pass, High pass, Band pass and band reject filters, Design of filters using 5 Butterworth approximations	10	15
V	Specialized ICs and its applications: Timer IC 555 : Astable and monostable operations, applications. Analog Multipliers: Introduction, Gilbert multiplier cell. Voltage Controlled Oscillator IC AD633 and their applications. Phase Locked Loop – Operation, Closed loop analysis, Lock and V capture range,	11	20

	Basic building blocks, PLL IC 565, Applications of PLL for AM & FM detection and Frequency multiplication, Frequency division, Frequency synthesizing. Monolithic Voltage Regulators - Fixed voltage regulators, 78XX and 79XX series, Adjustable voltage regulators, IC 723 – Low voltage and high voltage configurations, Current boosting, Current limiting, Short circuit and Fold-back protection		
VI	Data Converters: D/A converter, Specifications, Weighted resistor type, R-2R Ladder type. A/D Converters: Specifications, Classification, Flash type, Counter ramp type, Successive approximation type, Single slope type, Dual slope type, Sample-and-hold circuits.	8	20

TEXT BOOKS:

1	Franco S., Design with Operational Amplifiers and Analog Integrated Circuits, 3/e, Tata McGraw Hill, 2008
2	Salivahanan S. ,V. S. K. Bhaaskaran, Linear Integrated Circuits, Tata McGraw Hill, 2008

REFERENCES:

1	Botkar K. R., Integrated Circuits, 10/e, Khanna Publishers, 2010
2	C.G. Clayton, Operational Amplifiers, Butterworth & Company Publ. Ltd. Elsevier, 1971
3	David A. Bell, Operational Amplifiers & Linear ICs, Oxford University Press, 2 nd edition, 2010
4	Gayakwad R. A., Op-Amps and Linear Integrated Circuits, Prentice Hall, 4/e, 2010
5	R.F. Coughlin & Fredrick Driscoll, Operational Amplifiers & Linear Integrated Circuits, 6 th Edition, PHI,2001
6	Roy D. C. and S. B. Jain, Linear Integrated Circuits, New Age International, 3/e, 2010
7	Sedra A. S. and K. C. Smith, Microelectronic Circuits, 6/e, Oxford University Press, 2013

PREREQUISITES:

Nil

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objective:

1	To equip the students with a sound understanding of fundamental concepts of operational amplifiers
2	To know the diversity of operations that op amp can perform in a wide range of applications
3	To introduce a few special functions integrated circuits
4	To impart basic concepts and types of data converters

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Infer the DC and AC characteristics of BJT differential amplifier and operational amplifiers and its effect on output and their compensation techniques.
2	Elucidate and design the linear and non-linear applications of an opamp and special application Ics
3	Able to design and analyze oscillators, converters and general purpose opamp circuits
4	Able to design and analyze filters and waveform generators
5	Able to design, classify and comprehend the working principle of data converters. Able to design Voltage regulators, multi vibrators using special application IC 555, PLL and its application in communication
6	Able to design ADC and DAC converters

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	3												3	1	
CO2	3	2	2												2	
CO3	3	3	2													
CO4	3	3	2													
CO5	3	3	2													
CO6	3	3	2													

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Analog circuits can be designed and modified to provide solutions to real life problems
	PO2	3	Design & demonstration of experiments will help to identify the problems and lead to modifications
CO2	PO1	3	IC circuits can be used in a wide range of applications like communication, instrumentation etc.
	PO2	2	Design & analysis of analog IC circuits
	PO3	2	A wide range of application can be developed using linear ICs. Everyday electronic s makes use of ICs extensively
CO3	PO1	3	Oscillator circuits can be designed and modified to provide solutions to real life problems
	PO2	3	With the knowledge of oscillator circuit the signal generation problem can be analysed
	PO3	2	With the knowledge of oscillator circuit the signal generation problem can be solved
CO4	PO1	3	Op amp filter circuits can be designed and modified to provide solutions to transmission and communication problems

	PO2	**3**	With the knowledge of filter circuit the signal generation and noise problem can be analysed
	PO3	**2**	With the knowledge of filter circuit the signal generation and noise problem can be identified and solved
CO5	**PO1**	**3**	Voltage regulators and MVs can be designed to provide solutions to power supply problems
	PO2	**3**	With the knowledge of regulator circuit the power supply problem can be analysed and solved
	PO3	**2**	With the knowledge of regulator circuit the power supply problem can be analysed
CO6	**PO1**	**3**	Data converters can be designed to provide solutions to complex engineering problems
	PO2	**3**	With the knowledge of data converters the complex engineering problems can be analysed
	PO3	**2**	With the knowledge of data converters the complex engineering problems can be identified and solved

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Design & demonstration of analog circuits involves circuit implementation, testing & troubleshooting
	PSO2	**1**	With prior knowledge of EDA tools, students can use their knowledge to simulate, experiment & develop newer applications
CO2	**PSO2**	**2**	With prior knowledge of EDA tools, students can use their knowledge to simulate, experiment & develop newer applications

EC206 Computer Organisation

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Computer Organisation**	Course code**: EC206**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Functional units of a computer Arithmetic Circuits: Adder-carry propagate adder, Ripple carry adder, Basics of carry look ahead and prefix adder, Subtractor, Comparator, ALU Shifters and rotators, Multiplication, Division Number System: Review of Fixed point & Floating point number system	8	15
II	Architecture : Assembly Language, Instructions, Operands, Registers, Register set, Memory, Constants Machine Language: R-Type, I-Type, J-Type Instructions, Interpreting machine language code	5	15
III	MIPS Addressing modes – Register only, Immediate, Base, PC relative, Pseudo - direct MIPS memory map, Steps for executing a program - Compilation, Assembling, Linking, Loading Pseudo instructions, Exceptions, Signed and Unsigned instructions, Floating point instructions	9	15
IV	MIPS Microarchitectures – State elements of MIPS processor Design process and performance analysis of Single cycle processor, Single cycle data path, Single cycle control for R – type arithmetic/logical instructions. Design process and performance analysis of multi cycle processor, Multi cycle data path, Multi cycle control for R – type arithmetic/logical instructions.	7	15
V	I/O system – Accessing I/O devices, Modes of data transfer, Programmed I/O, Interrupt driven I/O, Direct Memory Access, Standard I/O interfaces – Serial port, Parallel port, PCI, SCSI, and V USB. Memory system – Hierarchy, Characteristics and Performance analysis, Semiconductor memories (RAM, ROM, EPROM), Memory Cells – SRAM and DRAM, internal organization of a memory chip, Organization of a memory unit.	7	20

VI	Cache Memory – Concept/principle of cache memory, Cache size, mapping methods – direct, associated, set associated, Replacement algorithms, Write policy- Write through, Write back. Virtual Memory – Memory management, Segmentation, Paging, Address translation, Page table, Translation look aside buffer.	6	20

TEXT BOOKS:

1	David A. Patterson and John L. Hennessey, Computer Organisation and Design, Fourth Edition, Morgan Kaufmann
2	David Money Harris, Sarah L Harris, Digital Design and Computer Architecture,M Kaufmann – Elsevier, 2009

REFERENCES:

1	Carl Hamacher : "Computer Organization ", Fifth Edition, Mc Graw Hill
2	John P Hayes: "Computer Architecture and Organisation", Mc Graw Hill
3	William Stallings: "Computer Organisation and Architecture", Pearson Education
4	Andrew S Tanenbaum: "Structured Computer Organisation", Pearson Education
5	Craig Zacker: "PC Hardware : The Complete Reference", TMH

PREREQUISITES:

1. Logic Circuit Designs

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objective:

1	To impart knowledge in computer architecture
2	To impart knowledge in machine language programming
3	To develop understanding on I/O accessing techniques and memory structures.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Understand the functional units of a computer.
2	Identify the different types of instructions
3	Understand the various addressing modes
4	Understand the I/O addressing system
5	Explain various design techniques in computer design
6	Categorize the different types of memories

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	2													2	
CO2	3	2												3		
CO3	3													2		
CO4	3	1	2	1										2		
CO5		2	2											3	2	2
CO6	3															

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Apply the knowledge of computers in complex engineering problems.
CO2	**PO1**	**3**	Apply the knowledge of instructions to develop different languages .
	PO2	**2**	Identify the instructions as per the requirements.
CO3	**PO1**	**3**	Apply the knowledge of addressing modes to develop softwares.
CO4	**PO1**	**3**	Architecture and design of IO systems involves solving complex engineering problems
	PO2	**1**	Analyze the addressing system as per the requirements
	PO3	**2**	Develop the addressing system to meet particular languages
	PO4	**1**	Design knowledge of I/O system can be used to conduct experiments in I/O performance to provide valid conclusions
CO5	**PO2**	**2**	Design and analysis of processor design used to solve many problems
	PO3	**2**	Architecture knowledge of Processor can be used to design and conduct experiments to provide valid conclusions
CO6	**PO1**	**3**	Apply the basic knowledge of computer memory to develop different programs.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO2**	**2**	Students can code, simulate and test functional blocks of computer s using EDA tools
CO2	**PSO1**	**3**	Graduates will be able to provide novel approaches to develop different languages as per the instructions
CO3	**PSO1**	**2**	Graduates will apply the learnt knowledge to develop new programs.

CO4	**PSO1**	**2**	Graduates will Identify usage of I/O and memory designs in VLSI and Embedded systems.
CO5	**PSO1**	**3**	Graduates will apply the learnt knowledge throughout their life for developing new language.
	PSO2	**2**	The graduates of the programme are able to provide novel approaches to design computer systems
	PSO3	**2**	Graduates will able to apply the learnt knowledge to real world applications

EC208 Analog Communication Engineering

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Analog Communication Engineering**	Course code**: EC208**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction, Elements of communication systems, Need for modulation .Noise in communication system, Thermal noise (white noise), Shot noise, Partition noise, Flicker noise, Burst noise, Signal to noise ratio, Noise factor, Noise temperature, Narrow band noise.	5	15
II	Amplitude modulation: Sinusoidal AM, Modulation index, Average power, Effective voltage and current, Nonsinusoidal modulation. Amplitude modulator circuits, Amplitude demodulator circuits, AM transmitters, Noise in AM Systems.	9	15
III	Single Sideband Modulation: Principles, Balanced modulators, Singly & doubly balanced modulators, SSB generation, Filter method, Phasing method & Third method, SSB reception, Modified SSB systems, Pilot carrier SSB & ISB, Companded SSB.	6	15
IV	Angle modulation: Frequency modulation, Sinusoidal FM, Frequency spectrum, Modulation index, Average power, Non-sinusoidal modulation, Deviation ratio, Comparison of AM and FM. AM & FM Receivers: Super heterodyne receiver, Tuning range, Tracking, Sensitivity and gain, Image rejection, Double conversion, Adjacent channel selectivity, Automatic Gain Control (AGC)..	8	15
V	Phase modulation, Equivalence between PM and FM, Sinusoidal phase modulation, Digital phase modulation. Angle modulator Circuits: Varactor diode modulators, Transistor modulators. FM Transmitters: Direct and Indirect Methods.	6	20
VI	Angle modulation detectors, Slope detector, Balanced slope detector, Foster-Seeley discriminator, PLL demodulator, Automatic Frequency Control (AFC), Amplitude limiters, Noise in FM systems, Pre-emphasis and De-emphasis. Telephone	8	20

	systems, standard telephone set, basic call procedures 4 and tones, DTMF, cordless telephones.		

TEXT BOOKS:

1	Dennis Roody and John Coolen, Electronic Communication, Pearson, 4/e, 2011.
2	George Kennedy, Electronic Communication Systems, McGrawHill, 4/e, 2008.
3	Tomasi, Electronic Communications System, Pearson, 5/e, 2011.

REFERENCES:

1	Blake, Electronic Communication system, Cengage, 2/e, 2012.
2	Simon Haykin, Communication Systems, Wiley 4/e, 2006.
3	Taub, Schilling, Saha, Principles of communication system, McGraw Hill, 2013.
4	Tomasi, Advanced Electronic Communications Systems, Pearson, 6/e, 2012.

PREREQUISITES:

EC205 Electronic Circuits

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objective:

1	To study the concepts and types of modulation schemes.
2	To study different types of radio transmitters and receivers.
3	To study the effects of noise in analog communication systems.
4	To impart basic knowledge on public telephone systems

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	The students will be able to explain the need for modulation and to understand the different analog modulation schemes.
2	The students will be able to classify different types of noises and its effect in communication systems
3	Describe the concept of Amplitude modulation and Frequency modulation
4	Apply the knowledge about different types of modulators in communication
5	The students will be able to explain the principle and working of analog transmitters and receivers
6	The students will be able to know the basic idea of communication system like telephone systems

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	2	1	3	2							2		3		2
CO2	3	3	2											3		
CO3	3	2			2									3	2	
CO4	3	2			2									3	2	
CO5	3	2	3			3								3	2	2
CO6	3	2	3													1

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	**Mathematical basics in analog modulation schemes**
	PO2	**2**	Design and analysis of modulator and demodulator circuit using basic mathematical equations.
	PO3	**1**	Design and analysis of modulator and demodulator circuit using basic mathematical equations.
	PO4	**3**	Design and experiment analog modulator and demodulator circuits
	PO5	**2**	Simulate circuit using MATLAB, PSPICE.
	P12	**2**	Understanding of communication system.
CO2	**PO1**	**3**	Expressing noises in communication systems using mathematical equations.
	PO2	**3**	Analyze the noises in communication system with the help of mathematical background
	PO3	**2**	Design of transmitter and receiver in communication system and the calculation of transmitting power.
CO3	PO1	3	Apply the knowledge of various types AM & FM generation & demodulation methods
	PO2	2	Analyze the various types of AM & FM generation & demodulation methods
	PO5	2	Create and apply modern tools to AM & FM generation & demodulation thereby increasing their efficiency
CO4	PO1	3	Apply the knowledge various types of modulators
	PO2	2	Analyze the the importance of modulators in communication system
	PO5	2	Create and apply modern tools to study the scope of modulators in communication system
CO5	**PO1**	**3**	Mathematical background of radio communication system.
	PO2	**2**	Design and analysis of radio transmitters and receivers
	PO3	**3**	Design and analysis of radio transmitters and receivers
	PO6	**3**	Understanding of communication system

CO6	**PO1**	**3**	Understanding of communication system
	PO2	**2**	Understanding of basic public telephone system
	PO3	**3**	Basics of telephone systems

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Design of communication system in different modulation schemes
	PSO3	**2**	Application of communication systems in real world application
CO2	**PSO1**	**3**	Analysis of effect of noise in communication system
CO3	PSO1	3	Graduates will be able to provide novel approaches to different types of AM & FM generation & demodulation methods
	PSO2	2	Graduates will able to apply the learnt knowledge togenerate & demodulate AM & FM
CO4	PSO1	3	Graduates will be able to provide novel approaches to the modulator circuits
	PSO2	2	Graduates will able to apply the learnt knowledge aboutvarious modulator circuits
CO5	**PSO1**	**3**	Design, analysis and implementation of analog modulator and demodulator circuit.
	PSO2	**2**	Design, analysis and implementation of analog modulator and demodulator circuit.
	PSO3	**2**	Application of communication system.
CO6	**PSO3**	**1**	Basic idea of communication system in real world appication

	PSO1	**3**	Design of communication system in different modulation schemes

EC230 LOGIC CIRCUIT DESIGN LAB

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: LOGIC CIRCUIT DESIGN LAB**	Course code**: EC230**
L-T-P**:0-0-3**	Credit**:1**

SYLLABUS:

List of Experiments: (Minimum 12 experiments are to be done)

1. Realization of functions using basic and universal gates (SOP and POS forms).

2. Design and Realization of half /full adder and subtractor using basic gates and universal gates.

3. 4 bit adder/subtractor and BCD adder using 7483.

4. 2/3 bit binary comparator.

5. Binary to Gray and Gray to Binary converters.

6. Study of Flip Flops: S-R, D, T, JK and Master Slave JK FF using NAND gates

7. Asynchronous Counter: Realization of 4-bit counter

8. Asynchronous Counter: Realization of Mod-N counters.

9. Asynchronous Counter:3 bit up/down counter

10. Synchronous Counter: Realization of 4-bit up/down counter.

11. Synchronous Counter: Realization of Mod-N counters.

12. Synchronous Counter:3 bit up/down counter

13. Shift Register: Study of shift right, SIPO, SISO, PIPO, PISO (using FF & 7495)

14. Ring counter and Johnson Counter. (using FF & 7495)

15. Realization of counters using IC's (7490, 7492, 7493).

16. Multiplexers and De-multiplexers using gates and ICs. (74150, 74154),

17. Realization of combinational circuits using MUX & DEMUX.

18. Random sequence generator.

19. LED Display: Use of BCD to 7 Segment decoder / driver chip to drive LED display

20. Static and Dynamic Characteristic of NAND gate (MOS/TTL)

PREREQUISITES:

EC207 Logic circuit design

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objective:

1	To study the working of standard digital ICs and basic building blocks
2	To design and implement combinational circuits
3	To design and implement sequential circuits

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Design and demonstrate functioning of various combination and sequential circuits
2	Work efficiently as an individual and as a part of a team to accomplish the given task

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	2			3									3	2	
CO2	3	2							3					3	2	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Apply the knowledge of LCD to design various combinational and sequential circuits
	PO2	2	Analyze various combination and sequential circuits
	PO5	3	Create, Select and apply modern simulation tools such as PsPice,VHDL etc. to design various combination and sequential circuits
CO2	PO1	3	Apply the expertise of each member in team to solve a problem
	PO2	2	Analyze the strength and weakness of members in the team
	PO9	3	Function effectively as an individual and as a member of team in the completion of experiment

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO1	3	Graduates will be able to provide novel approaches to design various combinational and sequential circuitsfor solving engineering problems
	PSO2	2	Graduates will able to apply the learnt knowledge of various combinational and sequential circuits for solving engineering problems
CO2	PSO1	3	Graduates will be able to provide novel approaches for effective team work

	PSO2	2	Graduates will able to apply the learnt knowledge about the importance of working as a team for solving engineering problems

EC 232 Analog Integrated Circuits Lab

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Analog Integrated Circuits Lab**	Course code**: EC232**
L-T-P**:0-0-3**	Credit**:1**

SYLLABUS:

List of Experiments: (Minimum 12 experiments are to be done)

1. Familiarization of Operational amplifiers - Inverting and Non inverting amplifiers, frequency response, Adder, Integrator, comparators.
2. Measurement of Op-Amp parameters.
3. Difference Amplifier and Instrumentation amplifier.
4. Schmitt trigger circuit using Op –Amps.
5. Astable and Monostable multivibrator using Op -Amps.
6. Timer IC NE555
7. Triangular and square wave generators using Op- Amps.
8. Wien bridge oscillator using Op-Amp - without & with amplitude stabilization.
9. RC Phase shift Oscillator.
10. Precision rectifiers using Op-Amp.
11. Active second order filters using Op-Amp (LPF, HPF, BPF and BSF).
12. Notch filters to eliminate the 50Hz power line frequency.
13. IC voltage regulators.
14. A/D converters- counter ramp and flash type.
15. D/A Converters- ladder circuit.
16. Study of PLL IC: free running frequency lock range capture range

PREREQUISITES:

1. Analog Integrated Circuits

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objective:

1	To acquire skills in designing and testing analog integrated circuits
2	To expose the students to a variety of practical circuits using various analog ICs

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Student should be able to design and demonstrate functioning of various analog circuits
2	Student should be able to analyze and design various applications of analog circuits

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	2	2	2	1	2									2	1	
CO2	3	2	3	1	2									3	1	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	2	Analog circuits can be designed and modified to provide solutions to real-life problems
	PO2	2	Design & demonstration of experiments will help to identify the problems and lead to modifications
	PO3	2	Design of basic analog circuits
	PO4	1	Team work required for designing & demonstration of circuits
	PO5	2	Designing enhances engineering skills
CO2	PO1	3	IC circuits can be used in a wide-range of applications like communication, instrumentation etc.
	PO2	2	Design & analysis of analog IC circuits
	PO3	3	A wide range of application can be developed using linear ICs. Everyday electronics makes use of ICs extensively
	PO4	1	Group work is essential for all the activities so as to draw meaningful inferences
	PO5	2	Design & analysis are key to engineering

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO1	3	Design & demonstration of analog circuits involves circuit implementation, testing & trouble shooting
	PSO2	1	With prior knowledge of EDA tools, students can use their knowledge to simulate, experiment & develop newer applications
CO2	PSO2	2	With prior knowledge of EDA tools, students can use their knowledge to simulate, experiment & develop newer applications

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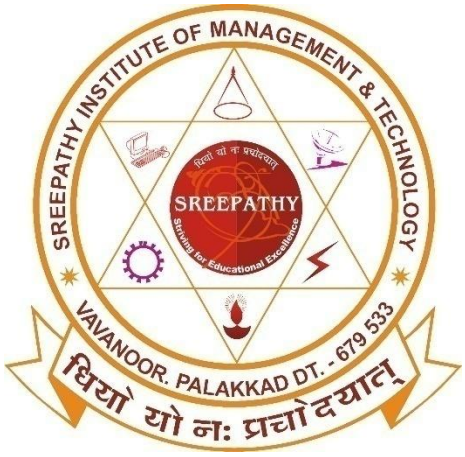


COURSE HANDBOOK

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER V

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

VISION

To transform students into motivated, competent and socially committed engineering professionals in the core domains of Electronics & Communication through quality education and research orientation with emphasis on holistic approach.

MISSION

- To nurture young individuals into knowledgeable, skillful and ethical professionals in their pursuit of Electronics & Communication Engineering.
- To empower budding engineers with the state of art technology, team work and leadership qualities to stride forth as resourceful citizens.
- To develop industry interaction for innovation and product development to solve real time problems.

B-TECH PROGRAMME

PROGRAMME EDUCATIONAL OBJECTIVES (PEO):

After successful completion of the program, the graduates will be

PEO1: Able to exhibit their innovative ideas and management skills to analyze, design, develop and implement electronic systems or equipment

PEO2: Able to apply knowledge in mathematics, science and computing to the field of Electronics & Communication Engineering either in industry, academics or research career with creativity and commitment

PEO3: Receptive to new technologies and attain professional competence through lifelong learning.

PEO4: Able to embody a commitment to professional ethics, diversity and social awareness in their professional career.

PROGRAM OUTCOMES (PO):

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

2. 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.

3. 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.

4. 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.

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

6. 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.

7. 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.

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

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

10. 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.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering 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.

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

PROGRAM SPECIFIC OUTCOMES (PSOS):

Electronics and Communication Engineering graduates will be able to:

PSO1 – have the capacity to apply the concepts of Electronics, Communications, Signal processing, VLSI, Control systems, Cryptography etc., in the analysis, design**,** development and implementation of integrated electronic systems as well as to interpret and synthesize the experimental data leading to valid conclusions

PSO2 – have competence in using latest hardware and software tools, along with analytical and managerial skills for the design and analysis of complex electronic systems in furtherance to research activities.

PSO3 – be an acquaintance of social and environmental awareness with ethical responsibilities to have a successful career in real-world applications by keeping in trend with technological changes.

EC301 DIGITAL SIGNAL PROCESSING

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: DIGITAL SIGNAL PROCESSING**	Course code**: EC 301**
L-T-P**: 3-1-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	The Discrete Fourier Transform: DFT as a linear transformation, Relationship of the DFT to other transforms, IDFT , Properties of DFT and examples Circular convolution, Linear Filtering methods based on the DFT- linear convolution using circular convolution, overlap save and overlap add methods, Frequency Analysis of Signals using the DFT	11	15
II	Computation of DFT: Radix-2 Decimation in Time and Decimation in Frequency FFT Algorithms IDFT computation using Radix -2 FFT Algorithms Efficient computation of DFT of Two Real Sequences and a 2N-Point Real Sequence	7	15
III	Design of FIR Filters- Symmetric and Anti-symmetric FIR Filters Design of linear phase FIR Filters using Window methods (rectangular, Hamming and Hanning) and frequency sampling Method Comparison of Design Methods for Linear Phase FIR Filters	9	15
IV	Design of IIR Digital Filters from Analog Filters (Butterworth) IIR Filter Design by Impulse Invariance, and Bilinear Transformation Frequency Transformations in the Analog and Digital Domain	9	15
V	Block diagram and signal flow graph representations of filters FIR Filter Structures: (Linear structures), Direct Form, Cascade Form and Lattice Structure IIR Filter Structures: Direct Form, Transposed Form,	9	20

	Cascade Form and Parallel Form .Computational Complexity of Digital filter structures Computer architecture for signal processing : Introduction to TMS320C67xx digital signal processor.		
VI	Multi-rate Digital Signal Processing: Decimation and Interpolation (Time domain and Frequency Domain Interpretation without proof) Finite word length effects in DSP systems: Introduction (analysis not required), fixed-point and floating-point DSP arithmetic, ADC quantization noise Finite word length effects in IIR digital filters: coefficient quantization errors Finite word length effects in FFT algorithms: Round off errors	9	20

TEXT BOOKS:

1	Oppenheim A. V., Schafer R. W. and Buck J. R., Discrete Time Signal Processing, 3/e, Prentice Hall, 2007.
2	Proakis J. G. and Manolakis D. G., Digital Signal Processing, 4/e, Pearson Education, 2007

REFERENCES:

1	Chassaing, Rulph., DSP applications using C and the TMS320C6x DSK. Vol. 13. John Wiley & Sons, 2003.
2	Ifeachor E.C. and Jervis B. W., Digital Signal Processing: A Practical Approach, 2/e, Pearson Education, 2009.
3	Lyons, Richard G., Understanding Digital Signal Processing, 3/e. Pearson Education India, 2004.
4	Mitra S. K., Digital Signal Processing: A Computer Based Approach, 4/e McGraw Hill (India), 2014.
5	NagoorKani, Digital Signal Processing, 2e, Mc Graw –Hill Education New Delhi, 2013
6	Salivahanan, Digital Signal Processing,3e, Mc Graw –Hill Education New Delhi, 2014 (Smart book)
7	Singh A., Srinivasan S., Digital Signal Processing: Implementation Using DSP Microprocessors, Cenage Learning, 2012.

PREREQUISITES:

EC 202 Signals & Systems

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To provide an understanding of the principles, algorithms and applications of DSP
2	To study the design techniques for digital filters
3	To give an understanding of Multi-rate Signal Processing and its applications
4	To introduce the architecture of DSP processors

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Understand the basics of Discrete Fourier Transform and their properties
2	Implement various methods of the Fast Fourier Transform.
3	Design an analog butterworth IIR filter and perform frequency transformations in digital and analog domain
4	Design an FIR filter using window techniques and perform frequency transformations in digital and analog domain.
5	Able to realize various FIR and IIR filter structures and get an overall idea about the TMS320C67XX DSP processor
6	Analyze various finite word length effects in digital filters along with the concepts of decimation and interpolation.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	**3**	**3**		**2**	**2**									**3**	**2**	
CO2	**3**	**3**		**2**	**2**									**3**	**2**	
CO3	**3**	**3**		**2**	**2**									**3**	**2**	

CO4	**3**	**3**		**2**	**2**									**3**	**2**	
CO5	**3**	**3**		**2**	**2**									**3**	**2**	
CO6	**3**	**3**		**2**	**2**									**3**	**2**	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Apply the knowledge of DFT and its properties
	PO2	**3**	Analyze the various properties and applications of DFT
	PO4	**2**	Interpret the various applications and properties of DFT to provide valid conclusions
	PO5	**2**	Create, select, and apply modern simulation tools suchs MATLAB for computation of DFT
CO2	**PO1**	**3**	Apply the knowledge of FFT for efficient and fast computation of DFT
	PO2	**3**	Analyze the various RADIX 2 methods for FFT computation such as DIT and DIF
	PO4	**2**	Interpret the various applications of FFT
	PO5	**2**	Create , select and apply modern tools like MATLAB for performing FFT of digital signals
CO3	**PO1**	**3**	Apply the knowledge of IIR filter design methods
	PO2	**3**	Analyze the various methods of IIR filter design techniques
	PO4	**2**	Interpret the various methods of IIR filter design techniques
	PO5	**2**	Apply modern tools for the design of IIR filters
CO4	**PO1**	**3**	Apply the knowledge of FIR filter design methods
	PO2	**3**	Analyze the various methods of FIR filter design techniques
	PO4	**2**	Interpret the various methods of FIR filter design techniques

	PO5	**2**	Apply modern tools for the design of FIR filters
CO5	**PO1**	**3**	Apply the the concept of block diagram reduction and signal flow graph for the realization of FIR & IIR filters
	PO2	**3**	Analyze the various techniques FIR & IIR filter realization
	PO4	**2**	Interpret the various methods of FIR & IIR filter realization techniques
	PO5	**2**	Use modern DSP processor for the efficient implementation of filters and others systems
CO6	**PO1**	**3**	Apply the knowledge of concepts of decimation and interpolation
	PO2	**3**	Analyze the various finite word length effect of filters
	PO4	**2**	Interpret the various finite word length effect of filters and draw valid conclusions about the concepts of decimation and interpolation
	PO5	**2**	Use modern simulation tools to perform decimation and interpolation

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Graduates will be able to provide novel approaches to identify various properties and applications of DFT
	PSO2	**2**	Graduates will able to apply the learnt knowledge to identify various properties and applications of DFT
CO2	**PSO1**	**3**	Graduates will apply the learnt knowledge about fast and efficient computation of frequency domain signals throughout their life for developing new ideas
	PSO2	**2**	Graduates will be aware about the various contributions that can be made to real world using the concept of FFT.
CO3	**PSO1**	**3**	Graduates will Identify various frequency domain transformations and design methods of filters
	PSO2	**2**	Graduates will able to apply the learnt knowledge about filter design to real world applications
CO4	**PSO1**	**3**	Graduates will Identify design methods of FIR filters
	PSO2	**2**	Graduates will able to apply the learnt knowledge about filter design to real world applications

CO5	**PSO1**	**3**	Graduates will be able to provide novel approaches to different types of filter realization methods to real world applications
	PSO2	**2**	Graduates will able to apply the learnt knowledge about the DSP processors to real world applications
CO6	**PSO1**	**3**	Graduates will be able to provide novel approaches about decimation and interpolation
	PSO2	**2**	Graduates will able to apply the learnt knowledge about the various finite word length effects to real world applications

EC 303 APPLIED ELECTROMAGNETIC THEORY

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Applied Electromagnetic Theory**	Course code**: EC 303**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Review of vector calculus, Spherical and Cylindrical coordinate system, Coordinate transformation Curl, Divergence, Gradient in spherical and cylindrical coordinate system. Electric field – Application of Coulomb's law, Gauss law and Amperes current law (proof not required, simple problems only) Poisson and Laplace equations (proof not required, simple problems only), Determination of E and V using Laplace equation. Derivation of capacitance and inductance of two wire transmission line and coaxial cable. Energy stored in Electric and Magnetic field. Displacement current density, continuity equation. Magnetic vector potential. Relation between scalar potential and vector potential.	8	15
II	Maxwell's equation from fundamental laws. Boundary condition of electric field and magnetic field from Maxwell's equations . Solution of wave equation .Propagation of plane EM wave in perfect dielectric, lossy medium, good conductor, media-attenuation, phase velocity, group velocity, skin depth.	6	15
III	Reflection and refraction of plane electromagnetic waves at boundaries for normal & oblique incidence (parallel and perpendicular polarization), Snell's law of refraction, Brewster angle. Power density of EM wave, Poynting vector theorem, Complex Poynting vector. Polarization of electromagnetic wave-linear, circular and elliptical polarisation.	9	15

IV	Uniform lossless transmission line - line parameters Transmission line equations, Voltage and Current distribution of a line terminated with load .Reflection coefficient and VSWR. Derivation of input impedance of transmission line.	5	15
V	Transmission line as circuit elements (L and C). Half wave and quarter wave transmission lines. Development of Smith chart - calculation of line impedance and VSWR using smith chart. Single stub matching (Smith chart and analytical method).	7	20
VI	Parallel-Plate Waveguide - TE & TM waves. The hollow rectangular wave guide – modes of propagation of wave-dominant mode, group velocity and phase velocity - derivation and simple problems only. Attenuation in wave guides, guide wavelength and impedance -derivation and simple problems only.	7	20

TEXT BOOKS:

1	John D. Kraus, Electromagnetics, 5/e, TMH, 2010.
2	Mathew N O Sadiku, Elements of Electromagnetics, Oxford University Press, 6/e, 2014
3	William, H., Jf Hayt, and John A. Buck. Engineering Electromagnetics. McGraw-Hill, 8/e McGraw-Hill, 2014.

REFERENCES:

1	Jordan and Balmain , Electromagnetic waves and Radiating Systems, PHI, 2/e,2013
2	Joseph A Edminister , Electromagnetics, Schaum‘s Outline Series McGraw Hill, 4/e, 1995
3	Martin A Plonus , Applied Electromagnetics, McGraw Hill, 2/e,1978.
4	Matthew N.O. Sadiku & S.V. Kulkarni "‘Principles of Electromagnetics’, Oxford University Press Inc. Sixth Edition, Asian Edition,2015
5	Nannapaneni Narayana Rao, Elements of Engineering Electromagnetics, Pearson, 6/e, 2006.
6	Umran S. Inan and Aziz S. Inan, Engineering Electromagnetics, Pearson, 2010.

PREREQUISITES:

NIL

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To introduce basic mathematical concepts related to electromagnetic vector fields.
2	To impart knowledge on the basic concepts of electric and magnetic fields
3	To develop a solid foundation in the analysis and application of electromagnetic fields, Maxwell's equations and Poynting theorem.
4	To become familiar with propagation of signal through transmission lines and waveguides.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	To develop a solid foundation and a fresh perspective in the analysis and application of electromagnetic fields.
2	To analyze the propagation of electromagnetic waves in different media
3	To identify the behavior of waves at different boundaries of two mediums and to calculate the energy associated with the EM wave
4	To analyze the characteristics of transmission lines.
5	To solve the different transmission line problems using smith chart
6	To understand the different modes of propagation in waveguides

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	**3**	**3**		**2**										**2**		
CO2	**3**	**3**		**2**										**2**		
CO3	**3**	**2**	**2**	**2**										**2**		
CO4	**3**	**3**	**2**	**3**										**2**		
CO5	**2**	**3**	**2**	**2**										**2**		
CO6	**2**	**3**	**2**	**2**												

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Students will acquire the knowledge of vector calculus and apply this knowledge to understand electric fields and solve problems
	PO2	**3**	Solving problems using vector calculus
	PO4	**2**	analysis and interpretation of Electrostatic effects
CO2	**PO1**	**3**	Students will acquire the knowledge of vector calculus and apply this knowledge to understand magnetic fields and solve problems
	PO2	**3**	Solving problems using vector calculus
	PO4	**2**	analysis and interpretation of Magneto static effects
CO3	**PO1**	**3**	Study of MW TWT and measurement of MW parameter
	PO2	**2**	Analysis of MW semiconductor devices

	PO3	**2**	Design of semiconductor device s for efficient MW communication system
	PO4	**2**	Analysis of TED 'S and avalanche transit time devices
CO4	**PO1**	**3**	Microwave hybrid circuits, scattering parameters calculation
	PO2	**3**	Identify and formulate the S-Matrix for various passive devices such as waveguide tee junctions and directional couplers
	PO3	**2**	Introduction of non reciprocal device s such as isolator and circulator
	PO4	**3**	Analysis of various passive MW devices
CO5	**PO1**	**2**	Basic principle of operation of solid state devices
	PO2	**3**	Analysis of various solid state devices such as transistor, tunnel diode and gunn diode
	PO3	**2**	Design of MW oscillators using tunnel , gunn diode for efficient MW communication system
	PO4	**2**	Designing experiments such as gunn characteristics and tunnel diode characteristic
CO6	**PO1**	**2**	Basics of Radar equation
	PO2	**3**	Analysis of CW radar and MTI radar
	PO3	**2**	Design of Radar transmitter and receiver
	PO4	**2**	Design experiments related to radar modulator, Mixers etc

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**2**	Demonstrate their skills in designing, implementing EM field based applications
CO2	**PSO1**	**2**	Demonstrate their skills in designing, implementing EM field based applications

CO3	**PSO1**	**2**	Demonstrate their skills in designing, implementing EM field based applications
CO4	**PSO1**	**2**	Demonstrate their skills in designing, implementing EM field based applications
CO5	**PSO1**	**2**	Demonstrate their skills in designing, implementing EM field based applications

EC 305 MICROPROCESSOR AND MICROCONTROLLER

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Microprocessor and Microcontroller**	Course code**: EC 305**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Microprocessors: Introduction, organization of a microprocessor based system, evolution of microprocessors, 8085 architecture and its operation, microprocessor initiated operations and bus organization, pin configuration and functions, generation of control signals for external operations- fetch, IO/M, read/write.	5	15
II	Machine cycles and bus timings, Addressing modes, instruction set instruction classification. Overview/concept of peripheral IC interfacing with 8085 microprocessor (8251, 8253, 8255, 8279). Simple examples in assembly language programming for 8085 (only for internal examination) Introduction to development tools: IDE, cross assembler, builder, linker and debugger.(not required for exam)	12	15
III	Introduction to 8086 and comparison between 8086,80286,80386,80486 and Pentium Microcontrollers: Introduction, comparison between microprocessors and microcontrollers, microcontroller families, 8051- features, architecture, memory organization, registers, I/O ports, pin configuration and functions.	8	15
IV	Addressing modes, instruction set, instruction classification. Assembly language programming examples for 8051.	5	15
V	Interrupts in 8051: Types, interrupt source, interrupt handling and programming Timer/Counter programming: Operating modes, time delay generation, Waveform	6	20

	generation. Serial communication: RS 232 interface, registers in UART, modes of operation, programming examples for serial data transmission and reception .		
VI	Interfacing: Interfacing (block schematic and assembly language programming) of DIP switch, stepper motor, ADC, DAC, LEDs and seven segment displays, alphanumeric LCD module with 8051.	6	20

TEXT BOOKS:

1	Kenneth J. Ayala, The 8051 Microcontroller, Cengage learning, 3/e.
2	Lyla B.Das : Microprocessors and Microcontrollers, Pearson Education, India, 2011
3	Ramesh S. Goankar. 8085 Microprocessors Archiecture Application and Programming. Penram International, 5/e.

REFERENCES:

1	Aditya P Mathur, Introduction to Microprocessor. Tata Mc Graw – Hill
2	Han Way Hung, "PIC Microcontroller, An introduction to software and hardware interfacing ", Cenage learning
3	I.Scott Mackenzie, Raphel C.-W Phan, The 8051 microcontroller, 4th edition.
4	Muhammed Ali Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education, 2nd edition
5	Nagoorkani, Microprocessors and Microcontrollers 2e, McGraw Hill Education India, 2012
6	Soumitra Kumar Mandal. Microprocessors and Microcontrollers Architecture, Programming & Interfacing Using 8085, 8086 and 8051, McGraw Hill Education (2011).

PREREQUISITES:

EC207 Logic Circuit Design

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objective:

1	To understand fundamental operating concepts of microprocessors and microcontrollers
2	To communicate with various devices using controller
3	To design a microcontroller based system with the help of the interfacing devices.
4	To program the controller to make various peripherals work for specified application.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Discuss the architecture and memory organization of microprocessor system in depth.
2	Illustrate the peripheral IC interfacing with 8085 microprocessor.
3	Differentiate various processors and discuss the architecture and memory organization of 8051 microcontroller.
4	Demonstrate programming proficiency using the various addressing modes and data transfer instructions of the microcontroller.
5	Perform the detailed hardware design and develop the program using SFRs.
6	Design and develop the assembly language program for interfacing the peripheral device to the 8051 microcontroller

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3													2		
CO2	2				2									2		
CO3	3													2		
CO4	3		2											2	2	
CO5	2															
CO6			2													

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Apply the knowledge of architecture of microprocessor for the designing of a digital system.
CO2	PO1	2	Design and Develop a interfacing circuit using 8085 microprocessor.
	PO5	2	Select the appropriate tool for the analysis or execution of the program.
CO3	PO1	3	Get the basic idea about various processors and the internal architecture of a microcontroller.
CO4	PO1	3	Apply the knowledge of addressing modes and instructions to develop algorithms of a given problem.
	PO3	2	Analyze how to develop an assembly language program for various mathematical operations.
CO5	PO1	2	Apply the knowledge of SFRs for the design and analysis of timer and interrupt programming using 8051.
CO6	PO3	2	Analyze the given problem and develop an interfacing hardware with ALP.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**2**	Apply their knowledge about the internal architecture of a basic microprocessor for the designing of a microprocessor or embedded system
CO2	**PSO1**	**2**	Demonstrate their skills in developing an interfacing hardware with 8085 microprocessor
CO3	**PSO1**	**2**	Apply their idea about the internal architecture of a basic microcontroller for the designing of a microcontroller or embedded system
CO4	**PSO1**	**2**	Apply their knowledge to analyze a problem and develop an assembly language program
	PSO2	**2**	Apply their knowledge and skills to develop and debug the assembly language program related to 8051 microcontroller
CO5	**PSO2**	**2**	Demonstrate their skills in hardware design and develop a program using the SFR of 8051 microcontroller
C06	**PSO2**	**2**	Demonstrate their skills in designing and testing of an assembly level program for interfacing the peripheral device to the 8051 microcontroller

EC307 POWER ELECTRONICS & INSTRUMENTATION

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Power Electronics & Instrumentation**	Course code**: EC307**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Linear Electronics versus Power Electronics - Power semiconductor switches. Power diodes-structure, static and dynamic characteristics Power transistors - Power BJT, Power MOSFET, GTO and IGBT Steady state and switching characteristics of Power BJT, Power MOSFET and IGBT.	8	15
II	Introduction to Switched mode regulators .Buck, Boost and Buck-Boost DC-DC converters .Waveforms and expression of DC-DC converters for output voltage, voltage and current ripple under continuous conduction mode. (Derivation not required) .Isolated converters - Flyback, Forward, Push Pull, Half Bridge and Full Bridge Converters - waveforms and governing equations. (Derivation not required)	7	15
III	Overview of SMPS, Switched mode inverters- Principles of PWM switching schemes. Single phase inverters - half bridge, full bridge and push pull. UPS - on line and off line. Three phase inverters - PWM and Space vector modulation in three phase inverters.	8	15
IV	Generalized configurations of instruments - Functional elements. Classification of instruments Generalized performance characteristics of instruments - Static characteristics and Dynamic characteristics. Measurement of: resistance using Wheastone's bridge, inductance using Maxwell-Wien bridge, and capacitance using Schering's bridge.	5	15

V	Transducers - Classification, Selection of transducers. Resistance transducers - Principle of operation, strain gauge. Inductive Transducers: LVDT. Capacitive transducers - different types, capacitor microphone, Hall Effect transducer, proximity transducers. .	7	20
VI	Electronic Multimeter, Audio Power Meter, RF power meter . Digital Instruments - Basics, digital measurement of time, phase, frequency and digital voltmeter. Frequency synthesizer, Spectrum analyzers, Logic State analyzers (block diagram only).	5	20

TEXT BOOKS:

1	Bell D. A., Electronic Instrumentation and Measurements, Oxford University Press, 2003
2	Rashid M. H., "Power Electronics Circuits, Devices and Applications", Prentice Hall India, Third Edition, New Delhi.
3	Umanand L., Power Electronics Essentials and Applications, Wiley India, 2015.

REFERENCES:

1	Daniel W. Hart, Power Electronics, McGraw Hill, 2011
2	Doeblin E., Measurement Systems, 5/e, McGraw Hill, 2003
3	Helfrick A. D. and W. D. Cooper: Modern Electronic Instrumentation and Measurement Techniques, 5/e, PHI, 2003.
4	Mandal, Power Electronics 1e, McGraw Hill Education India, 2014
5	Mohan N. and T. M. Undeland, Power Electronics: Converters, Applications and Design, John Wiley, 2007.
6	Nakra, Instrumentation, Measurement and Analysis,4e, Mc Graw –Hill Education New Delhi,2016.
7	Patranabis D., Principles of Electronic Instrumentation, PHI, 2008.

PREREQUISITES:

EC205 Electronic Circuits

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objective:

1	To provide an insight on the concepts of Power Electronics and Electronic instruments.
2	To study the applications of Power electronics such as Switched mode regulators and inverters.
3	To develop understanding of the concept of Transducers and Digital instruments.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	The students will be able to understand the concepts of Power Electronics and the various applications.
2	Students will be able to recall the applications of Power electronics such as Switched mode regulators and inverters .
3	Students will be able to distinguish various types of Switched mode regulators.
4	Students will be able to analyze different types of bridge circuit.
5	The students will be able to understand the principle of operation of Transducers.
6	Students will be able to understand and learn about various measuring equipments.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	1		2	1										2		1
CO2	1		2			1								2		1
CO3	1		2			1								1		1
CO4	1		2			1								1		1

CO5				**1**		**2**								**2**	**1**	**1**
CO6			**1**	**2**										**2**	**1**	**1**

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**1**	Students will be apply the knowledge of mathematics and science to solve various fundamental problems in power electronics.
	PO3	**2**	Students will be able to design solutions with appropriate consideration for environmental issues such as energy management with advanced power semiconductor devices.
	PO4	**1**	Students will be able to design solutions with appropriate consideration for environmental issues such as energy management with advanced power semiconductor devices.
CO2	**PO1**	**1**	Students will be apply the knowledge of mathematics and science to solve various fundamental problems for the application of power electronics.
	PO3	**2**	Students will be able to develop solutions using inverters for the further development of society
	PO6	**1**	Students will be able to apply the knowledge of regulators and inverters for the society.
CO3	**PO1**	**1**	Application of mathematics in different types of switched mode regulators
	PO3	**2**	Students will be able to design switched mode converters for applications in the field of renewable energy.
	PO6	**1**	Students will be able to apply the knowledge of regulators and inverters for the society.
CO4	**PO1**	**1**	Application of mathematical equations for deriving bridge circuit.
	PO3	**2**	Students will be able to design bridge circuit.
	PO6	**1**	Students will be able to apply the knowledge of bridge circuit for the measurement.
CO5	**PO4**	**1**	Students will be able to use the knowledge of different bridges to conduct complex experiments such as LVDT, LDR etc
	PO6	**2**	Students will be able to apply the knowledge of transducer to assess the societal, health, safety, legal and cultural issues.
C06	**PO3**	**1**	Students will be able to develop solutions using measurement equipments for future applications
	PO4	**2**	Students will be able to conduct experiments using various measuring instruments

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**2**	Basic idea about power electronic circuit.
	PSO3	**1**	Applications of power electronics circuits in real world applications.
CO2	**PSO1**	**2**	Basic idea about power electronic circuit.
	PSO3	**1**	Applications of power electronics circuits in real world applications.
CO3	**PSO1**	**1**	Basic idea about power electronic circuit.
	PSO3	**1**	Applications of power electronics circuits in real world applications.
CO4	**PSO1**	**1**	Basic idea about measurement circuit.
	PSO2	**1**	Apply the knowledge of bridge circuits in practical applications
	PSO3	**1**	Applications of measurement circuits in real world applications.
CO5	**PSO1**	**2**	Basic idea about transducer circuit.
	PSO2	**1**	Apply the knowledge of transducer circuits in practical applications
	PSO3	**1**	Applications of transducer circuits in real world applications.
CO6	**PSO1**	**2**	Basic idea about measuring circuit.
	PSO2	**1**	Apply the knowledge of measuring circuits in practical applications
	PSO3	**1**	Applications of measuring circuits in real world applications.

EC365 BIOMEDICAL ENGINEERING

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Biomedical Engineering**	Course code**: EC365**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction to bio-medical instrumentation system, overview of anatomy and physiological systems of the body. Sources of bio-electric potential: Resting and action potential, propagation of action potentials. Bioelectric potentials examples (ECG, EEG, EMG, ERG, EOG, EGG, etc introduction only.) Electrode theory: Nernst relation Bio potential electrodes: Microelectrodes, skin surface electrodes, needle electrodes. Instrumentation for clinical laboratory: Bio potential amplifiers-instrumentation amplifiers, carrier amplifiers, isolation amplifiers, chopper amplifiers .Heart and cardiovascular system (brief discussion), electro conduction system of the heart. Electrocardiography, ECG machine block diagram, ECG lead configurations, ECG recording system, Einthoven triangle, analysis of ECG signals.	6	15
II	Measurement of blood pressure: Direct, indirect and relative methods of blood pressure measurement, auscultatory method, oscillometric and ultrasonic non-invasive pressure measurements. Measurement of blood flow: Electromagnetic blood flow meters and ultrasonic blood flow meters.	7	15
III	The human nervous system. Neuron, action potential of brain, brain waves, types of electrodes, placement of electrodes, evoked potential, EEG recording, analysis of EEG. Electromyography: Nerve conduction velocity, instrumentation system for EMG. Physiology of respiratory system (brief discussion), Respiratory	8	15

	parameters, spirometer, body plethysmographs, gas exchange and distribution. Instruments for clinical laboratory: Oxymeters, pH meter, blood cell counter, flame photometer, spectrophotometer		
IV	Therapeutic Equipment's: Principle, block schematic diagram, working and applications of : pacemakers, cardiac defibrillators, heart–lung machine, dialyzers, surgical diathermy equipment, ventilators	6	15
V	Medical Imaging systems (Basic Principle only): X-ray imaging - Properties and production of X-rays, X-ray machine, applications of X-rays in medicine. Computed Tomograpy: Principle, image reconstruction, scanning system and applications. Ultrasonic imaging systems: Basic pulse echo system, propagation of ultrasonic through tissues and reflections, display types, A-Scan, B-Scan, M-Scan, applications, real-time ultrasonic imaging systems and probes. .	7	20
VI	Magnetic Resonance Imaging – Basic NMR components, Biological effects and advantages of NMR imaging. Biomedical Telemetry system: Components of biotelemetry system, application of telemetry in medicine, single channel telemetry system for ECG and temperature Patient Safety: Electric shock hazards, leakage current, safety codes for electro medical equipments	6	20

TEXT BOOKS:

1	K S Kandpur, "Hand book of Biomedical instrumentation", Tata McGraw Hill 2nd e/d.
2	Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Biomedical Instrumentation and Measurements, PHI, 2nd Edition, 2004

REFERENCES:

1	Barbara Christe, Introduction to Biomedical Instrumentation, Cambridge University Press, 2008.
2	J. J. Carr, "Introduction to Biomedical Equipment Technology", Pearson Education 4th e/d.
3	John G Webster, "Medical Instrumentation application and design", John Wiley 3rd e/d.
4	Richard Aston, "Principle of Biomedical Instrumentation and Measurement". Merrill Education/Prentice Hall.

PREREQUISITES:

NIL

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objective:

1	To introduce student to basic biomedical engineering
2	To understand the anatomy & physiology of major systems of the body in designing equipment for medical treatments.
3	To impart knowledge about the principle and working of different types of bio-medical electronic equipment/devices.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	To understand the importance of electronics engineering in medical field.
2	To understand the principle, working and applications of various diagnosis and therapy related equipments.
3	To understand the working of various instruments for clinical laboratory.
4	To understand the working of Therapeutic equipments.
5	To understand the basic principle and applications of medical imaging systems.
6	To understand the importance of telemetry in patient care and patient safety in electromedical equipments.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	3	3	2		3								2	1	
CO2	3	3	3	2	2	3								1		
CO3	3	3	3	2	2	2				1		1		1	2	
CO4	3	3	3	2	2	2						2		1	1	
CO5	3	3	3	2										1	1	
CO6	3	3	3	2										1	1	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Students apply science and basic electronics to understand biomedical engineering
	PO2	3	Analysis and research of literature in engineering and natural sciences
	PO3	3	Equip students in design and development for public health
	PO4	2	Understanding demands analysis of different systems
	PO6	3	Assessment of health and safety are paramount
CO2	PO1	3	Knowledge of basic subjects are essential
	PO2	3	Equipment understanding involves circuit analysis
	PO3	3	Equipments are designed to meet the design criteria

	PO4	**2**	Design criteria are made through research
	PO5	**2**	To measure the blood pressure.
	PO6	**3**	Analyze blood flow methods
CO3	**PO1**	**3**	Knowledge of basic subjects are essential
	PO2	**3**	To understand the structure and working of brain.
	PO3	**3**	Analyze clinical instruments.
	PO4	**2**	EEG electrode placement.
	PO5	**2**	Modeling required to completely understand circuit operations
	PO6	**2**	Assessment of health and safety are paramount
CO4	**PO1**	**3**	Knowledge of clinical instruments are essential
	PO2	**3**	Equipment understanding involves circuit analysis
	PO3	**3**	Equipment‟s are designed to meet the design criteria
	PO4	**2**	Design criteria are made through research
	PO5	**2**	Modeling required to completely understand imaging
CO5	**P01**	**3**	To study the imaging systems.
	P02	**3**	Knowledge of principle of computer tomography.
	P03	**3**	Analyse Ultrsonic imaging systems.
	PO4	**2**	Apply the knowledge in real time applications
C06	**P01**	**3**	To understand the principle of MRI.
	P02	**3**	To study the components of telemetry system.
	P03	**3**	Assesment of safety codes.
	PO4	**2**	Electric shock hazards and safety measures.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**2**	Fundamentals of biomedical helps electronics engineers to design and develop electronic systems for health care
	PSO2	**2**	Fundamentals of logic circuits serves the Health industry and research
CO2	**PSO1**	**2**	Concepts of human body helps electronics engineers to design and develop efficient electronic systems
CO3	**PSO1**	**2**	Fundamentals of bio potentials helps electronics engineers to design and develop electronic systems
	PSO2	**2**	Concepts of Theraputical serves the medical industry and research
CO4	**PSO1**	**2**	Fundamentals of ECG,EEG electronics engineers to design and develop monitoring systems
	PSO2	**2**	Concepts of Clinical laboratory serves the medical electronics industry and research
CO5	**PSO1**	**1**	Fundamentals of medical imaging, computer tomography to design and develop monitoring systems.
	PSO2	**1**	Concepts of ultrasonic imaging systems serves the medical electronics industry and research
CO6	**PSO1**	**1**	Fundamentals of telemetry system to develop monitoring systems
	PSO2	**1**	Concepts of leakage current and safety codes for electro medical equipment's.

HS300 PRINCIPLES OF MANAGEMENT

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Principles Of Management**	Course code**: HS300**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction to Management: definitions, managerial roles and functions; Science or Art perspectives- External environment-global, innovative and entrepreneurial perspectives of Management (3 Hrs.)– Managing people and organizations in the context of New Era- Managing for competitive advantage - the Challenges of Management (3 Hrs.)	6	15
II	**Early Contributions and Ethics in Management**: Scientific Management- contributions of Taylor, Gilbreths, Human Relations approach-contributions of Mayo, McGregor's Theory, Ouchi's Theory Z (3 Hrs.) Systems Approach, the Contingency Approach, the Mckinsey 7-S Framework Corporate Social responsibility- Managerial Ethics. (3 Hrs)	6	15
III	**Planning:** Nature and importance of planning, -types of plans (3 Hrs.)- Steps in planning, Levels of planning - The Planning Process. – MBO (3 Hrs.).	6	15
IV	**Organising for decision making:** Nature of organizing, organization levels and span of control in management Organisational design and structure –departmentation, line and staff concepts (3 Hrs.) Limitations of decision making- Evaluation and selecting from alternatives- programmed and non programmed decisions - decision under certainty, uncertainty and risk-creative process and innovation (3 Hrs.)	6	15

V	**Staffing and related HRD Functions:** definition, Empowerment, staff – delegation, decentralization and recentralisation of authority – Effective Organizing and culture-responsive organizations –Global and entrepreneurial organizing (3 Hrs.) Manager inventory chart-matching person with the job-system approach to selection (3 Hrs.) Job design-skills and personal characteristics needed in managers-selection process, techniques and instruments (3 Hrs.) .	9	20
VI	**Leading and Controlling:** Leading Vs Managing – Trait approach and Contingency approaches to leadership - Dimensions of Leadership (3 Hrs.) - Leadership Behavior and styles – Transactional and Transformational Leadership (3 Hrs.) Basic control process- control as a feedback system – Feed Forward Control – Requirements for effective control – control techniques – Overall controls and preventive controls – Global controlling (3 Hrs.)	9	20

TEXT BOOKS:

1	Harold Koontz and Heinz Weihrich, *Essentials of Management*, McGraw Hill Companies, 10th Edition.

REFERENCES:

1	Daft, *New era Management*, 11th Edition, Cengage Learning.
2	Griffin, *Management Principles and Applications*, 10th Edition, Cengage Learning
3	Heinz Weirich, Mark V Cannice and Harold Koontz, *Management: a Global, Innovative and Entrepreneurial Perspective*, McGraw Hill Education, 14th Edition
4	Peter F Drucker, *The Practice of Management*, McGraw Hill, New York
5	Robbins and Coulter, *Management*, 13th Edition, 2016, Pearson Education

PREREQUISITES:

NIL

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objective:

1	To develop ability to critically analyse and evaluate a variety of management practices in the contemporary context.
2	To understand and apply a variety of management and organizational theories in practice
3	To be able to mirror existing practices or to generate their own innovative management competencies, required for today's complex and global workplace.
4	To be able to critically reflect on ethical theories and social responsibility ideologies to create sustainable organisations.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	To know about management and basics management functions and problems
2	To evaluate about the early contributions and ethics related to management and its applications
3	To develop planning skills, procedures and levels of planning in day to day life activities.
4	Analyzing of organizational models, levels, structure and make the ability to decision making power on students
5	To familiarize the staffing procedures and related functions
6	To analyze the aspects related to leader and its functions, controlling and its applications and need in an organization and daily life

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1								3	3			
CO2									3		2	
CO3											2	3
CO4						2					2	
CO5							3		2			
CO6						3	2		2			

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO8	3	To analyzing the managerial functions and roles it should concerned the related social and cultural issues
	PO9	3	The functions of management are highly correlated with the ethics related to management
CO2	PO9	3	To apply the managerial theories it is necessary to analyze the professional ethics and responsibilities
	PO11	2	The application of management theory is related to demonstration knowledge and understanding of theories
CO3	PO11	2	Planning procedures are depends upon the different kinds of managerial practices and roles
	PO12	3	Planning is a lifelong learning process which is changed according to programs, and levels of organizations
CO4	PO6	2	The decision making is an important tool which is connected to entire work forces

	PO11	2	The organizational pattern, structure and levels determination is depend on the business practices followed by them
CO5	PO7	3	The proper communication skills is essential for each staff with co workers
	PO9	2	It is necessary to understand the ethics and responsibilities related to an organization when a staff was appointed
CO6	PO6	3	Leader must have the ability to concerned about the group he posses
	PO7	2	Maintaining of effective communication among members is essential
	PO9	2	Understanding of ethics and responsibilities is crucial when a team is formed.

EC333 DIGITAL SIGNAL PROCESSING LAB

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Digital Signal Processing Lab**	Course code**: EC333**
L-T-P**:0-0-3**	Credit**:1**

SYLLABUS:

UNIT	DETAILS	HOURS
	Part A: Experiments on Digital Signal Processor/ DSP kits: (All experiments are mandatory)	
1	Generation of sine wave and standard test signals.	3 hrs.
2	Convolution : Linear and Circular	3 hrs.
3	Real Time FIR Filter implementation (Low-pass, High-pass and Bandpass) by inputting a signal from the signal generator	3 hrs.
4	Real Time IIR Filter implementation (Low-pass, High-pass and Bandpass) by inputting a signal from the signal generator	3 hrs.
5	Sampling of analog signal and study of aliasing.	3 hrs.
	Part B: Experiments based on MATLAB/SciLab/OCTAVE (7 experiments are mandatory)	
1	Generation of Waveforms (Continuous and Discrete)	3 hrs.
2	Verification of Sampling Theorem.	3 hrs.
3	Time and Frequency Response of LTI systems (First and second order).	3 hrs.
4	Linear Convolution, Circular Convolution and Linear Convolution using Circular Convolution.	3 hrs.
5	To find the DFT and IDFT for the given input sequence.	3 hrs.
6	Linear convolution using DFT (Overlap-add and Overlap-Save methods)	3 hrs.
7	To find the DCT and IDCT for the given input sequence.	3 hrs.

8	To find FFT and IFFT for the given input sequence.	3 hrs.
9	FIR and IIR filter design using Filter Design Toolbox.	3 hrs.
10	FIR Filter (Low-pass, High-pass and Band-pass)design (Window method)	3 hrs.
11	IIR Filter (Low-pass, High-pass and Band-pass)design (Butterworth and Chebychev).	3 hrs.
12	Generation of AM, FM & PWM waveforms and their spectrum.	3 hrs.
13	Generation of DTMF signal.	3 hrs.
14	Study of sampling rate conversion (Decimation, Interpolation, Rational factor).	3 hrs.
15	Filtering of noisy signals	3 hrs.
16	Implementation of simple algorithms in audio processing (delay, reverb, flange etc.).	3 hrs.
17	Implementation of simple algorithms in image processing (detection, de-noising, filtering etc.)	3 hrs.

TEXT BOOKS:

1	DIGITAL SIGNAL PROCESSING using MATLAB by Vinay K Ingle & John G. Proakis

PREREQUISITES:

EC 213 Electronics Design Automation Lab, EC 202 Signals & Systems

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objective:

1	To enable the students to explore the concepts of design, simulation and implementation of various systems using MATLAB/SciLab/OCTAVE and DSP kit.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Design, simulate and realize various systems related to DSP
2	Implement experiments in DSP KIT

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	2			3									3	2	
CO2	3	2			3									3	2	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Apply the knowledge of MATLAB for solving engineering problems
	PO2	2	Analyze the engineering problems using MATLAB for solving engineering problems
	PO5	3	Create, Select and apply modern simulation tools such as MATLAB to complex circuits for ease of analysis
CO2	PO1	3	Apply the expertise gained in DSP kits for solving engineering problems
	PO2	2	Analyze the engineering problems using DSP kits for solving engineering problems
	PO5	3	Create and apply MATLAB files to complex systems for ease of analysis

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO1	3	Graduates will be able to provide novel approaches to MATLAB for solving engineering problems
	PSO2	2	Graduates will able to apply the learnt knowledge of MATLAB for solving engineering problems
CO2	PSO1	3	Graduates will be able to provide novel approaches to various DSP kits for solving engineering problems
	PSO2	2	Graduates will able to apply the learnt expert knowledge of DSP kits for solving engineering problems

EC335 POWER ELECTRONICS & INSTRUMENTATION LAB

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Power Electronics & Instrumentation Lab**	Course code**: EC335**
L-T-P**:0-0-3**	Credit**:1**

SYLLABUS:

UNIT	DETAILS	HOURS
	Cycle I (Four mandatory)	
1	Design and Set up DC-DC converter 2. Design and Set up Push pull DC- DC Converter 3. Design and Set up Buck DC-DC Converters 4. Design and Set up Simple SMPS 5. c 6. Design and Set up basic Inverter Circuits	3 hrs.
2	Design and Set up Push pull DC- DC Converter	3 hrs.
3	Design and Set up Buck DC-DC Converters	3 hrs.
4	Design and Set up Simple SMPS	3 hrs.
5	Design and Set up Half bridge and full bridge converters	3 hrs.
6	Design and Set up basic Inverter Circuits	3 hrs.
	Cycle II (Four mandatory)	
7	Transducer measurements using diode thermometer	3 hrs.
8	Transducer measurements using LVDT	3 hrs.
9	Transducer measurements using Strain gauge	3 hrs.
10	Transducer measurements using Pressure transducer	3 hrs.
11	Transducer measurements using Thermocouple & RTDS	3 hrs.
12	Transducer measurements using Photocells	3 hrs.
	Desired Experiment	
13	Study of Digital LCR meter, Frequency synthesizer, Spectrum analyzer and Logic State analyzer application.	3 hrs.

TEXT BOOKS:

1	Bell D. A., Electronic Instrumentation and Measurements, Oxford University Press, 2003

PREREQUISITES:

NIL

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objective:

1	To design and implement basic power electronic circuits
2	To study the working of transducers
3	To train the usage of Digital Instruments

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	The students will be able to design and demonstrate basic power electronic circuits.
2	The students will be able to use transducers for application.
3	The students will be able to function effectively as an individual and in a team to accomplish the given task

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1			**1**				**1**								**1**	
CO2							**1**		**1**						**1**	

CO3							**1**		**2**						**1**	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO3**	**1**	Design of basic power electronic circuits.
	PO7	**1**	Idea about power electronic circuits.
CO2	**PO7**	**1**	Knowledge about different transducer .
	PO9	**1**	Able to discuss about different transducer circuits.
CO3	**PO7**	**1**	Idea about circuits based on power electronics & measurement circuits
	PO9	**2**	Able to discuss about measurement and power electronics circuits.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO2**	**1**	Concept of designing power electronic circuit
CO2	**PSO2**	**1**	Designing and application of transducer.
CO3	**PSO2**	**1**	Design and application of power electronic and measurement circuits.

SREEPATHY INSTITUTE OF MANAGEMENT AND TECHNOLOGY

COURSE HANDBOOK

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER VI

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

VISION

To transform students into motivated, competent and socially committed engineering professionals in the core domains of Electronics & Communication through quality education and research orientation with emphasis on holistic approach.

MISSION

- To nurture young individuals into knowledgeable, skillful and ethical professionals in their pursuit of Electronics & Communication Engineering.
- To empower budding engineers with the state of art technology, team work and leadership qualities to stride forth as resourceful citizens.
- To develop industry interaction for innovation and product development to solve real time problems.

B-TECH PROGRAMME

PROGRAMME EDUCATIONAL OBJECTIVES (PEO):

After successful completion of the program, the graduates will be

PEO1: Able to exhibit their innovative ideas and management skills to analyze, design, develop and implement electronic systems or equipment

PEO2: Able to apply knowledge in mathematics, science and computing to the field of Electronics & Communication Engineering either in industry, academics or research career with creativity and commitment

PEO3: Receptive to new technologies and attain professional competence through lifelong learning.

PEO4: Able to embody a commitment to professional ethics, diversity and social awareness in their professional career.

PROGRAM OUTCOMES (PO):

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

2. 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.

3. 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.

4. 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.

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

6. 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.

7. 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.

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

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

10. 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.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering 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.

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

PROGRAM SPECIFIC OUTCOMES (PSOS):

Electronics and Communication Engineering graduates will be able to:

PSO1 – have the capacity to apply the concepts of Electronics, Communications, Signal processing, VLSI, Control systems, Cryptography etc., in the analysis, design**,** development and implementation of integrated electronic systems as well as to interpret and synthesize the experimental data leading to valid conclusions

PSO2 – have competence in using latest hardware and software tools, along with analytical and managerial skills for the design and analysis of complex electronic systems in furtherance to research activities.

PSO3 – be an acquaintance of social and environmental awareness with ethical responsibilities to have a successful career in real-world applications by keeping in trend with technological changes.

EC 302 DIGITAL COMMUNICATION

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: DIGITAL COMMUNICATION**	Course code**: EC 302**
L-T-P**:4-0-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Overview of Random variables and Random process: Random variables–continuous and Discrete, random process Stationarity, Autocorrelation and power spectral density, Transmission of Random Process through LTI systems, PSD, AWGN Pulse Code Modulation (PCM): Pulse Modulation, Sampling process, Performance comparison of various sampling techniques Aliasing, Reconstruction, PAM, Quantization, Noise in PCM system Modifications of PCM: Delta modulation, DPCM, ADPCM, ADM, Performance comparison of various pulse modulation schemes, Line codes, PSD of various Line codes.	10	15
II	Transmission over baseband channel: Matched filter, Inter Symbol Interference (ISI), Nyquist Criteria for zero ISI, Ideal solution, Raised cosine spectrum, Eye Pattern Correlative Level Coding - Duobinary coding, precoding, Modified duobinary coding, Generalized Partial response signalling.	7	15
III	Signal Space Analysis: Geometric representation of signals, Gram Schmidt orthogonization procedure. 3 Transmission Over AWGN Channel: Conversion of the 15 continuous AWGN channel into a vector channel, Likelihood function, Maximum Likelihood Decoding, Correlation Receiver	7	15

IV	Digital Modulation Schemes: Pass band transmission model, Coherent Modulation Schemes- BPSK, QPSK, BFSK. NonCoherent orthogonal modulation schemes, Differential Phase Shift Keying (DPSK) Detection of Binary modulation schemes in the presence of noise, BER for BPSK, QPSK, BFSK	9	15
V	Pseudo–noise sequences: Properties of PN sequences. Generation of PN Sequences, generator polynomials, Maximal length codes and Gold Codes. Importance of synchronization: Carrier, frame and symbol/chip synchronization techniques. 2 Spread spectrum communication: Direct sequence spread spectrum with coherent binary phase shift keying, Processing gain, Probability of error, Anti-jam Characteristics, Frequency Hop spread spectrum with MFSK, Slow and Fast frequency hopping.	9	20
VI	Multipath channels: classification, Coherence time, Coherence bandwidth, Statistical characterization of multi path channels, Binary signalling over a Rayleigh fading channel. Diversity techniques: Diversity in time, frequency and space. Multiple Access Techniques: TDMA, FDMA, CDMA and SDMA – RAKE receiver, Introduction to Multicarrier communication- OFDM	10	20

TEXT BOOKS:

1	1. John G. Proakis, Masoud Salehi, Digital Communication, McGraw Hill Education Edition, 2014
2	Nishanth N, Digital Communication, Cengage Learning India , 2017
3	Ramakrishna Rao, Digital communication, Tata McGraw Hill Education Pvt. Limited.
4	Simon Haykin, Communication Systems, 4/e Wiley India, 2012.

REFERENCES:

1	Couch: Analog and Digital Communication. 8e, Pearson Education India, 2013.
2	H.Taub and Schilling Principles of Communication Systems, , TMH, 2007
3	K.Sam Shanmugham, Digital and Analog Communication Systems, John Wiley & Sons

4	Pierre Lafrance ,Fundamental Concepts in Communication, Prentice Hall India.
5	Sheldon.M.Ross, "Introduction to Probability Models", Academic Press, 7th edition.
6	Sklar: Digital Communication, 2E, Pearson Education
7	T L Singal, Digital Communication, McGraw Hill Education (India) Pvt Ltd, 2015

PREREQUISITES:

1. EC204 Signals and Systems,
2. EC208 Analog Communication VLSI

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To understand the concept of Digital representation of analog source
2	To understand the Performance comparison various pulse modulation schemes.
3	To discuss Inter Symbol Interference (ISI) problem in digital communication and to derive the Nyquist Criteria for zero ISI in data Transmission.
4	To analyse the need for introducing ISI in controlled manner.
5	To understand signal space representation of signal using Gram Schmidt ortho normalization procedure.
6	To analyse the error probability for different modulation schemes like BPSK, BFSK, QPSK etc.
7	To understand the principle of spread spectrum communication and to illustrate the

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	The students will be able to explain the knowledge of probability and random processes for the analysis and design of communication and will be able to identify the performance comparison of various digital pulse modulation schemes.

2	The students will be able to identify the effects of inter symbol interference and channel noise in the transmission of digital data through a baseband channel and will be able to demonstrate the geometric representation of signals of finite energy for the study of data transmission and the maximum likelihood procedure for the detection of a signal in AWGN channel.
3	The students will be able to identify signal space representation of signal using Gram Schmidt ortho normalisation procedure .
4	The students will be able to identify the digital modulation schemes and their detection in the presence of noise.
5	The students will be able to identify the principle of spread spectrum communication and the concept of FHSS and DSSS.
6	The students will be able to illustrate the various multiple access and diversity techniques used in multi user communication systems.

CO-PO-PSO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2		PSO 1	PSO 2	PSO 3
CO 1	**3**	**3**	**3**	**3**	**2**	**2**						**3**		**3**		**2**
CO 2	2	**2**	**3**	**2**	**2**					**2**		**2**		**3**		**2**
CO 3	**3**	**3**	**3**	**3**	**2**	**2**				**3**		**3**		**3**		**2**
CO 4	**3**	**3**	**3**	**3**	**2**	**2**				**3**		**3**		**3**		**2**
CO 5	**2**	**2**	**3**	**2**	**2**					**2**		**2**		**3**		**2**
CO 6	**2**	**2**	**3**	**2**	**2**							**3**		**3**		**3**

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Random process
	PO2	**3**	Design a digital communication system as random process
	PO3	**3**	Solutions of problems based on random theory.
	PO4	**3**	Design and interpretation of data using random theory
	PO5	**2**	Simulation using MATLAB
	PO6	**2**	Can assess problems regarding communication based on random theory
	PO12	**3**	Random theory

CO2	**PO1**	**2**	Applying mathematical basics on different pulse modulation schemes.
	PO2	**2**	Analysis of pulse modulation techniques.
	PO3	**3**	Design constraints and solutions for PCM
	PO4	**2**	Analysis of different PCM schemes.
	PO5	**2**	Simulation using MATLAB
	PO10	**2**	Idea of communication systems
	PO12	**2**	Modification to improve the performance
CO3	**PO1**	**3**	ISI on mathematical background
	PO2	**3**	Analysis of ISI
	PO3	**3**	Design system to eliminate ISI.
	PO4	**3**	Minimize ISI in communication problems
	PO5	**2**	Simulation using MATLAB
	PO6	**2**	Assess problems on interference
	PO10	**3**	Idea of communication systems
	PO12	**3**	Attainment of getting zero ISI
CO4	**PO1**	**3**	Geometric representation of signals
	PO2	**3**	Analysis of signals for the transmission and detection
	PO3	**3**	Maximum likelihood receiver
	PO4	**3**	Design and analysis of the receiver
	PO5	**2**	Simulation using MATLAB
	PO6	**2**	Design of communication systems
	PO10	**3**	Analysis and design of signals and systems
	PO12	**3**	Analysis and design of signals and systems
CO5	**PO1**	**2**	Coherent and noncoherent digital modulation schemes
	PO2	**2**	Ability to select suitable modulation schemes
	PO3	**3**	Attainment of low BER
	PO4	**2**	Coherent and noncoherent digital modulation schemes for effective communication
	PO5	**2**	Simulation using MATLAB

	PO10	**2**	Idea of whole communication systems
	PO12	**2**	Minimizing BER
C06	**PO1**	**2**	Concept of spread spectrum modulation
	PO2	**2**	Design spread spectrum communication system for antijamming
	PO3	**3**	Design the system with low probability of error
	PO4	**2**	Concept of spread spectrum communication
	PO5	**2**	MATLAB simulation
	PO12	**3**	Effect of antijamming and the minimization of probability of error.
	PO2	**3**	Study of multipath signals
	PO3	**3**	Diversity technique, OFDM
	PO4	**3**	Multiuser communication systems
	PO5	**2**	MATLAB simulation
	PO10	**3**	Idea of whole communication systems
	PO12	**3**	Multipath signals, Multiple Access Techniques

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Concept of probability and random process
	PSO3	**2**	Concept of random theory in communication
CO2	**PSO1**	**3**	Knowledge about different pulse modulation scheme
	PSO3	**2**	Application of different pulse modulation

CO3	**PSO1**	**3**	Effect of ISI and channel noise and to achieve zero ISI
	PSO3	**2**	Effect of ISI and channel noise and to achieve zero ISI
CO4	**PSO1**	**3**	Maximum likelihood procedure to detect data with zero ISI
	PSO3	**2**	Maximum likelihood procedure to detect data with zero ISI
CO5	**PSO1**	**3**	Concept of digital modulation schemes
	PSO3	**2**	Concept of digital modulation schemes
CO6	**PSO1**	**3**	Concept of spread spectrum modulation
	PSO3	**3**	Concept of spread spectrum modulation
	PSO3	**3**	Concept of diversity

EC 304 VLSI

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: VLSI**	Course code**: EC 304**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS

I	**Material Preparation**- Purification, Crystal growth (CZ and FZ process), wafer preparation **Thermal Oxidation**- Growth mechanisms, Dry and Wet oxidation, Deal Grove model. **Diffusion**- Fick's Laws, Diffusion with constant surface concentration and from a constant source, diffusion technique **Ion implantation**-Technique, Range Theory, annealing.	7	15
II	**Epitaxy :** Vapour phase epitaxy and molecular beam epitaxy **Lithography**- Photo lithographic sequence, Electron Beam Lithography, Etching and metal deposition **Methods of isolation Circuit component fabrication:** transistor, diodes, resistors, capacitors, N-well CMOS IC Fabrication Sequence	7	15
III	**CMOS inverters**- DC characteristics, switching characteristics, power dissipation **Layout Design rules**, Stick Diagram and layout of CMOS Inverter, two input NAND and NOR gates	8	15
IV	**MOSFET Logic Design** -Pass transistor logic, Complementary pass transistor logic and transmission gate logic , realization of functions	6	15
V	**Read Only Memory**-4x4 MOS ROM Cell Arrays(OR,NOR,NAND) **Random Access Memory** –SRAM-Six transistor CMOS SRAM cell, DRAM –Three transistor and One transistor Dynamic Memory Cell **Sense amplifiers** –Differential Voltage Sensing Amplifiers Introduction to PLDs and FPGAs, Design of PLAs	7	20
VI	**Adders**- Static adder, Carry-By pass adder, Linear Carry-Select adder, Square- root carry- select adder **Multipliers**-Array multiplier	4	20

TEXT BOOKS:

1	John P Uyemura, Introduction to VLSI Circuits and Systems, Wiley India, 2006
2	S.M. SZE, VLSI Technology, 2/e, Indian Edition, McGraw-Hill,2003

REFERENCES:

1	Jan M.Rabaey, Digital Integrated Circuits- A Design Perspective, Prentice Hall, Second Edition, 2005.
2	Neil H.E. Weste, Kamran Eshraghian, Principles of CMOS VLSI Design- A Systems Perspective, Second Edition. Pearson Publication, 2005
3	Razavi - Design of Analog CMOS Integrated Circuits,1e, McGraw Hill Education India Education, New Delhi, 2003.
4	Sung –Mo Kang & Yusuf Leblebici, CMOS Digital Integrated Circuits- Analysis & Design, McGraw-Hill, Third Ed., 2003.
5	Yuan Taur & Ning, Fundamentals of Modern VLSI Devices, Cambridge University Press, 2008

PREREQUISITES:

EC203 Solid State Devices, EC204 Analog Integrated Circuit.

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To give the knowledge about IC Fabrication Techniques
2	To impart the skill of analysis and design of MOSFET and CMOS logic circuits

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Demonstrate the various steps in IC fabrication, starting from the raw material to the finished product as well as physical principles involved in these processes
2	Analyze the characteristics & power dissipation of CMOS inverters
3	Design simple CMOS circuits by studying MOS Layers and design rules and implement logic functions using Stick diagrams and Layout diagrams.

4	Design and realize functions using different transistor logic such as pass transistor, complementary pass transistor and transmission gate.
5	To study the methodologies to design logic circuits using PLD's and FPGA and realize functions using PLA.
6	To impart the skill of analysis and design of MOSFET and CMOS logic circuits in static / dynamic memory, adders and multipliers.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	**1**		**2**													
CO2	**2**	**2**	**2**											**2**		
CO3		**3**	**1**											**3**	**3**	
CO4		**3**	**1**											**3**		
CO5		**3**	**1**											**3**		
CO6		**2**	**1**											**3**		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**1**	Fabrication steps in IC design involves science fundamentals
	PO3	**2**	Fabrication process has to consider safety, and environmental considerations
CO2	**PO1**	**2**	Principles of mathematics and engineering sciences are used in various aspects of CMOS circuit realization
	PO2	**2**	Realization of CMOS circuit involves solving complex engineering problems

	PO3	**2**	CMOS circuits implementation involves designing solutions for optimal usage and specification
CO3	**PO2**	**3**	Stick diagram representation involves logical analysis of mathematical expression
	PO3	**1**	Layout rules helps in design of complex ICs
CO4	**PO2**	**3**	Problems in CMOS design are identified and solutions found using other designs such as pass transistor
	PO3	**1**	Solutions for CMOS design deficiencies are found using transmission gate.
CO5	**PO2**	**3**	Principles of digital electronics are used to find the solutions in various aspects of PLA,FPGA realizations
	PO3	**1**	Using the knowledge of FPGA we can design and develop solutions for complex IC fabrication.
CO6	**PO2**	**2**	Problems in memory design using CMOS circuits are investigated
	PO3	**1**	Alternative solutions to CMOS circuits in memory /adder/multiplier are developed

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO2	**PSO1**	**2**	Apply the concept of power dissipation to electronic CMOS circuits.
CO3	**PSO1**	**3**	Design of CMOS structures may be done using VLSI tools
	PSO2	**3**	Students can code, simulate and test different CMOS structures using EDA tools
CO4	**PSO1**	**3**	Designing of various VLSI structures using different transistor logic

CO5	**PSO1**	**3**	Design of PLA, FPGA, ROM etc can be done using VLSI tools
CO6	**PSO1**	**3**	Design of memory in the integrated system is important

EC 306 ANTENNA & WAVE PROPAGATION

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Antenna & Wave Propagation**	Course code**: EC 306**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Basic antenna parameters - gain, directivity, beam solid angle, beam width and effective aperture calculations. Effective height - wave polarization - antenna temperature - radiation resistance - radiation efficiency - antenna field zones - principles of reciprocity. Duality of antennas.	7	15
II	Concept of retarded potential. Field, directivity and radiation resistance of a short dipole and half wave dipole. Measurement of radiation pattern, gain, directivity and impedance of antenna	7	15
III	Arrays of point sources - field of two isotropic point sources - principle of pattern multiplication - linear arrays of 'n' isotropic point sources. Grating lobes. Design of Broadside, Endfire & Binomial arrays. Design of DolphChebyshev arrays.	8	15
IV	Basic principle of beam steering. Travelling wave antennas. Principle and applications of V and rhombic antennas. Principles of Horn, Parabolic dish antenna, Cassegrain antenna (expression for E, H andGain without derivation).	6	15

V	Principle of Log periodic antenna array and Helical antenna. Antennas for mobile base station and handsets. Design of rectangular Patch antennas. Principle of smart antenna.	6	20
VI	Radio wave propagation , Modes , structure of atmosphere, sky wave propagation , effect of earth's magnetic field, Ionospheric abnormalities and absorption, space wave propagation, LOS distance Field strength of space wave, duct propagation, VHF and UHF Mobile radio propagation, tropospheric scatter propagation, fading and diversity techniques.	8	20

TEXT BOOKS:

1	Balanis, Antenna Theory and Design, 3/e, Wiley Publications
2	John D. Krauss, Antennas for all Applications, 3/e, TMH.

REFERENCES:

1	Collin R.E, Antennas & Radio Wave Propagation, McGraw Hill. 1985
2	Jordan E.C. & K. G. Balmain, Electromagnetic Waves & Radiating Systems, 2/e, PHI.
3	Raju G.S.N., Antenna and Wave Propagation, Pearson, 2013.
4	Sisir K.Das & Annapurna Das, Antenna and Wave Propagation, McGraw Hill,2012 .
5	Terman, Electronics & Radio Engineering, 4/e, McGraw Hill
6	Thomas A. Milligan, Modern Antenna Design, IEEE PRESS, 2/e, Wiley Inter science

PREREQUISITES:

EC303 Applied Electromagnetic Theory

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1.	To learn the basic working of antenna
2.	To study various antennas, arrays and radiation patterns of antenna
3.	To understand various techniques involved in various antenna parameter measurements.
4.	To understand the propagation of radio waves in the atmosphere

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Evaluate and understand the various parameters used for characterizing antenna: their optimum values and measurements.
2	Design dipole antennas and analyze measurement of antenna parameters.
3	Analyze the concept of antenna arrays and different types.
4	Design and understand different antenna types and their applications.
5	Discuss various antenna types and their radiation patterns.
6	Identify various modes of radio propagation and relate it to real communication instances.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	2	2	1										3		
CO2	3	2	2													
CO3	3	2	1	1										2		
CO4	3	1	2	1										2		
CO5	3	1	2	1										2		

CO6	**3**	**2**	**1**	**1**		**1**										**2**

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	3	Apply the knowledge of Parameters and Measurements of antenna
	PO2	2	Characterize the antennas
	PO3	2	Identify the antenna characteristics as per the requirements
	PO4	1	Design, analysis and synthesis of antenna characteristics
CO2	**PO1**	3	Apply the knowledge of dipole antenna
	PO2	2	Analyze the working and measurement parameters of dipole antenna
	PO3	2	Design various dipole antennas
CO3	**PO1**	3	Apply the knowledge of antenna arrays
	PO2	2	Analyze the working of different antenna arrays.
	PO3	1	Design and develop antenna arrays.
	PO4	1	Design and analyse various antenna concept.
CO4	**PO1**	3	Apply the knowledge of different antenna types
	PO2	1	Analyze the working of different antennas.
	PO3	2	Design and develop different types of antennas
	PO4	1	Identify antennas based on applications
CO5	**PO1**	3	Apply the knowledge of different antenna types
	PO2	1	Analyze the working of different antennas.

	PO3	2	Design and develop different types of antennas
	PO4	1	Identify antennas based on applications
CO6	**PO1**	3	Apply the knowledge of radio propagation.
	PO2	2	Analyze working of frequency based propagation.
	PO3	1	Design and analyse the frequency based propagation
	PO4	1	For the frequency used identify the propagation
	PO6	1	Contextual Knowledge on types of propagation

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Graduates will be able to provide novel approaches to design antennas.
CO2	**PSO1**	**2**	Graduates will identify applications of dipole antenna
CO3	**PSO1**	**2**	Graduates will apply the learnt knowledge throughout their life for developing new ideas.
CO4	**PSO1**	**2**	Graduates will Identify antennas based on applications.
CO5	**PSO1**	**2**	Graduates will Identify various antennas and their radiation pattern based on applications.

CO6	**PSO3**	**2**	Graduates will able to apply the learnt knowledge to real world applications

EC 308 EMBEDDED SYSTEMS

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Embedded Systems**	Course code**: EC 308**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction to Embedded Systems– Components of embedded system hardware–Software embedded into the system –Embedded Processors - CPU architecture of ARM processor (ARM9) – CPU Bus Organization and Protocol. Design and Development life cycle model - Embedded system design process – Challenges in Embedded system design	7	15
II	Serial Communication Standards and Devices - UART, HDLC, SCI and SPI. Serial Bus Protocols - I2C Bus, CAN Bus and USB Bus. Parallel communication standards ISA, PCI and PCI-X Bus.	6	15
III	Memory devices and systems - memory map – DMA - I/O Devices – Interrupts - ISR – Device drivers for handling ISR – Memory Device Drivers – Device Drivers for on-board bus.	6	15
IV	Programming concepts of Embedded programming – Features of Embedded C++ and Embedded Java (basics only). Software Implementation, Testing, Validation and debugging, system-on- chip. Design Examples: Mobile phones, ATM machine, Set top box	7	15

V	Inter Process Communication and Synchronization - Process, tasks and threads –Shared data– Inter process communication - Signals – Semaphore – Message Queues – Mailboxes – Pipes –Sockets – Remote Procedure Calls (RPCs).	8	20
VI	Real time operating systems - Services- Goals – Structures - Kernel - Process Management – Memory Management – Device Management – File System Organization. Micro C/OS-II RTOS - System Level Functions – Task Service Functions – Memory Allocation Related Functions – Semaphore Related Functions. Study of other popular Real Time Operating Systems.	8	20

TEXT BOOKS:

1	David E. Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000
2	Wayne Wolf, Computers as Components: Principles of Embedded Computing System Design, Morgan Kaufman Publishers - Elsevier 3ed, 2008

REFERENCES:

1	Frank Vahid and Tony Givargis, Embedded Systems Design – A Unified Hardware / Software Introduction, John Wiley, 2002
2	Iyer - Embedded Real time Systems, 1e, McGraw Hill Education New Delhi, 2003
3	K.V. Shibu, Introduction to Embedded Systems, 2e, McGraw Hill Education India, 2016
4	Lyla B. Das, Embedded Systems: An Integrated Approach, 1/e , Lyla B. Das, Embedded Systems, 2012
5	Rajkamal, Embedded Systems Architecture, Programming and Design, TMH, 2003
6	Steve Heath, Embedded Systems Design, Newnes – Elsevier 2ed, 2002
7	Tammy Noergaard, Embedded Systems Architecture, A Comprehensive Guide for Engineers and Programmers, Newnes – Elsevier 2ed, 2012

PREREQUISITES:

1. EC206 Computer Organization,
2. EC305 Microprocessors & Microcontrollers

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To have a thorough understanding of the basic structure and design of an Embedded System
2	To study the different ways of communicating with I/O devices and standard I/O interfaces.
3	To study the basics of RTOS for Embedded systems.
4	To study the programming concepts of Embedded Systems
5	To study the architecture of System-on-Chip and some design examples

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Describe the basics of embedded system and to design an embedded system product.
2	Discuss the different standards and protocols used for communication with I/O devices.
3	Distinguish different ways of communication with I/O devices.
4	Acquire the knowledge of basic programming concepts of Embedded Systems
5	Aware of Inter Process Communication and Synchronization
6	Explain the basics of RTOS for Embedded systems

CO-PO-PSO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12		PSO 1	PSO 2	PSO 3
CO 1			**3**									**1**		**3**	**2**	
CO 2	**2**	**3**	**3**									**1**		**3**		
CO 3	**2**	**3**	**3**	**3**										**3**		
CO 4		**3**	**3**	**3**	**2**									**3**		**2**
CO 5	**2**				**1**									**2**		
CO			**2**											**2**		

6																

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO3	3	Since embedded systems have lots of inbulit components the basic knowledge of engineering fundamentals is needed
	PO12	1	Embedded system design requires the knowledge of all engineering areas
CO2	PO1	2	Programming requires some mathematical skills.
	PO2	3	This course will help the students to study research papers and analyze Engineering problems in the field of Embedded systems.
	PO3	3	programming requires programming logic which requires some mathematical skills
	PO12	1	The programming level of students also requires updations.
CO3	PO1	2	Problem analysis is required in the design of interfacing circuits and systems using microcontrollers
	PO2	3	The outcome of design process is a solution.
	PO3	3	investigations are done by design interfacing circuits and systems using microcontrollers
	PO4	3	For execution and debugging modern tools are used, IDE
CO4	PO2	3	The outcome of a system, give the analysis and interpretation of data, and it can synthesis information to provide valid conclusions
	PO3	3	investigations are done by the design process
	PO4	3	For execution and debugging of the designed systems, modern tools are used.
	PO5	2	Socially relevant systems can be designed using the interfacing of microcontroller
CO5	PO1	2	Ability to understand about inter-process communication.
	PO5	1	Socially relevant systems can be designed using inter-process communication.
CO5	PO3	2	Ability to design real time embedded systems using the concepts of RTOS.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	PSO1	3	Graduates will get the basic idea about the designing of an embedded system.
	PSO2	2	Have competence in embedded C++ and java

CO2	**PSO1**	**3**	Graduates will apply the learnt knowledge throughout their life for developing new ideas.
CO3	**PSO1**	**3**	Graduates will distinguish different ways of communication.
CO4	**PSO1**	**3**	Graduates will able to apply the learnt knowledge to real world applications
	PS03	**2**	Graduates will able to update with the trends in technology
CO5	**PSO1**	**2**	Graduates will distinguish different ways of inter process communication
CO6	**PSO1**	**2**	Have the capacity to apply the concepts for the design and development of RTOS

EC 368 ROBOTICS

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Robotics**	Course code**: EC 368**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction – Definition and origin of robotics, Robot Anatomy, Robot specifications, Robot characteristics – accuracy, precision, and repeatability, Areas of application, classification of robots. Robotic arm – Components and structure, Types of joints and workspace, Common kinematic arrangements, Wrists, End effectors.	7	15
II	Sensors: Types and applications of sensors in Robotics, position and displacement sensors, Strain gauge based force-torque sensors, Tachometers. Robotic drive systems and actuators: Hydraulic, Pneumatic and Electric drives. Specification, principle of operation and areas of application of: Stepper motor, Servo motor and brushless DC motor. Microprocessor	6	15

	control of electric motors, speed control using PWM and direction control using H- Bridge		
III	Robotic vision systems: Imaging, Sensing and Digitization, Image processing techniques, Areas of application in robotics. Introduction to kinematics: Position and orientation of objects, Rotation, Euler angles, Rigid motion representation using Homogenous Transformation matrix	7	15
IV	Forward kinematics: Link coordinates, Denavit-Hartenberg Representation, Application of DH convention to different serial kinematic arrangements fitted with spherical wrist. Inverse kinematics – General properties of solutions, Kinematic Decoupling, Inverse kinematic solutions for all basic types of three-link robotic arms fitted with a spherical wrist.	9	15
V	Velocity kinematics – Derivation of the Jacobian, Application of velocity kinematics for serial manipulators, importance of Singularities. Manipulator Dynamics. Introduction to Legrangian mechanics and Dynamic equation for 2 DOF robots, Introduction to position control and force control of robotic manipulators, Robot actuation and control using PID controllers.	6	20
VI	Robot Programming – Programming methods, Robot language classification, Robot language structure, elements and its functions. Motion, End-effecter and Sensor commands in VAL programming language. Simple programs. Industrial applications of Robots in material handling and assembly. Mobile robots, Recent developments in Robotics	7	20

TEXT BOOKS:

1	Mikell and Groover, Industrial Robotics – Technology, Programming and Applications, McGraw Hill, 2/e, 2012
2	Saeed B. Niku Introduction to Robotics. Analysis and control, applications- Wiley student edition, 2010
3	Spong and Vidyasagar, Robot Dynamics and Control, John Wiley & Sons, 1990

REFERENCES:

1	Ashitava Ghosal, Robotics, Fundamental concepts and analysis, OXFORD University Press, 2006
2	Fu, K.S,Gonzalez,R.C,Lee, C.S.G.,Robotics, Control, Sensing, Vision and Intelligence, McGraw-Hill, 1987.
3	John. J.Craig, Introduction to Robotics: Mechanics and Control, PHI, 2005.
4	Klafter, R.D., Chmielewski, T.A, Negin, M, Robotic Engineering An Integrated Approach, PHI, 2007
5	Robert J. Schilling, Fundamentals of Robotics: Analysis & Control, Pearson Education, 2000
6	S. R. Deb, Robotics Technology and Flexible Automation, Tata McGraw Hill, New Delhi, 1994.

PREREQUISITES:

1. EC 307 Power Electronics & Instrumentation,
2. EC 305 Microprocessors & Microcontrollers

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To impart knowledge about the engineering aspects of Robots and their applications

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	understand basics of robots – history, specifications, areas of application, components & structure
2	Identify robotic sensors, drives and actuators.
3	Understand basics of robotic vision.
4	Students will have an understanding of forward and inverse kinematics
5	Students will have an understanding of velocity kinematics & manipulator dynamics
6	Students will have an understanding of robot programming & industrial applications of robots

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3													3		
CO2	3													3		
CO3	3	3	3											3	3	
CO4	3	3	3	3	3									3		
CO5	3	3	2	3	3									3		
CO6	3	3	3	3	3							3		3	3	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Understanding the basics of robots is essential to building a robotic applications
CO2	**PO1**	**3**	For the robot to control its own working and to interact with the environment, sensors, drives and actuators are to be used
CO3	**PO1**	**3**	Vision being one of the most powerful robot sensing modalities is essential in building a powerful robot
	PO2	**3**	Image processing techniques provide solutions to many real-life problems that are handled by robots
	PO3	**3**	Understanding robotic vision and its applications helps in designing and developing better robots
CO4	**PO1**	**3**	Robot movement should be properly understood if it has to be controlled
	PO2	**3**	Study of robotic movements helps to identify and formulate real world engineering problems
	PO3	**3**	Robots can work in environments which are unsafe for human beings and can perform labour-intensive tasks also, thereby relieving human effort
	PO4	**3**	Robots can provide many solutions to industrial problems
	PO5	**3**	MATLAB and similar tools can be used to develop solutions to vision problems
CO5	**PO1**	**3**	Robot movement should be properly understood if it has to be controlled
	PO2	**3**	Study of robotic movements helps to identify and formulate realworld engineering problems
	PO3	**3**	Robots can work in environments which are unsafe for human beings and can perform labour-intensive tasks also, thereby relieving human effort
	PO4	**3**	Robots can provide many solutions to industrial problems
	PO5	**3**	MATLAB and similar tools can be used to develop solutions to vision problems
CO6	**PO1**	**3**	Robot programming deals with the software control of robots, which is essential for a robot to work, since a controller is the heart of a robotic system
	PO2	**3**	Study of robot programming helps to identify and formulate real world engineering problems
	PO3	**3**	Robots can be programmed using robot programming languages to do specific tasks

	PO4	**3**	Robots can provide many solutions to industrial problems
	PO5	**3**	Languages dedicated for Robot programming like VAL can be used for the same
	PO12	**3**	Study of recent developments in robotics keeps students abreast with changing and new technologies in the field

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Basics of robotics is essential to finding solutions to many engineering problems using robots
CO2	**PSO1**	**3**	Robotic sensors & drives are essential to finding solutions to many engineering problems using robots
CO3	**PSO1**	**3**	Robotic vision systems are useful for finding solutions to many engineering problems using robots
	PSO2	**3**	Robotic vision systems can be simulated, developed and tested using EDA tools
CO4	**PSO1**	**3**	Study of robotic motion is pivotal to finding solutions to many engineering problems using robots
CO5	**PSO1**	**3**	Study of robotic motion is pivotal to finding solutions to many engineering problems using robots
CO6	**PSO1**	**3**	Robot programming languages are essential to finding solutions to many engineering problems using robots
	PSO2	**3**	MATLAB, Open CV tool kits for robotic applications can be used

EC 332 COMMUNICATION ENGINEERING LAB

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: communication engineering lab**	Course code**: EC 332**
L-T-P**: 0-0-3**	Credit**:1**

SYLLABUS:

UNIT	DETAILS	HOURS
	Cycle I (Six experiments are mandatory)	
1	AM generation using discrete components.	3 hrs.
2	AM using multiplier IC AD534 or AD633.	3 hrs.
3	AM detection using envelope detector.	3 hrs.
4	IF tuned amplifier.	3 hrs.
5	FM using 555 IC.	3 hrs.
6	FM generation and demodulation using PLL.	
7	Frequency multiplier using PLL	3 hrs.
8	Pre-emphasis and de-emphasis circuits	3 hrs.
9	Analog signal sampling & Reconstruction	3 hrs.
	Cycle II (Six experiments are mandatory)	3 hrs.
10	Generation of Pseudo Noise Binary sequence using Shift registers	3 hrs.
11	Time Division Multiplexing and Demultiplexing	3 hrs.
12	Generation & Detection of DM/SIGMA DELTA/ ADM	3 hrs.
13	Generation & Detection of PAM/PWM/PPM	3 hrs.
14	Generation & Detection of BPSK/DPSK/DEPSK	3 hrs.
15	Generation & Detection of PCM	3 hrs.
16	QPSK Modulation and Demodulation	3 hrs.

PREREQUISITES:

1. EC204 Analog Integrated Circuit,
2. EC208 Analog Communication Engineering

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To provide experience on design, testing and analysis of few electronic circuits used in communication engineering

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	The students will be able to understand the basic concepts of circuits used in communication systems
2	The students will be able to compare different modulation schemes(analog & digital)

CO-PO-PSO MAPPING:

	PO 1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2		PSO 1	PSO 2	PSO 3
CO 1			1							2					2	2
CO 2						2	2		3						2	2

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO3	1	Design of different modulator circuits.
	PO10	2	Idea about communication circuits.
CO2	PO6	2	Knowledge about different modulation schemes
	PO7	2	Knowledge about different modulation schemes
	PO9	3	Ability to do the team work to design communication circuit

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION

CO1	**PSO2**	**2**	Concept of designing communication circuit
	PSO3	**2**	Concept of designing communication circuit
CO2	**PSO2**	**2**	Designing and application of various modulator circuit
	PSO3	**2**	Designing and application of various modulator circuit

EC 334 MICROCONTROLLER LAB

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Microcontroller Lab**	Course code**: EC 334**
L-T-P**: 0-0-3**	Credit**:1**

SYLLABUS:

UNIT	DETAILS	HOURS
PART –A (At least 6 experiments are mandatory) ***Assembly Language Programming experiments using 8051 Trainer kit.***		
1	Data transfer/exchange between specified memory locations.	3 hrs.
2	Largest/smallest from a series.	3 hrs.
3	Sorting (Ascending/Descending) of data.	3 hrs.
4	Addition / subtraction / multiplication / division of 8/16 bit data.	3 hrs.
5	Sum of a series of 8 bit data.	3 hrs.
6	Multiplication by shift and add method.	
7	Square / cube / square root of 8 bit data.	3 hrs.
8	Matrix addition.	3 hrs.
9	LCM and HCF of two 8 bit numbers.	3 hrs.
10	Code conversion – Hex to Decimal/ASCII to Decimal and vice versa.	3 hrs.
PART –B (At least 4 experiments are mandatory) Interfacing experiments using 8051 Trainer kit and interfacing modules.		
11	Time delay generation and relay interface.	3 hrs.

12	Display (LED/Seven segments/LCD) and keyboard interface.	3 hrs.
13	ADC interface.	3 hrs.
14	DAC interface with wave form generation.	3 hrs.
15	Stepper motor and DC motor interface.	3 hrs.
16	Realization of Boolean expression through port.	
17	Elevator interfacing.	3 hrs.
PART -C(At least 2 experiments are mandatory) Programming / interfacing experiments with IDE for 8051/PIC/MSP/Arduino/Raspberry Pi based interfacing boards/sensor modules (Direct downloading of the pre-written ALP/'C'/Python programs can be used).		
18	Relay control	3 hrs.
19	Distance measurement.	3 hrs.
20	Temperature measurement / Digital Thermometer	3 hrs.
21	Txr-Rxr interface.	3 hrs.
22	Alphanumeric LCD display interface.	3 hrs.
23	Simple project work including multiple interfaces.	3 hrs

PREREQUISITES:

1. EC305 Microprocessors & Microcontrollers

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To understand Assembly Language/embedded C programming of Microcontroller
2	To interface simple peripheral devices to a Microcontroller
3	To equip student groups to design and implement simple embedded systems

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	The student should be able to understand fundamental programming concepts of Microcontrollers
2	The student should be able to interface various devices with the controller.

3	The student should be able to design a microcontroller based system with the help of the interfacing devices

CO-PO-PSO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2		PSO 1	PSO 2	PSO 3
CO 1		1										1	1	1		
CO 2		1										1	1	1		
CO 3	1	1	1									1	1	1		1

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO2**	**1**	Based on the application requirement, a processor of suitable architecture can be chosen to design the solution
	PO12	**1**	By acquiring the basic principles of microprocessors and microcontrollers, more advanced versions of both can be easily studied and used.
CO2	**PO2**	**1**	Based on the application requirement, a processor of suitable architecture can be chosen and suitable memory of appropriate speed and space can be used to design the solution
	PO12	**1**	By acquiring the basic principles of microprocessors, microcontrollers and memories, more advanced versions of both can be easily studied and use
CO3	**PO1**	**1**	With sufficient practice, students will develop logic to develop more complex programs that can serve as solution to the complex problems
	PO2	**1**	Programming skills can be enhanced and this can be used to develop more powerful codes for solving problems
	PO3	**1**	Microprocessors & microcontrollers, have wide scope in automation and various fields of engineering.

	PO12	**1**	Programming helps to develop logic and coding skills can be used to develop more powerful software in future.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**1**	Processors of suitable architectures may be selected for each application
	PSO2	**1**	To develop efficient codes for microprocessors and microprocessors, thorough knowledge of their architecture is essential
CO2	**PSO1**	**1**	In addition to selecting appropriate processor based on architecture, memory requirements for the application can be met by selecting the right memory
	PSO2	**1**	Thorough understanding of memory and its features is an additional feature required to develop efficient programs
CO3	**PSO1**	**1**	Embedded systems and automation have a wide scope in today"s world for which programming skills are necessary
	PSO2	**1**	Execution of the desired logic can be done only if the right programs are developed

SREEPATHY INSTITUTE OF MANAGEMENT AND TECHNOLOGY

COURSE HANDBOOK

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER VII

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

VISION

To transform students into motivated, competent and socially committed engineering professionals in the core domains of Electronics & Communication through quality education and research orientation with emphasis on holistic approach.

MISSION

- To nurture young individuals into knowledgeable, skillful and ethical professionals in their pursuit of Electronics & Communication Engineering.
- To empower budding engineers with the state of art technology, team work and leadership qualities to stride forth as resourceful citizens.
- To develop industry interaction for innovation and product development to solve real time problems.

B-TECH PROGRAMME

PROGRAMME EDUCATIONAL OBJECTIVES (PEO):

After successful completion of the program, the graduates will be

PEO1: Able to exhibit their innovative ideas and management skills to analyze, design, develop and implement electronic systems or equipment

PEO2: Able to apply knowledge in mathematics, science and computing to the field of Electronics & Communication Engineering either in industry, academics or research career with creativity and commitment

PEO3: Receptive to new technologies and attain professional competence through lifelong learning.

PEO4: Able to embody a commitment to professional ethics, diversity and social awareness in their professional career.

PROGRAM OUTCOMES (PO):

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

2. 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.

3. 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.

4. 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.

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

6. 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.

7. 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.

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

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

10. 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.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering 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.

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

PROGRAM SPECIFIC OUTCOMES (PSOS):

Electronics and Communication Engineering graduates will be able to:

PSO1 – have the capacity to apply the concepts of Electronics, Communications, Signal processing, VLSI, Control systems, Cryptography etc., in the analysis, design**,** development and implementation of integrated electronic systems as well as to interpret and synthesize the experimental data leading to valid conclusions

PSO2 – have competence in using latest hardware and software tools, along with analytical and managerial skills for the design and analysis of complex electronic systems in furtherance to research activities.

PSO3 – be an acquaintance of social and environmental awareness with ethical responsibilities to have a successful career in real-world applications by keeping in trend with technological changes.

EC401 INFORMATION THEORY & CODING

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Information Theory & Coding**	Course code**: EC 401**
L-T-P**:4-0-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction to Information Theory. Concept of information, units, entropy, marginal, conditional and joint entropies, relation among entropies, mutual information, information rate. Source coding: Instantaneous codes, construction of instantaneous codes, Kraft's inequality, coding efficiency and redundancy	9	15
II	Noiseless coding theorem , construction of basic source codes, Shannon – Fano Algorithm, Huffman coding, Channel capacity – redundancy and efficiency of a channel, binary symmetric channel (BSC), Binary erasure channel (BEC) – capacity of band limited Gaussian channels	9	15
III	Continuous Sources and Channels: Differential Entropy, Mutual information, Waveform channels, Gaussian channels, Shannon – Hartley theorem, bandwidth, SNR trade off, capacity of a channel of infinite bandwidth, Shannon's limit	9	15

IV	Introduction to rings, fields, and Galois fields. Codes for error detection and correction – parity check coding – linear block codes – error detecting and correcting capabilities – generator and parity check matrices – Standard array and syndrome decoding	9	15
V	Perfect codes, Hamming codes, encoding and decoding Cyclic codes, polynomial and matrix descriptions, generation of cyclic codes, decoding of cyclic codes BCH codes, Construction and decoding, Reed Solomon codes	9	20
VI	Convolutional Codes – encoding – time and frequency domain approaches, State Tree & Trellis diagrams transfer function and minimum free distance Maximum likelihood decoding of convolutional codes – The Viterbi Algorithm. Sequential decoding.	9	20

TEXT BOOKS:

1	P S Sathya Narayana, Concepts of Information Theory & Coding, Dynaram Publications, 2005
2	Simon Haykin: Digital Communication Systems, Wiley India, 2013.

REFERENCES:

1	Bose, Information theory coding and cryptography, 3/e McGraw Hill Education India , 2016
2	D.E.R. Denning, Cryptography and Data Security, Addison Wesley, 1983.
3	J S Chitode, Information Theory and Coding, Technical Publications, Pune, 2009
4	Kelbert & Suhov, Information theory and coding by examples, Cambridge University Press, 2013
5	Shu Lin & Daniel J. Costello. Jr., Error Control Coding : Fundamentals and Applications.
6	2/e, Prentice Hall Inc., Englewood Cliffs, NJ,2004

PREREQUISITES:

1. EC302 Digital Communication

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To introduce the concept of information.
2	To understand the limits of error free representation of information signals and thetransmission of such signals over a noisy channel
3	To design and analyze data compression techniques with varying efficiencies as per requirement
4	To understand the concept of various theorems proposed by Shannon for efficient data compression and reliable transmission
5	To give idea on different coding techniques for reliable data transmission
6	To design an optimum decoder for various coding schemes used.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Students will be able to understand the concept of information and entropy
2	Students will be able to design a lossless transmission system on the basis of channel capacity and source coding theorem.
3	Students will be able understand the basics of Gaussian Channel & Shannon's Limit.
4	Students will be able to analyze error correction and detection using linear block codes.
5	Students will be able to analyze error correction and detection using cyclic codes.
6	Students will be able to implement encoding and decoding of convolutional code.

CO-PO-PSO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2		PSO 1	PSO 2	PSO 3
CO 1	2	3	1									2		3	2	
CO	3	3	2		2							2		3	2	

2																
CO 3	**3**	**3**	**2**		**2**							**2**		**1**	**1**	
CO 4	**3**	**3**	**3**		**2**							**2**		**3**	**2**	
C05	**3**	**3**	**3**		**2**							**2**		**3**	**2**	
C06	**3**	**3**	**3**		**2**							**2**		**3**	**2**	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**2**	Information concept and mathematical formulation of information
	PO2	**3**	Information concept and mathematical formulation of information
	PO3	**1**	Construction of codes for source coding
	PO12	**2**	For 5Gand millimeter wave and IOT requirements shannons contribution
CO2	**PO1**	**3**	Basic concept of source coding & lossless transmission
	PO2	**3**	Mathematical formulation of noiseless coding
	PO3	**2**	Limiting case of noiseless coding and complex channels
	PO5	**2**	Mathematical modeling for channels
	PO12	**2**	Channel complexity
CO3	**PO1**	**3**	Differential Entropy
	PO2	**3**	SNR Trade off & Channel capacity calculations
	PO3	**2**	Application of Shannon Hartley theorem & Shannon's limit
	PO5	**2**	Mathematical modeling for channels
	PO12	**2**	Complex analysis of noise due to heavy traffic
CO4	**PO1**	**3**	Study of rings, groups & fields.

	PO2	**3**	Algebra background for coding
	PO3	**3**	Application oriented coding techniques
	PO12	**2**	Study of linear block codes for error correction
C05	**PO1**	**3**	Basic concept of error correction & detection.
	PO2	**3**	Algebra background for coding
	PO3	**3**	Application oriented coding techniques
	PO5	**2**	MatLab code for error correction & detection.
	PO12	**3**	Study of cyclic codes for error correction
C06	**PO1**	**3**	Time & frequency domain approaches for convolutional codes.
	PO2	**3**	Algebra background for coding
	PO3	**3**	Application of maximum likelihood decoding
	PO5	**2**	MatLab code for encoding & decoding of convolutional codes
	PO12	**3**	Study of convolutional codes – encoding & decoding.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Sampling ,shannons theorem ,Probability aspects
	PSO2	**2**	FCC broad band allocation
CO2	**PSO1**	**3**	Communication and signal processing background for different channels
CO3	**PSO1**	**1**	Communication and signal processing background for Noise analysis
CO4	**PSO1**	**3**	Signal processing and communication aspects of coding
	PSO2	**2**	Setting lab experiments for understanding coding

C05	**PSO1**	**3**	Signal processing and communication aspects of error correction techniques.
	PSO2	**2**	MatLab codes for error correction & detection.
CO6	**PS01**	**3**	Signal processing and communication aspects of error correction techniques.
	PS02	**2**	MatLab codes for sequential decoding

EC403 MICROWAVE & RADAR ENGINEERING

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Microwave & Radar Engineering**	Course code**: EC 403**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	**Microwaves:** introduction, advantages, Cavity Resonators - Rectangular and Circular wave guide resonators- Derivation of resonance frequency of Rectangular cavity. **Microwave vacuum type amplifiers and sources:** Klystron Amplifiers - Re-entrant cavities, Velocity modulation, Bunching (including analysis), Output power and beam	8	15
II	**Reflex Klystron Oscillators**: Derivation of Power output, efficiency and admittance **Magnetron oscillators**: Cylindrical magnetron, Cyclotron angular frequency, Power output and efficiency.	5	15
III	**Travelling Wave Tube**: Slow wave structures, Helix TWT, Amplification process, Derivation of convection current, axial electric field, wave modes and gain. **Microwave measurements:** Measurement of impedance, frequency and power	6	15
IV	**Microwave hybrid circuits**: Scattering parameters,	9	15

	Waveguide tees- Magic tees, Hybrid rings, Corners, Bends, and Twists. Formulation of S-matrix. **Directional couplers**: Two hole directional couplers, S-matrix of a directional coupler. Circulators and isolators.		
V	**Solid state microwave devices**: Microwave bipolar transistors, Physical structures, Power frequency limitations equivalent circuit. Principle of **Tunnel diodes** and tunnel diode oscillators. **Gunn diodes**: Different modes, Principle of operation Gunn Diode Oscillators.	6	20
VI	**Radar**: The simple Radar equation. Pulse Radar, CW Radar, CW Radar with non zero IF, Equation for doppler frequency FM-CW Radar using sideband super heterodyne receiver. **MTI Radar**-Delay line canceller, MTI Radar with power amplifier & power oscillator, Non coherent MTI Radar, Pulse Doppler Radar **Radar Transmitters**: Radar Modulator-Block diagram, **Radar receivers**- noise figure, low noise front ends, Mixers, Radar Displays	8	20

TEXT BOOKS:

1	Merrill I. Skolnik, Introduction to Radar Systems, 3/e, Tata McGraw Hill, 2008.
2	Samuel Y. Liao, Microwave Devices and Circuits, 3/e, Pearson Education, 2003

REFERENCES:

1	Das, Microwave Engineering, 3/e, McGraw Hill Education India Education , 2014
2	David M. Pozar, Microwave Engineering,4/e, Wiley India, 2012.
3	Kulkarni M, Microwave and Radar Engineering, 4/e, Umesh Publications, 2012.
4	Rao, Microwave Engineering, 2/e, PHI, 2012.
6	Robert E. Collin, Foundation of Microwave Engineering, 2/e, Wiley India, 2012.

PREREQUISITES:

EC302 Digital Communication

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To introduce the various microwave sources, their principle of operation and measurement of various parameters
2	To study the various microwave hybrid circuits and formulate their S matrices.
3	To understand the basic concepts, types, working of radar and introduce to radar transmitters and receivers.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Students will Acquire knowledge about the characteristics of microwaves, Cavity resonators and Klystron amplifiers.
2	Microwave tubes such as reflex klystrons and magnetron oscillators are studied
3	Will have an idea about TWT, various measurement techniques for MW parameters such as power, impedance and frequency.
4	Students will be able to understand the basics of various hybrid circuits ,Directional couplers and scattering parameters with S matrix formulation.
5	Knows the basic theory of operation of microwave transistor, Tunnel Diodes and Gunn Diodes.
6	The students are introduced about the concept of various types of radar systems.

CO-PO-PSO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12		PSO 1	PSO 2	PSO 3
CO 1	**3**	**3**	**3**	**2**										**3**		

CO 2	**2**	**3**	**2**	**2**										**2**		
CO 3	**3**	**3**	**3**	**2**										**3**		
CO 4	**3**	**3**	**3**	**3**										**3**		
CO 5	**2**	**3**	**3**	**2**										**3**		
CO 6	**2**	**3**	**3**	**2**										**3**		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Principle of operation of MW tubes like klystron amplifier etc
	PO2	**3**	Output power and efficiency calculation
	PO3	**3**	Resonant freq derivation for rectangular cavity Resonator
	PO4	**2**	Design of klystron amplifiers
CO2	**PO1**	**2**	Principle of operation of MW tubes like reflex klystron oscillator etc
	PO2	**3**	Analysis of MW tubes like reflex klystron and magnetron oscillator etc
	PO3		Design of MW oscillators
	PO4		Analysis of Oscillators power output and efficiency
CO3	**PO1**	**3**	Study of MW TWT and measurement of MW parameter
	PO2	**3**	Analysis of MW semiconductor devices
	PO3	**3**	Design of semiconductor device s for efficient MW communication system

	PO4	**2**	Analysis of TED 'S and avalanche transit time devices
CO4	**PO1**	**3**	Microwave hybrid circuits, scattering parameters calculation
	PO2	**2**	Identify and formulate the S-Matrix for various passive devices such as waveguide tee junctions and directional couplers
	PO3	**1**	Introduction of non reciprocal device s such as isolator and circulator
	PO4	**1**	Analysis of various passive MW devices
CO5	**PO1**	**3**	Basic principle of operation of solid state devices
	PO2	**3**	Analysis of various solid state devices such as transistor, tunnel diode and gunn diode
	PO3	**3**	Design of MW oscillators using tunnel , gunn diode for efficient MW communication system
	PO4	**2**	Designing experiments such as gunn characteristics and tunnel diode characteristic
CO6	**PO1**	**3**	Basics of Radar equation
	PO2	**2**	Analysis of CW radar and MTI radar
	PO3	**1**	Design of Radar transmitter and receiver
	PO4	**1**	Design experiments related to radar modulator, Mixers etc

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Analysis of bunching process in klystron amplifier
CO2	**PSO1**	**3**	Design and implementation of mw active devices Based on Power output and efficiency
CO3	**PSO1**	**3**	Design and implementation of MW receiver using parameter measurement s

CO4	**PSO1**	**3**	Design and implementation of passive devices using scattering parameters.
CO5	**PSO1**	**3**	Design of MW circuits using MW solid state devices such as tunnel diode and gunn diode
CO6	**PSO1**	**3**	Design of Radar system using the basics of radar concepts

EC405 OPTICAL COMMUNICATION

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Optical Communication**	Course code**: EC 405**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	General light wave system, advantages, classification of light wave systems. Fibres: types and refractive index profiles, mode theory of fibres: modes in SI and GI fibres, linear and non linear effects in fibres, dispersion, Group Velocity Dispersion, modal, wave guide and Polarization, Modes, Dispersion, attenuation- absorption, bending and scattering losses.	8	15
II	Fibre materials, fabrication of fibres, photonic crystal fibre, index guiding PCF, photonic bandgap fibre, fibre cables. Optical sources, LEDs and LDs, structures, characteristics, modulators using LEDs and LDs. coupling with fibres, noise in Laser diodes, Amplified Spontaneous Emission noise, effects of Laser diode noise in fibre communications	7	15
III	Optical detectors, types and characteristics, structure and working of PIN and AP, noise in detectors, comparison of performance. Optical receivers, Ideal photo receiver and quantum limit of detection.	6	15
IV	Digital transmission systems, design of IMDD links-power and rise time budgets, coherent Systems, sensitivity	8	15

	of a coherent receiver, comparison with IMDD systems. Introduction to soliton transmission, soliton links using optical amplifiers, GH effect, soliton-soliton interaction, amplifier gain fluctuations, and design guide lines of soliton based links.		
V	Optical Amplifiers ,basic concept, applications, types, doped fibre amplifiers, EDFA, basic theory, structure and working, Semiconductor laser amplifier, Raman amplifiers, TDFA, amplifier configurations, performance comparison.	6	20
VI	The WDM concept, WDM standards, WDM components, couplers, splitters, Add/ Drop multiplexers, gratings, tunable filters, system performance parameters. Introduction to optical networks. Introduction to free space optics, LiFi technology and VLC. Optical Time Domain Reflectometer (OTDR) – fault detection, length and refractive index measurements.	7	20

TEXT BOOKS:

1	Gerd Keiser, Optical Fiber Communications, 5/e, McGraw Hill, 2013.
2	Mishra and Ugale, Fibre optic Communication, Wiley, 2013.

REFERENCES:

1	Chakrabarthi, Optical Fibre Communication, McGraw Hill, 2015.
2	Hebbar, Optical fibre communication, Elsevier, 2014
3	John M Senior- Optical communications, 3/e, Pearson, 2009.
4	Joseph C. Palais, Fibre Optic Communications, 5/e Pearson, 2013.
5	Keiser, Optical Communication Essentials (SIE), 1/e McGraw Hill Education New Delhi, 2008.

PREREQUISITES:

EC203 Solid State Devices, EC205 Electronic Circuits

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objective:

1	To introduce the concepts of light transmission through optical fibers, optical sources and detectors.
2	To compare the performance of various optical transmission schemes.
3	To impart the working of optical components and the principle of operation of optical amplifiers.
4	To give idea on WDM technique.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Summarize the different types of fibers and various attenuation mechanisms.
2	Know the various types of optical sources and their working.
3	Know the various types of optical detectors and their working.
4	Compare the performance of various digital transmission systems and analyse the importance of solitons.
5	Apply the knowledge of optical amplifiers in the design of optical link.
6	Describe the concept of WDM, WDM components, FSO and LiFi.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	2			2									3	2	3
CO2	3	2			2									3	2	3
CO3	3	2			2									3	2	3
CO4	3	2			2									3	2	3
CO5	3	2			2									3	2	3
CO6	3	2			2									3	2	3

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Apply the knowledge of different types of fibers and various attenuation mechanisms
	PO2	2	Analyze the various attenuation mechanisms and methods to tackle them
	PO5	2	Create and pply modern tools to solve various attenuation mechanisms
CO2	PO1	3	Apply the knowledge of various types of optical sources and detectors and their working
	PO2	2	Analyze the various types of optical sources and their working.
	PO3	2	Create and apply modern tools to optical sources thereby increasing their efficiency
CO3	PO1	3	Apply the knowledge of various types of optical detectors and their working
	PO2	2	Analyze the various types of optical detectors and their working.

	PO3	**2**	**Create and apply modern tools to optical detectors thereby increasing their efficiency**
CO4	**PO1**	**3**	**Apply the knowledge various digital transmission systems**
	PO2	**2**	**Analyze the importance of solitons based transmission systems**
	PO3	**2**	**Create and apply modern tools to study the scope of soliton transmissions**
CO5	**PO1**	**3**	**Apply the knowledge about the use of optical amplifiers in the design of optical link.**
	PO2	**2**	**Analyze the various types of optical amplifiers**
	PO3	**2**	**Create and apply modern tools to make the amplification process more efficient**
CO6	**PO1**	**3**	**Apply the knowledge of WDM, WDM components, FSO and LiFi.**
	PO2	**2**	**Analyze the various types of passive and active WDM components**
	PO3	**2**	**Create and apply modern tools for effective implementation of multiple wavelength systems**

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	**Graduates will be able to provide novel approaches to different types of fibers and various attenuation mechanisms**
	PSO2	**2**	**Graduates will able to apply the learnt knowledge to different types of fibers and various attenuation mechanisms**
CO2	**PSO1**	**3**	**Graduates will be able to provide novel approaches to different types of optical sources**
	PSO2	**2**	**Graduates will able to apply the learnt knowledge to modify different types of optical sources**
CO3	**PSO1**	**3**	**Graduates will be able to provide novel approaches to different types of optical detectors**
	PSO2	**2**	**Graduates will able to apply the learnt knowledge to modify different types of optical detectors**

CO4	**PSO1**	**3**	**Graduates will be able to provide novel approaches to the digital transmission system**
	PSO2	**2**	**Graduates will able to apply the learnt knowledge aboutSoliton based systems to real world applications**
CO5	**PSO1**	**3**	**Graduates will be able to provide novel approaches to different types of optical amplifiersto real world applications**
	PSO2	**2**	**Graduates will able to apply the learnt knowledge about the optical amplifiersto real world applications**
C06	**PSO1**	**3**	**Graduates will be able to provide novel approaches about WDM,FSO,Lifietc**
	PSO2	**2**	**Graduates will able to apply the learnt knowledge about the various WDM components to real world applications**

EC407 COMPUTER COMMUNICATION

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Computer Communication**	Course code**: EC 407**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction to computer communication: Transmission modes - serial and parallel transmission, asynchronous, synchronous, simplex, half duplex, full duplex communication. Switching: circuit switching and packet switching Networks: Network criteria, physical structures, network models, categories of networks, Interconnection of Networks: Internetwork Network models: Layered tasks, OSI model, Layers in OSI model, TCP/IP protocol suite.	6	15

II	Physical Layer: Guided and unguided transmission media (Co-axial cable, UTP,STP, Fiber optic cable) Data Link Layer: Framing, Flow control (stop and wait , sliding window flow control) Error control, Error detection(check sum, CRC), Bit stuffing, HDLC Media access control: Ethernet (802.3), CSMA/CD, Logical link control, Wireless LAN (802.11), CSMA/CA	8	15
III	Network Layer Logical addressing : IPv4 & IPV6 Address Resolution protocols (ARP, RARP) Subnetting, Classless Routing(CIDR), ICMP, IGMP, DHCP Virtual LAN, Networking devices (Hubs, Bridges & Switches)	8	15
IV	Routing: Routing and Forwarding, Static routing and Dynamic routing, Routing Algorithms: Distance vector routing algorithm, Link state routing (Dijkstra's algorithm), Routing Protocols: Routing Information protocol (RIP), Open Shortest Path First (OSPF), Border Gateway Protocol (BGP), MPLS.	6	15
V	Transport Layer –UDP, TCP, Congestion Control & Quality of Service – Data traffic, Congestion, Congestion Control, QoS and Flow Characteristics, Application Layer – DNS, Remote Logging (Telnet), SMTP, FTP, WWW, HTTP, POP3, MIME, SNMP	8	20
VI	Introduction to information system security, common attacks, Security at Application Layer (E-MAIL, PGP and S/MIME). Security at Transport Layer (SSL and TLS). Security at Network Layer (IPSec), Defense and counter measures: Firewalls and their types. DMZ, Limitations of firewalls, Intrusion Detection Systems -Host based, Network based, and Hybrid IDSs.	6	20

TEXT BOOKS:

1	Behrouz A. Forouzan, Cryptography & Network Security , , IV Edition, Tata McGraw-Hill, 2008
2	J F Kurose and K W Ross, Computer Network A Top-down Approach Featuring the Internet, 3/e, Pearson Education, 2010

REFERENCES:

1	Behrouz A Forouzan, Data Communications and Networking, 4/e, Tata McGraw-Hill, 2006.
2	Larry Peterson and Bruce S Davie: Computer Network- A System Approach, 4/e, Elsevier India, 2011.
3	S. Keshav, An Engineering Approach to Computer Networking, Pearson Education, 2005.
4	Joseph C. Palais, Fibre Optic Communications, 5/e Pearson, 2013.
5	Achyut S.Godbole, Data Communication and Networking, 2e, McGraw Hill Education New Delhi, 2011

PREREQUISITES:

NIL

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objective:

1	Different types of network topologies and protocols.
2	The layers of the OSI model and TCP/IP with their functions.
3	The concept of subnetting and routing mechanisms.
4	The basic protocols of computer networks, and how they can be used to assist in network design and implementation.
5	Security aspects in designing a trusted computer communication system.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Identify different types of network topologies and protocols.
2	Classify the layers of the OSI model and TCP/IP with their functions.
3	Implement the concept of subnetting in computer networks
4	Construct and find the shortest path in computer networks using different routing mechanisms
5	Identify the basic protocols of computer networks, and how they can be used to assist in network design and implementation
6	Review the security aspects in designing a trusted computer communication system

CO-PO-PSO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO 1		2	1									2		1		
CO 2		2	1									2		1		
CO 3		3	1									2			1	
CO 4			3	2										2		
CO 5	2											2		1		
CO 6	3											2		1		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO2	2	Identify, formulate, review and analyze different networks.
	PO3	1	Design solutions for different network with appropriate consideration for society.
	PO12	2	Understanding of the various network and requirements enable student to learn further about the latest protocols
CO2	PO2	2	Using the acquired knowledge identify, formulate, review and analyze the need for layered architecture.
	PO3	1	Design solutions for different network with appropriate consideration for society.
	PO12	2	Understanding of various layers to learn further about the modern internet.
CO3	PO2	3	Students will be able to apply knowledge of IP to solve networking problems.
	PO3	1	Design solutions for complex network problems with appropriate considerations for the size of network required by the organization.
	PO12	2	Understanding of the given outcome enables student to learn further about the network management.
CO4	PO3	3	Design routing methods and protocols using the acquired knowledge of existing methods
	PO4	2	Designing leads to conduct investigations and research methods to find solutions find shortest path.
CO5	PO1	2	Students will be able to apply knowledge of IP to the basic protocols of computer networks
	PO12	2	Understanding of the given outcome enables student to learn further about network design and implementation.
CO6	PO1	3	Students will be able to apply knowledge of networking to the basic security in computer communication networks

	PO12	**2**	Understanding of the given outcome enables student to learn further about the changing trends in cryptography

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**1**	Apply concepts in identifying network topologies/protocols
CO2	**PSO1**	**1**	Recognize the importance of layered architecture in the design of network system
CO3	**PSO2**	**1**	Apply software tools to design subnet or supernet and manage network
CO4	**PSO1**	**2**	Demonstrate skills in designing routers to find the shortest path
CO5	**PSO1**	**1**	Understand the fundamentals of latest network protocols
CO6	**PSO1**	**1**	Understand the security aspect of network design

EC409 CONTROL SYSTEMS

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: CONTROL SYSTEMS**	Course code**: EC 409**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY

			% MARKS
I	Basic Components of a Control System, Applications, Open-Loop Control Systems and Closed-Loop Control Systems, Examples of control system, Effects of Feedback on Overall Gain, Stability, External, disturbance or Noise, Types of Feedback Control Systems, Linear versus Nonlinear Control Systems, Time-Invariant versus Time-Varying Systems. Overview of solving differential equations using Laplace transforms, Mathematical modelling of control systems - Electrical Systems and Mechanical systems, Block diagram representation and reduction methods, Signal flow graph and Mason's rule formula.	10	15
II	Standard test signals. Time response specifications.Time response of first and second order systems to unit step input, ramp inputs, time domain specifications, Steady state error and static error coefficients, Dynamic error coefficient.	5	15
III	Stability of linear control systems: methods of determining stability, Routh's Hurwitz Criterion, Root Locus Technique: Introduction, properties and its construction. Frequency domain analysis: Frequency domain specifications, correlation between time and frequency responses.	5	15
IV	Nyquist stability criterion: fundamentals and analysis.Relative stability: gain margin and phase margin. Stability analysis with Bode plot, Design of Control Systems: PI,PD and PID controllers, Design with phase-lead and phase-lag controllers (frequency domain approach), Lag-lead.	8	15
V	State variable analysis: state equation, state space representation of Continuous Time systems, Transfer function from State Variable Representation, Solutions of the state equations, state transition matrix Concepts of Controllability and Observability, Kalman's Test, Gilbert's test.	6	20
VI	Discrete Control systems fundamentals: Overview of Z transforms. State space representation for Discrete time systems. Sampled Data control systems, Sampling Theorem, Sample & Hold, Open loop & Closed loop sampled data systems. State space analysis : Solving discrete time state space equations, pulse transfer function, Discretization of continuous time state space equations, Stability analysis of discrete time systems Jury's test.	8	20

TEXT BOOKS:

1	Farid Golnaraghi, Benjamin C. Kuo, Automatic Control Systems, 9/e, Wiley India.
2	Gopal, Control Systems, 4/e, McGraw Hill Education India Education, 2012.
3	Ogata K., Discrete-time Control Systems, 2/e, Pearson Education.

REFERENCES:

1	Gopal, Digital Control and State Variable Method, 4/e, McGraw Hill Education India 2012.
2	Norman S. Nise, Control System Engineering, 5/e, Wiley India
3	Ogata K., Modern Control Engineering, Prentice Hall of India, 4/e, Pearson Education, 2002.
4	Richard C Dorf and Robert H. Bishop, Modern Control Systems, 9/e, Pearson Education, 2001.

PREREQUISITES:

EC202 Signals & Systems

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objective:

1	To introduce the elements of control system and its modeling
2	To introduce methods for analyzing the time response, the frequency response and the stability of systems.
3	To design control systems with compensating techniques.

4	To introduce the state variable analysis method.
5	To introduce basic concepts of digital control systems.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Describe mathematically a systems and deriving their transfer function model.
2	Illustrate the time response and frequency response of the systems for any input.
3	Identify the stability of system
4	Explain a control system with suitable compensation techniques
5	Explain the design of a digital control system.
6	Identify the stability of the digital control system.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	3	2	1										1	3	3
CO2	2	2	3	2										1	2	2
CO3	1	1	2	3										3	1	1

CO4	**2**	**2**	**3**	**3**										**3**	**2**	**2**
CO5	**2**	**2**	**3**	**3**										**3**	**2**	**2**
CO6	**1**	**1**	**2**	**3**										**3**	**1**	**1**

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Knowledge of differential equations, Laplace transforms
	PO2	**3**	Modelling a system using mathematical equations
	PO3	**2**	Modelling a a system using transfer function method.
	PO4	**1**	Modelling a complex problem.
CO2	**PO1**	**2**	Analysing a system from different perspective to understand its behavior using the model.
	PO2	**2**	Analysis system behavior
	PO3	**3**	Analysis system behavior
	PO4	**2**	Analysis time domain specification of the system
CO3	**PO1**	**1**	Stability analysis method
	PO2	**1**	Stability analysis method
	PO3	**2**	Understanding stability of the controller
	PO4	**3**	Stability analysis
CO4	**PO1**	**2**	Compensation technique in control system
	PO2	**2**	Compensation technique in control system
	PO3	**3**	Design compensation technique.

	PO4	**3**	Analysis and design of compensation circuit.
CO5	**PO1**	**2**	Identify digital control system
	PO2	**2**	Mathematical approach to analyse a digital control system.
	PO3	**3**	State space analysis of digital control system
	PO4	**3**	State space analysis of a digital control system
CO6	**PO1**	**1**	Method to analyse the stability of the system
	PO2	**1**	Method to analyse the stability of the system
	PO3	**2**	Stability analysis
	PO4	**3**	Stability analysis

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Apply the skill to model a control system using mathematical equation
CO2	**PSO1**	**3**	Apply the skill to model a control system using mathematical equation
CO3	**PSO1**	**3**	Stability analysis of a system
CO4	**PSO1**	**3**	To apply the knowledge of various compensation technique.
CO5	**PSO1**	**3**	Knowledge about digital control system
C06	**PSO1**	**3**	Knowledge about the analysis of digital control system.

EC469 OPTO ELECTRONIC DEVICES

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Opto Electronic Devices**	Course code**: EC 469**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Optical processes in semiconductors – electron hole recombination, absorption, Franz-Keldysh effect, Stark effect, quantum confined Stark effect, deep level transitions, Auger recombination heat generation and dissipation, heat sources..	7	15
II	Lasers – threshold condition for lasing, line broadening mechanisms, axial and transverse laser modes, heterojunction lasers, distributed feedback lasers, DBR lasers, quantum well lasers, tunneling based lasers, modulation of lasers.	7	15
III	Nitride light emitters, nitride material properties, InGaN/GaN LED, structure and working, performance parameters, InGaN/GaN Laser Diode, structure and working, performance parameters. White-light LEDs, generation of white light with LEDs, generation of white light by dichromatic sources, ,generation of white light by trichromatic sources, temperature dependence of trichromatic, 7generation of white light by tetrachromatic and pentachromatic sources, white-light sources based on wavelength converters.	9	15
IV	Optical modulators using pn junction, electro-optical modulators, acousto-optical modulators, Raman-Nath modulators, FranzKeldysh and Stark effect modulators, quantum well electroabsorption modulators, optical switching and logic devices, optical memory.	5	15
V	Optical detection – PIN, APD, modulated barrier photodiode, Schottky barrier photodiode, wavelength selective detection, micro cavity photodiodes. Optoelectronic ICs, advantages, integrated transmitters and receivers, guided wave devices. Working of LDR, liquid	7	20

	crystal display, structure, TFT display, structure, polymer LED, organic LED.		
VI	Introduction to optical components, directional couplers, multiplexers, attenuators, isolators, circulators, tunable filters, fixed filters, add drop multiplexers, optical cross connects, wavelength convertors, optical bistable devices.	6	20

TEXT BOOKS:

1	Pallab Bhattacharya: Semiconductor Optoelectronic Devices, Pearson, 2009
2	Yariv, Photonics Optical Electronics in modern communication, 6/e ,Oxford Univ Press,2006

REFERENCES:

1	Alastair Buckley, Organic Light-Emitting Diodes, Woodhead, 2013.
2	B E Saleh and M C Teich, Fundamentals of Photonics:, Wiley-Interscience, 1991
3	Bandyopadhay, Optical communicatoion and networks, PHI, 2014.
4	Mynbaev, Scheiner, Fiberoptic Communication Technology, Pearson, 2001.
5	Piprek, Semiconductor Optoelectronic Devices, Elsevier, 2008
6	Xun Li, Optoelectronic Devices Design Modelling and Simulation, Cambridge University Press, 2009

PREREQUISITES:

NIL

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objective:

1	To know the physics of absorption, recombination and photoemission from semiconductors.
2	To analyse different types of photo detectors based on their performance parameters.
3	To discuss different LED structures with material properties and reliability aspects.
4	To explain optical modulators and optical components
5	To illustrate different types of lasers with distinct properties.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Explain the property of absorption, recombination and photoemission in semiconductors.
2	Illustrate different types of lasers with distinct properties.
3	Explain different LED structures with material properties.
4	Describe different optical modulators used in optoelectronics
5	Analyze different types of photo detectors & Design various optical components.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	1	1											1		
CO2	3	2	1											2		

CO3	**3**	**2**											**2**		
CO4	**3**	**2**											**1**		
CO5	**2**	**2**	**1**										**2**		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Understand the knowledge of optical processes such as absorption, recombination
	PO2	**1**	Analyze optical processes such as absorption, recombination
	PO3	**1**	Measurement of absorption and luminescence spectra
CO2	**PO1**	**3**	Apply the basic concepts of laser emission, modulation
	PO2	**2**	Analysis of basic concepts of laser emission, modulation
	PO3	**1**	Design of semiconductor lasers for optical communication
CO3	**PO1**	**3**	Apply the knowledge of Nitride light emitters and white light in new technologies
	PO2	**2**	Analysis of nitride light emitters and generation of white light
	PO1	**3**	Apply the knowledge of opto electronic ICs
CO4	**PO2**	**2**	Analyze performance of optical detectors and optoelectronic ICs
	PO1	**2**	Apply the knowledge of optical components and filters in new methods
	PO2	**2**	Analyze working principle of optical components, filters and cross connects
CO5	**PO3**	**1**	Design of optical filters and cross connects
	PO1	**3**	Understand the knowledge of optical processes such as absorption, recombination
	PO2	**1**	Analyze optical processes such as absorption, recombination

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**1**	Graduates will be able to provide novel approaches about semiconductors.
CO2	**PSO1**	**2**	Graduates will apply the learnt knowledge throughout their life for developing new ideas.
CO3	**PSO1**	**2**	Graduates will know different types of LEDs and generation of White lights.
CO4	**PSO1**	**1**	Graduates will analyze the type of photo detectors based on the knowledge.
CO5	**PSO1**	**2**	Graduates will able to know Implementation & Design of opto-electronic circuits

EC431 COMMUNICATION SYSTEMS LAB (OPTICAL & MICROWAVE)

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Communication Systems Lab (Optical & Microwave)**	Course code**: EC 431**
L-T-P**:0-0-3**	Credit**:1**

SYLLABUS:

UNIT	DETAILS	HOURS
	Microwave Experiments: (Minimum Six experiments are mandatory)	
1	GUNN diode characteristics	3 hrs.
2	Reflex Klystron Mode Characteristics.	3 hrs.
3	VSWR and Frequency measurement.	3 hrs.
4	Verify the relation between Guide wave length, free space wave length and cut off wave length for rectangular wave guide.	3 hrs.
5	Measurement of E-plane and H-plane characteristics	3 hrs.

6	Directional Coupler Characteristics	
7	Unknown load impedance measurement using smith chart and verification using transmission line equation.	3 hrs.
8	Measurement of dielectric constant for given solid dielectric cell	3 hrs.
9	Antenna Pattern Measurement.	3 hrs.
10	Study of Vector Network Analyser	3 hrs.
	Optical Experiments: (Minimum Six Experiments are mandatory)	
1	Measurement of Numerical Aperture of a fiber, after preparing the fiber ends	3 hrs.
2	Study of losses in Optical fiber	3 hrs.
3	Setting up of Fiber optic Digital link.	3 hrs.
4	Preparation of a Splice joint and measurement of the splice loss.	3 hrs.
5	Power vs Current (P-I) characteristics and measure slope efficiency of Laser Diode.	3 hrs.
6	Voltage vs Current (V-I) characteristics of Laser Diode.	3 hrs.
7	Power vs Current (P-I) characteristics and measure slope efficiency of LED	3 hrs.
8	Voltage vs Current (V-I) characteristics of LED	3 hrs.
9	Characteristics of Photodiode and measure the responsivity	3 hrs.
10	Characteristics of Avalanche Photo Diode (APD) and measure the responsivity	3 hrs.
11	Measurement of fiber characteristics, fiber damage and splice loss/connector loss by OTDR.	3 hrs.

PREREQUISITES:

1. **EC403 Microwave & Radar Engineering**
2. **EC405 Optical Communication**

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To provide practical experience in design, testing, and analysis of few electronic devices and circuits used for microwave and optical communication engineering

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**The students get an idea about the working of microwave equipments.**
2	**The students will be able to understand the basic concepts of Optical Communication.**

CO-PO-PSO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12		PSO 1	PSO 2	PSO 3
CO 1	2	1												2		
CO 2	2		1											2		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**1**	Knowledge about various components used in microwave communication.
	PO2	**2**	Idea about communication circuits.
CO2	**PO1**	**2**	**Knowledge about anlog and digital optical link**
	PO3	**1**	**Ability to do the team work to design communication circuit**

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**2**	Concept of designing microwave communication circuits
CO2	**PSO1**	**2**	Concept of designing optical communication circuits

EC451 SEMINAR AND PROJECT PRELIMINARY

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Seminar And Project Preliminary**	Course code**: EC 451**
L-T-P**:0-1-4**	Credit**:2**

PREREQUISITES:

All subjects till S7.

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To develop skills in doing literature survey, technical presentation and report preparation.
2	To enable project identification and execution of preliminary works on final semester projects.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Understand the recent technologies relating to Electronics & Communication Engineering.**
2	**To identify engineering problems through detailed literature survey and to develop a solution.**
3	**Develop communication and presentation skills during the presentation phase.**
4	**Develop ethical writing skills during the report submission.**

CO-PO-PSO MAPPING:

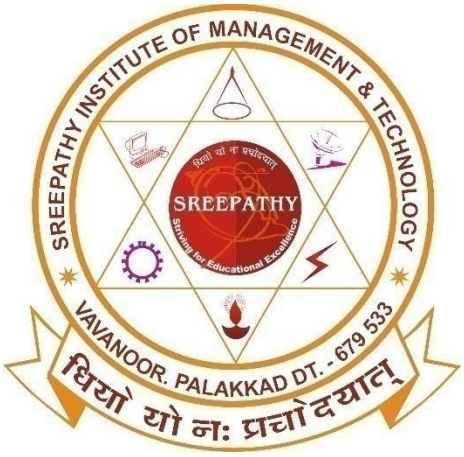
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	2								3			2				
CO2	3	3	3	2		2	2		3		3	3				
CO3								2	3	3						
CO4								3	3	3						

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	2	Apply engineering fundamentals in order to understand the recent developments.
	PO9	3	Individual contributions for seminar and project.
	PO12	2	Lifelong learning is achieved by analyzing the future scope of the recent technology
CO2	PO1	3	Apply the knowledge of mathematics, and engineering fundamentals, to the solution of engineering problems.

	PO2	**3**	Analyze engineering problems to arrive at substantiated conclusions
	PO3	**3**	Students will be able to design systems/solutions for engineering problems by considering public health, safety and environment.
	PO4	**2**	Use research-based knowledge from the literature survey which helps to provide valid conclusions.
	PO6	**2**	The topic identified, formulated and analysed should benefit engineering society.
	PO7	**2**	The domain studied must benefit the society in environmental context.
	PO9	**3**	Individual contributions for seminars and effective team work for projects are mandatory.
	PO11	**3**	Scheduling and budget estimation is done in the initial phase through literature survey.
	PO12	**3**	Lifelong learning is achieved in various stages like literature survey, methodology and future scope.
CO3	**PO8**	**2**	Discussions communicated through presentation should abide ethical principles.
	PO9	**3**	Individual contributions for seminars and effective team work for projects are mandatory during the presentation phase.
	PO10	**3**	Communicate effectively on complex engineering activities with effective presentations.
CO4	**PO8**	**3**	Existing results and discussion communicated through the report should abide professional ethics.
	PO9	**3**	Individual contributions for seminar and effective team work for projects are mandatory for report submission.
	PO10	**3**	Communicate effectively on complex engineering activities with effective reports and design documentation.

SREEPATHY INSTITUTE OF MANAGEMENT AND TECHNOLOGY



COURSE HANDBOOK

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER VIII

VISION

To transform students into motivated, competent and socially committed engineering professionals in the core domains of Electronics & Communication through quality education and research orientation with emphasis on holistic approach.

MISSION

- To nurture young individuals into knowledgeable, skillful and ethical professionals in their pursuit of Electronics & Communication Engineering
- To empower budding engineers with the state of art technology, team work and leadership qualities to stride forth as resourceful citizens
- To develop industry interaction for innovation and product development to solve real time problems

B-TECH PROGRAMME

PROGRAMME EDUCATIONAL OBJECTIVES (PEO):

After successful completion of the program, the graduates will be

PEO1: Able to exhibit their innovative ideas and management skills to analyze, design, develop and implement electronic systems or equipment

PEO2: Able to apply knowledge in mathematics, science and computing to the field of Electronics & Communication Engineering either in industry, academics or research career with creativity and commitment

PEO3: Receptive to new technologies and attain professional competence through lifelong learning.

PEO4: Able to embody a commitment to professional ethics, diversity and social awareness in their professional career.

PROGRAMME OUTCOMES (PO):

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

2. 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.

3. 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.

4. 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.

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

6. 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.

7. 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.

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

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

10. 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.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering 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.

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

PROGRAMME SPECIFIC OUTCOMES (PSOS):

Electronics and Communication Engineering graduates will be able to:

PSO1 – have the capacity to apply the concepts of Electronics, Communications, Signal processing, VLSI, Control systems, Cryptography etc., in the analysis, design**,** development and implementation of integrated electronic systems as well as to interpret and synthesize the experimental data leading to valid conclusions

PSO2 – have competence in using latest hardware and software tools, along with analytical and managerial skills for the design and analysis of complex electronic systems in furtherance to research activities.

PSO3 – be an acquaintance of social and environmental awareness with ethical responsibilities to have a successful career in real-world applications by keeping in trend with technological changes.

EC 402 NANO ELECTRONICS

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Nano Electronics**	Course code**: EC 402**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction to nanotechnology, Impacts, Limitations of Conventional microelectronics, Trends in microelectronics and optoelectronics. Mesoscopic physics, trends in microelectronics and optoelectronics, characteristic lengths in mesoscopic systems, Quantum mechanical coherence. Classification of Nano structures, Low dimensional structures Quantum wells, wires and dots, Density of states and dimensionality. Basic properties of two dimensional semiconductor nanostructures, square quantum wells of finite depth, parabolic and triangular quantum wells, Quantum wires and quantum dots, carbon nano tube, grapheme.	13	15
II	Introduction to methods of fabrication of nano-layers, different approaches, physical vapour deposition, chemical vapour deposition. Molecular Beam Epitaxy, Ion Implantation, Formation of Silicon Dioxide- dry and wet oxidation methods. Fabrication of nano particle- grinding with iron balls, laser ablation, reduction methods, sol gel, self assembly, precipitation of quantum dots.	6	15
III	Introduction to characterization of nanostructures, tools used for of nano materials characterization, microscope-optical, electron, and electron microscope. Principle of operation of Scanning Tunnelling Microscope, Atomic Force Microscope, Scanning Electron microscope, Specimen interaction. Transmission Electron Microscope. X-Ray Diffraction analysis, PL & UV Spectroscopy, Particle size analyser.	6	15

IV	Two dimensional electronic system, two dimensional behaviour, MOSFET structures, Heterojunctions. Quantum wells, modulation doped quantum wells, multiple quantum wells. The concept of super lattices Kronig - Penney model of super lattice.	6	15
V	Transport of charge in Nanostructures under Electric field – parallel transport, hot electrons, perpendicular transport. Quantum transport in nanostructures, Coulomb blockade. Transport of charge in magnetic field - Effect of magnetic field on a crystal. Aharonov-Bohm effect, the Shubnikov-de Hass effect, the quantum Hall effect.	7	20
VI	Nanoelectonic devices- MODFETS, heterojunction bipolar transistors. Resonant tunnel effect, RTD, RTT, Hot electron transistors. Coulomb blockade effect and single electron transistor, CNT transistors. Heterostructure semiconductor laser. Quantum well laser, quantum dot LED, quantum dot laser. Quantum well optical modulator, quantum well sub band photo detectors, principle of NEMS.	10	20

TEXT BOOKS:

1	J.M. Martinez-Duart, R.J. Martin Palma, F. Agulle Rueda Nanotechnology for Microelectronics and optoelectronics, Elsevier, 2006
2	W.R. Fahrner, Nanotechnology and Nanoelctronics, Springer, 2005

REFERENCES:

1	Chattopadhyay, Banerjee, Introduction to Nanoscience & Technology, PHI, 2012
2	George W. Hanson, Fundamentals of Nanoelectronics, Pearson Education, 2009.
3	K. Goser, P. Glosekotter, J. Dienstuhl, Nanoelectronics and nanosystems, Springer 2004.
4	Murty, Shankar, Text book of Nanoscience and Nanotechnology, Universities Press, 2012.
5	Poole, Introduction to Nanotechnology, John Wiley, 2006.
6	Supriyo Dutta, Quantum Transport- Atom to transistor, Cambridge, 2013.

PREREQUISITES:

1. Solid State Devices
2. VLSI

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To introduce the concepts of nanoelectronics.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	The students will be able to understand basic concepts of nanoelectronic devices and nanotechnology.
2	Analyse the Low dimensional structures, Quantum well,wires and dots.
3	Illustrate the methods of fabrication of nano layers.
4	Distinguish about the principle of operation of different microscopes.
5	Compare about the charge transport under electric and magnetic field.
6	Analyze about the different Nanoelectonic devices and Lasers.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	**3**	**2**	**1**	**1**										**3**		**2**
CO2	**3**	**3**	**1**	**1**										**2**		
CO3	**3**	**2**	**2**	**1**										**2**		
CO4	**3**	**2**	**1**	**1**										**2**		
CO5	**3**	**2**	**1**	**1**										**3**		
CO6	**3**	**2**	**2**	**1**										**3**		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Apply the knowledge of Science in nanotechnology.
	PO2	2	Identify the trends in microelectronics
	PO3	1	Understand the limitations of conventional microelectronics.
	PO4	1	Properties of nanodevices.
CO2	PO1	3	Apply the knowledge ofmathematics in low dimensional structures.
	PO2	3	Analyze the density of states.
	PO3	1	Design of nano structures.
	PO4	1	Advantages of nanostructures.
CO3	PO1	3	Apply the knowledge of physics.
	PO2	2	Analyze the methods of fabrication.
	PO3	2	Safely fabricate nanolayers.
	PO4	1	Conduct different experiments of fabrication.
CO4	PO1	3	Apply knowledge of engineering fundamentals.
	PO2	2	.Analyze charge transport
	PO3	1	Design nanoelctronic devices
	PO4	1	Get the knowledge of quantum transport
CO5	PO1	3	Understand transport of charge
	PO2	2	Identify parallel and perpendicular transport
	PO3	1	Define effects of magnetic field
	PO4	1	Analyze Nano structures under electic field
CO6	PO1	3	Recall nanoelctro devices
	PO2	2	Identify Resonant tunnelling effect

	PO3	**1**	Study about lasers
	PO4	**1**	Understand principle of NEMS

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Graduates will be able to study nanostructures and their properties..
	PS03	**2**	Graduates will be create real world applications using nanotechnology.
CO2	**PSO1**	**2**	Graduates will apply the learnt knowledge of low dimensional structures for developing new ideas.
CO3	**PSO1**	**2**	Graduates will Identify Fabrication technology of nanolayers and nano particles.
CO4	**PSO1**	**2**	Graduates will able to apply the learnt knowledge to real world applications
CO5	**PSO1**	**2**	Graduates will be able to study about charge transport in nano material
CO6	**PSO1**	**2**	Graduates will able to apply the concept of NEMS to create new product

EC 404 ADVANCED COMMUNICATION SYSTEMS

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Advanced Communication Systems**	Course code**: EC 404**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Microwave Radio Communications: Introduction, Advantages and Disadvantages, Analog vs digital microwave, frequency vs amplitude modulation. Frequency modulated microwave radio system, FM microwave radio repeater. Diversity, protection switching arrangements, FM microwave radio stations, microwave repeater station, line of sight path characteristics.	4	15
II	Digital TV: Digitized Video, Source coding of Digitized Video, Compression of Frames, DCT based (JPED), Compression of Moving Pictures (MPEG). Basic blocks of MPEG2 and MPE4,Digital Video Broadcasting (DVB) Modulation: QAM (DVB-S, DVB-C), OFDM for Terrestrial Digital TV (DVB –T). Reception of Digital TV Signals (Cable, Satellite and terrestrial). Digital TV over IP, Digital terrestrial TV for mobile Display Technologies: basic working of Plasma, LCD and LED Displays	10	15
III	Satellite Communication systems, introduction, Kepler's laws, orbits, orbital effects, orbital perturbations Satellite sub systems, Antennas, Transponders, earth station technology, Link calculation. Satellite systems- GEO systems, non-GEO communication systems, Satellite Applications- Global Positioning System, Very Small Aperture, Terminal system, Direct to Home Satellite Systems	7	15
IV	Evolution of mobile radio communications, paging systems, Cordless telephone systems, comparison of various wireless systems. Introduction to Modern Wireless Communication Systems, Second generation cellular networks, third generation wireless networks, fourth generation wireless technologies. Wireless in local loop, wireless local area networks, Blue tooth and Personal Area networks, Over view of WIMAX Technologies, architecture, spectrum allocation	6	15
V	Cellular concept, hand off strategies, Interference and system capacity: Cell splitting, Sectoring, Repeaters, and Microcells. Cellular System Design Fundamentals: Frequency Reuse, channel assignment strategies, handoff Strategies, Interference and system capacity, tracking and grade off service, improving coverage and capacity Wireless propagation mechanism, free space propagation model, ground reflection model, knife edge diffraction model, path loss prediction in hilly terrain, introduction to fading and diversity techniques, Introduction to MIMO	6	20

	system		
VI	Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum multiple Access, space division multiple access, CDMA, OFDM Wireless Networking, Difference between wireless and fixed telephone networks, development of wireless networks, fixed network transmission hierarchy, traffic routing in wireless networks, wireless data services, Wireless standards, GSM system architecture, radio link aspects, network aspects Introduction to new data services like High Speed Circuit Switched Data (HSCSD), General Packet Radio Service (GPRS), Digital Enhanced Cordless Telecommunications (DECT) , Enhanced Data Rate for Global Evolution (EDGE), Ultra wideband systems (UWB), Push To Talk (PTT) technology, Mobile IP	10	20

TEXT BOOKS:

1	Dennis Roody, Satellite communication, 4/e, McGraw Hill, 2006.
2	Herve Benoit, Digital Television Satellite, Cable, Terrestrial, IPTV, Mobile TV in the DVB Framework, 3/e, Focal Press, Elsevier, 2008
3	Simon Haykin, Michael Mohar, Modern wireless communication, Pearson Education, 2008
4	Theodore S. Rappaport: Wireless communication principles and practice,2/e, Pearson Education, 1990

REFERENCES:

1	Jochen Schiller, Mobile Communications, Pearson, 2008.
2	Mishra, Wireless communications and Networks, McGraw Hill, 2/e, 2013.
3	Nathan, Wirelesscommunications,PHI, 2012.
4	Singal, Wireless communications, Mc Graw Hill, 2010.
5	Tomasi, Advanced Electronic Communication Systems, 6/e, Pearson, 2015.
6	W.C.Y.Lee, Mobile Cellular Telecommunication, McGraw Hill, 2010.

PREREQUISITES:

EC302 Digital Communication, EC403 Microwave & Radar Engineering

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objectives:

1	To impart the basic concepts of various communication system.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Give an idea about the basics of Microwave Radio Communication methods.
2	Acquire the knowledge of the digital video coding, compression standards, broadcasting methods, modulation and display technologies.
3	Describe about Satellite Communication systems and its applications.
4	Illustrate the Modern Wireless Communication Systems and wireless local area network technologies.
5	Design cellular System and also get an idea about various wireless propagation mechanisms.
6	Compare the performance of various Multiple Access and Develop a wireless network and analyze the need of new data services.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12		PSO 1	PSO 2	PSO 3
CO1	**3**		**2**	**2**										**2**		
CO2	**3**	**2**												**3**		
CO3	**3**	**2**	**2**											**2**		
CO4	**3**		**3**											**3**	**2**	
CO5	**3**	**3**	**3**											**1**		
CO6	**3**		**2**	**1**								**2**		**1**		

CO-PO-PSO MAPPING:

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Apply the knowledge of engineering fundamentals to develop a microwave radio communication networks.
	PO3	2	Design system components process to meet the specifications with considerations for the need of societal effective communication.
	PO4	2	Use research based knowledge including design and analysis for video streaming in communication networks.
CO2	PO1	3	With the basic knowledge of basic engineering the student will be able to identify various coding and broadcasting techniques to be used
	PO2	2	With the knowledge of compression standards and broadcasting methods the communication problems can be identified and solved
CO3	PO1	3	Apply the knowledge of engineering specialization to the problems related to satellite communication.
	PO2	2	Design a basic satellite network using its related orbital parameters.
	PO3	2	Identify the different satellite launching methods.
CO4	PO1	3	Apply the knowledge related to communication fields in to understand modern wireless communication system.
	PO3	3	Design a simple cellular system by using fundamental communication standard.
CO5	PO1	3	With the basic knowledge of basic engineering and mathematics the student will be able to identify various cellular communication problems
	PO2	3	Apply the knowledge related to cellular networks to understand modern wireless mobile communication system.
	PO3	3	Design a simple cellular system by using fundamental communication standard.
CO6	PO1	3	Structure and methods of multiple access techniques in communication fields.
	PO4	1	Design system components process to meet the specifications with considerations for the need of new data services.
	PO12	2	Apply the learnt knowledge of advanced communication system for develop innovative/adaptive communication system.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**2**	Apply the concepts of communication in the design and development of different stages of microwave radio communication.
CO2	**PSO1**	**3**	Students will be able to provide a brief idea about the parameters related to orbits and satellite launching.
CO3	**PSO1**	**2**	Graduates will able to get an idea about the different wireless standards and apply the learnt knowledge to design cellular system.
CO4	**PSO1**	**3**	Graduates will provide novel approach to various multiple access techniques.
	PSO2	**2**	The students have the competence in using latest hardware and software tools in wireless and other advanced communication systems.
CO5	**PSO1**	**1**	Students will be able to identify various cellular communication problems
CO6	**PSO1**	**1**	Graduates will able to get an idea about structure and methods of multiple access techniques in communication fields.

EC468 SECURE COMMUNICATION

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Secure Communication**	Course code**: EC 468**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction on security, security goals and types of attacks: Passive attack, active attack, attacks on confidentiality, attacks on integrity and availability, Security services and mechanisms.	5	15

II	Modular arithmetic: Groups, Ring, Fields. The Euclidean algorithm, Finite fields of the form GF(p) Polynomial arithmetic: Finite fields of the form GF (2n).	8	15
III	Symmetric Ciphers, Symmetric Cipher Model Substitution Techniques, Caesar Cipher, Mono alphabetic Cipher, Play fair cipher, Hill cipher, Poly alphabetic Cipher, one time pad	7	15
IV	Transposition techniques ,Block Ciphers, Data encryption Standards, DES Encryption, DES decryption. Differential and Linear Crypt analysis Advanced Encryption standard. The AES Cipher, substitute bytes transformation, Shift row transformation, Mix Column transformation.	7	15
V	Public key cryptosystem, Application for Public key cryptosystem requirements RSA algorithm, Key management, Distribution of public key, public key certificates, Distribution of secret keys.	7	20
VI	Intruders: Intrusion techniques, Intrusion detection, Statistical anomaly detection, Rule based intrusion detection, Distributed intrusion detection, Honey pot, Intrusion detection exchange format. Password management: Password protection, password selection strategies.	7	20

TEXT BOOKS:

1	Behrouz A. Forouzan , Cryptography and Network security Tata McGraw-Hill, 2008
2	William Stallings, Cryptography and Network security: principles and practice", 2nd Edition, Prentice Hall of India, New Delhi, 2002

REFERENCES:

1	David S. Dummit & Richard M Foote, Abstract Algebra, 2nd Edition, Wiley India Pvt. Ltd., 2008.
2	Douglas A. Stinson, Cryptography, Theory and Practice, 2/e, Chapman & Hall, CRC Press Company, Washington, 2005.
3	Lawrence C. Washington, Elliptic Curves: Theory and Cryptography, Chapman & Hall, CRC Press Company, Washington, 2008.
4	N. Koeblitz: A course in Number theory and Cryptography, 2008

5	Thomas Koshy: Elementary Number Theory with Applications, 2/e, Academic Press, 2007
6	Tyagi and Yadav , Cryptography and network security, Dhanpatrai, 2012

PREREQUISITES:

EC407 COMPUTER COMMUNICATION

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objective:

1	To impart the students about the theory and technology behind the secure communication.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Identify and prevent various security attacks and will be able to interpret various security mechanisms and services
2	Apply the concepts of modular arithmetic's in the field of secure communication
3	Model a secure communication model using various substitution techniques.
4	Model a secure communication model using various transposition techniques.
5	Formulate efficient algorithms for the secure transmission of data.
6	Analyze various sources of intrusion and password management techniques to tackle such events.

CO-PO-PSO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12		PSO 1	PSO 2	PSO 3
CO 1	3	1	2	2	3	3								3		3
CO 2	3	3	2	2	1	1								3		1
CO 3	3	1	2	2	3	3								3		3
CO 4	3	1	2	2	3	3								3		3
CO 5	3	1	2	2	3	3								3		3
CO 6	3	1	2	2	3	3								3		3

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	PO1	3	Apply the knowledge of various security attacks
	PO2	1	Analyze the various types of security mechanisms and services
	PO3	2	Design and develop solutions for various security attacks
	PO4	2	Analyse and interpret various security aspects using the concept of security mechanisms
	PO5	3	Create ,select and apply modern security mechanisms, security services methods for various engineering activities
	PO6	3	Solve various security attacks related issues relevant to professional engineering practice
CO2	PO1	3	Apply the knowledge of modular arithmetics

	PO2	**3**	Analyze the various methods of modular arithmetics
	PO3	**3**	Design and develop solutions based on modular arithmetics
	PO4	**3**	Analyse and interpret various security aspects using the concept of modular arithmetics
	PO5	**1**	Create ,select and apply modern modular arithmetics methods for various engineering activities
	PO6	**1**	Use the concept of modular arithmetics to solve various security related issues relevant to professional engineering practice
CO3	**PO1**	**3**	Apply the knowledge of various substitution techniques.
	PO2	**1**	Analyze the various methods of substitution techniques
	PO3	**2**	Design and develop solutions based on substitution techniques
	PO4	**2**	Analyse and interpret various security aspects using the concept of substitution techniques
	PO5	**3**	Create ,select and apply modern substitution techniques methods for various engineering activities
	PO6	**3**	Use the concept of substitution techniques to solve various security related issues relevant to professional engineering practice
CO4	**PO1**	**3**	Apply the knowledge of various transposition techniques.
	PO2	**1**	Analyze the various methods of transposition techniques
	PO3	**2**	Design and develop solutions based on transposition techniques
	PO4	**2**	Analyse and interpret various security aspects using the concept of transposition techniques
	PO5	**3**	Create , select and apply modern transposition techniques methods for various engineering activities
	PO6	**3**	Use the concept of transposition techniques to solve various security related issues relevant to professional engineering practice
CO4	**PO1**	**3**	Apply the knowledge of different cryptographic algorithms
	PO2	**1**	Analyze the various cryptographic algorithms

	PO3	**2**	Design and develop solutions based on cryptographic algorithms
	PO4	**2**	Analyse and interpret various security aspects using various cryptographic algorithms
	PO5	**3**	Create ,select and apply cryptographic algorithms for various engineering activities
	PO6	**3**	Use the concept of various cryptographic algorithms s to solve various security related issues relevant to professional engineering practice
CO5	**PO1**	**3**	Apply the knowledge of various sources of intrusion and password management techniques
	PO2	**1**	Analyze the various sources of intrusion and password management techniques
	PO3	**2**	Design and develop solutions based on sources of intrusion and password management techniques
	PO4	**2**	Analyse and interpret various security aspects using various password management techniques
	PO5	**3**	Create ,select and apply password management techniques for various engineering activities
	PO6	**3**	Use the concept of various password management techniques to solve various security related issues relevant to professional engineering practice

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Graduates will be able to provide novel approaches to tackle various security attacks.
	PSO3	**3**	Graduates will able to apply the learnt knowledge to identify new securtiy mechanisms and services
CO2	**PSO1**	**3**	Graduates will apply the learnt knowledge about modular arithmetics throughout their life for developing new ideas
	PSO3	**1**	Graduates will be aware about the various contributions that can be

			made to real world using the arithmetics concept.
CO3	**PSO1**	**3**	Graduates will Identify various substitution techniques based on applications.
	PSO3	**3**	Graduates will able to apply the learnt knowledge about substitution techniques to real world applications
CO4	**PSO1**	**3**	Graduates will Identify various transposition techniques based on applications.
	PSO3	**3**	Graduates will able to apply the learnt knowledge about transposition techniques to real world applications
CO5	**PSO1**	**3**	Graduates will be able to provide novel approaches to different cryptographic algorithms to real world applications
	PSO3	**3**	Graduates will able to apply the learnt knowledge about different cryptographic algorithms to real world applications
C06	**PSO1**	**3**	Graduates will be able to provide novel approaches about various intrusion and password management techniques
	PSO3	**3**	Graduates will able to apply the learnt knowledge about intrusion and password management techniques to real world applications

EC 492 PROJECT

COURSE INFORMATION SHEET:

Program: **Electronics And Communication engineering**	Degree : **B-Tech**
Course **: Project**	Course code**: EC 492**
L-T-P**:0-0-6**	Credit**:6**

COURSE LEARNING OBJECTIVES:

This course will help students to achieve the following objective:

1	To apply engineering knowledge in practical problem solving.

2	To foster innovation in design of products, processes or systems.
3	To develop creative thinking in finding viable solutions to engineering problems.

COURSE OUTCOMES:

After successful completion of the course students should be able to:

CO's	DESCRIPTION
1	**Think innovatively** to develop new hardware solutions.
2	**Apply** the fundamental knowledge of Electronics and Communication Engineering in developing novel products/solutions.
3	**Design and develop** system prototypes independently by utilizing latest software's and equipments.
4	**Intellectual capability and innovative thinking** of the students are ignited.
5	**Identify** technical issues and solve them effectively in a systematic manner.
6	**Develop** professionalism, build self confidence and practice ethical responsibilities.

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	1	1	2	1	1		3								3	
CO2	1	2	2	1			1							1		
CO3	1	1	3		2										3	
CO4	2		3	1	3										3	
CO5	1	1	3	1												
CO6						3	3	3	3	3	3	3				

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	PO1	Students will be able to apply engineering knowledge to create innovative ideas
	PO2	Students will be able to apply engineering knowledge to solve technical problems
	PO3	Students will be able to apply engineering knowledge to design & develop new systems
	PO4	Students will be able to apply engineering knowledge to conduct investigations on complex problems
	PO5	Students will be able to familiarize with usage of modern tools
	PO7	Students will be able to think creatively to develop sustainable solutions
CO2	PO1	Students will be able to apply engineering knowledge to develop new products
	PO2	Students will be able to apply engineering knowledge to develop new systems
	PO3	Students will be able to think creatively to develop new designs
	PO4	Students will be able to apply engineering knowledge to conduct investigations on complex problems
CO3	PO7	Students will be able to think creatively to develop sustainable solutions
	PO1	Students will be able to apply engineering knowledge to create viable prototypes
	PO2	Students will be able to apply engineering knowledge to analyse the problems and develop systems
	PO3	Students will be able to think creatively t develop new solutions
	PO5	Students will be able to design new systems using modern tools
CO4	PO1	Students will be able to apply the basic knowledge of engineering to generate new designs
	PO3	Students will be able to develop new engineering products
	PO4	Students will be able to conduct investigations and identify problems
	PO5	Students will be capable of developing new engineering products using modern tools of engineering
CO5	PO1	Students will be able to apply the basic knowledge of engineering to systematically solve the problems
	PO2	Students will be able to investigate industrial/commercial issues and will be able to address them through their product/ innovative technology.
	PO3	Students will be able to propose and develop solutions for societal needs
	PO4	Students will be able to use modern simulation/optimization/design and coding technique for prototype development

CO6	**PO6**	Students will be able to apply reasoning informed by the contextual knowledge to solve societal issues
	PO7	Students will be able to develop new products/ technology for sustainable development of environment through their proposed system
	PO8	Students will be able to develop a code of ethics
	PO9	Students will be able to function effectively as a team
	PO10	Students will be able to communicate effectively with public the need of newly proposed system for societal development
	PO11	Students will be able to manage a project effectively
	PO12	Students will be able to identify the need of lifelong learning to cope up with the upcoming problems in engineering

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO2**	Students will be able to think innovatively by exploring technical knowledge
CO2	**PSO1**	Students will be able to identify problems using the basic knowledge of engineering
CO3	**PSO2**	Students will be able to design and develop prototypes using their technical knowledge
CO4	**PSO2**	Students will be able to gain competency to develop sustainable products