SREEPATHY INSTITUTE OF MANAGEMENT AND TECHNOLOGY

COURSE HANDBOOK

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

SEMESTER 3

EE 201 CIRCUITS & NETWORKS

COURSE INFORMATION SHEET:

Program:**Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Circuits & Networks**	Course code**: EE 201**
L-T-P**:3-1-0-4**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Network theorems – Superposition theorem – Thevenin's theorem – Norton's theorem – Reciprocity Theorem – Maximum power transfer theorem – dc and ac steady state analysis – dependent and independent sources	9	15
II	Network topology – graph, tree, incidence matrix – properties of incidence matrix – fundamental cut sets – cut set matrix – tie sets – fundamental tie sets – tie set matrix – relationships among incidence matrix, cut set matrix & tie set matrix – Kirchoff's laws in terms of network topological matrices – formulation and solution of network equations using topological methods	9	15
III	Steady state and transient response – DC response & sinusoidal response of RL, RC and RLC series circuits	9	15
IV	Application of Laplace transform in transient analysis– Application of Laplace transform in transient analysis – RL, RC and RLC circuits (Series and Parallel circuits) – step and sinusoidal response Transformed circuits – coupled circuits - dot convention - transform impedance/admittance of RLC circuits with mutual coupling – mesh analysis and node analysis of transformed circuits – solution of transformed circuits including mutually coupled circuits in s-domain	10	15
V	Two port networks – Z, Y , h, T parameters – relationship between parameter sets – condition for symmetry & reciprocity – interconnections of two port networks – driving point and transfer immittance – T-π transformation	9	20
VI	Network functions–Network synthesis-positive real functions and Hurwitz polynomial-synthesis of one port network with two kinds of elements-Foster form I&II-Cauer form I&II.	8	20

TEXT BOOKS:

1	Hayt and Kemmerly: Engineering Circuit Analysis, 8e, Mc Graw Hill Education , New Delhi, 2013.

2	Sudhakar and Shyam Mohan- Circuits and Networks: Analysis and Synthesis, 5e, Mc Graw Hill Education

REFERENCES:

1	SiskandC.S:ElectricalCircuits,McGrawHill
2	Joseph.A.Edminister:TheoryandproblemsofElectriccircuits,TMH
3	DRoyChaudhuri:NetworksandSystems,NewAgePublishers
4	A.Chakrabarti:CircuitTheory(AnalysisandSynthesis),DhanpatRai&Co
5	Valkenberg:NetworkAnalysis,PrenticeHallofInd
6	B.R.Gupta:NetworkSystemsandAnalysis,S.Chand&Companyltd

PREREQUISITE:NIL

COURSE OBJECTIVES:

1	To learn about various techniques available to solve varioustypesofcircuitsandnetwork
2	To gain the capability to synthesize a circuit for a particular purpose.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Solve** any DC and Ac circuits
2	**Apply** graph theory in solving networks
3	**Understand** the transient response of any circuit using Laplace Transform
4	**Analyze** the performance of two port network using network parameters

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
CO2		3	3											1		2
CO3	3	3	3											2		
CO4	3		3											1		
CO5	3		3											1		

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Student will be able to apply the knowledge of Engineering fundamentals to write equations using Network Theorems
	PO2	Student will be able to formulate and analyze equations of complex DC and AC circuits
CO2	**PO2**	Student will be to able to simplify circuit analysis using graph theory
	PO3	Student will be able to propose improved designs for any circuit based on the values of voltages and currents
CO3	**PO1**	Student will be able to apply the knowledge of Engineering fundamentals to determine the laplace transform
	PO2	Student will be able analyze the transient response of various circuits and predict the performance
	PO3	Student will be able to propose solutions for problems associated with various circuits based on the transient response
CO4	**PO1**	Student will be able to determine the network parameters using fundamental engineering aspects
	PO3	Student will be able to analyze the performance of any circuitusing two port approach
CO5	**PO1**	Student will be able to apply the knowledge of Engineering fundamentals to combine various networks
	PO3	Student will be able to solve the problems in the area of network analysis.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Graduates will able to apply the equations using network theorem
	PSO2	Graduates will able to apply different methods for solving the networks
	PSO3	Graduates will able to understand the problems that occur in network
CO2	**PSO1**	Graduates will able to apply the equations in graph theory
	PSO3	Graduates will able to understand the techniques used for solving the graph theory
CO3	**PSO1**	Graduates will be able apply the laplace transforms in a network.
CO4	**PSO1**	Graduates will be able design a two port network
CO5	**PSO1**	Graduates will able to design a network using Foster form &Cauer form

EE 203 ANALOG ELECTRONICS

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**:** A**nalog Electronics**	Course code**: EE 203**
L-T-P**:3-1-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Diode Circuits : Diode clipping circuits - Single level and two level clippers - Clamping circuits – Design of Zener Voltage Regulators. Bipolar Junction Transistors : Review of BJT characteristics- Operating point of a BJT – Factors affecting stability of Q point and DC Biasing – Biasing circuits: fixed bias, collector to base bias, voltage division bias and self bias. (Derivation of stability factors for Voltage Divider Biasing only) –Bias compensation using diode and thermistor. Low frequency equivalent circuit of BJT. Common Emitter amplifier - AC Equivalent Circuit – Role of coupling and emitter bypass capacitors – h parameter model of BJT -Amplifier gains and impedances calculations using h equivalent circuit.	9	15
II	Field Effect Transistors : Review of JFET and MOSFET construction, working and characteristics- Biasing a JFET and MOSFET using voltage divider bias–- CS and CD amplifiers – small signal models-FET as switch and voltage controlled resistance. Frequency respon se of Amplifiers : Miller's Theorem-BJT Internal Capacitances at high frequency operationsB High frequency analysis of CE Amplifier using hybrid Pi Model -Low Frequency Response of Common Emitter amplifier -– CE High frequency response-Gain bandwidth product- ––Low and High Frequency response of FET amplifiers	9	15
III	Multistage amplifiers:Direct,RC,transformer coupled amplifiers–Power amplifiers using BJT:ClassA,ClassB and ClassA B and classC-Conversionefficiencyanddistortioninpoweramplifiers .FeedbackAmplifiers-Effect of positive and negative feedbacks-Basic feedback topologies and their properties	8	15
IV	Oscillators : Bark Hausen's criterion – RC oscillators (RC Phase shift oscillator and Wein Bridge oscillator) – LC oscillators (Hartley and Colpitt's)- Derivation of frequency of oscillation for the above mentioned	8	15

	oscillators- Crystal oscillator..Operational Amplifiers: Review of Operational Amplifier basics - Analysis of fundamental differential amplifier- Properties of ideal and practical Op-Amp - Gain, CMRR and Slew rate of IC 741 and LM 301– Drift and frequency compensation in OP Amps- Open loop and Closed loop Configurations- Concept of virtual short and its relation to negative feedback		
V	OP-AMP Circuits : Review of inverting and nona inverting amplifier circuits- Summing and difference amplifiers, Differentiator and Integrator circuits- Logarithmic amplifier- Half Wave Precision rectifier - Instrumentation amplifier. Comparators: Zero crossing and voltage level detectors, Schmitt trigger.	8	20
VI	Wave form generati on using Op-Amps: Square, triangular and ramp generator circuits using Op-Amp - Effect of slew rate on waveform generation. Timer 555 IC : Internal diagram of 555 IC– Astable and Monostablemultivibrators using 555 IC. Oscillator circuits using Op-amps : RC Phase shift oscillator, Wein Bridge oscillator, LC Oscillators- (Derivation not required) - Crystal oscillator..	8	20

TEXT BOOKS:

1	FloydT.L,DigitalFundamentals,10/e,PearsonEducation, 2011
2	Boylestad R. L. and L. Nashelsky, Electronic Devices and Circuit Theory, 10/e, Pearson Education India, 2009.
3	Choudhury R., Linear Integrated Circuits, New Age International Publishers. 2008.

REFERENCES:

1	FloydT.L.,FundamentalsofAnalogCircuits,,PearsonEducation,2012
2	RobertT.PaynterandJohnClemons,Paynter'sIntroductoryelectronicdevices&circuits,PrenticeHallCareer&Technology,NewJersey
3	BellD.A.,ElectronicDevicesandCircuits,PrenticeHallofIndia,2007.
4	MillmanJ.andC.C.Halkias,IntegratedElectronics:AnalogandDigitalCircuitsandSystems,TataMcGraw-Hill,2010.
5	StreetmanB.G.andS.Banerjee,SolidStateElectronicDevices,PearsonEducationAsia,2006.
6	GayakwardR.A.,Op-AmpsandLinearIntegratedCircuits,PHILearningPvt.Ltd.,2012.

PREREQUISITE:

NIL

COURSE OBJECTIVES:

1	To impart an in depth knowledge in electronic semiconductor devices & circuits giving importance to the various aspects of design & analysis
2	To provide knowledge about different types amplifier & oscillator circuits and their design.
3	To provide a thorough understanding of the operational amplifier circuits and their functions

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Design** biasing scheme for transistor circuits
2	**Model** BJT and FET amplifier circuits
3	**Choose** a power amplifier with appropriate specifications for electronic circuit applications
4	**Design &analyse** oscillator circuits using BJT
5	**Choose** Operational amplifier(OPAMP) for specific applications including waveform generation.
6	**Design & implement** analog circuits using OPAMPs .

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Student will be able to apply knowledge of engineering mathematics,

		science and engineering fundamentals to design biasing scheme for a particular application.
	PO2	Student will be able to select aa particular biasing scheme based on the requirements.
	PO3	Student will be able to design a suitable biasing circuit that meets the specific needs with due consideration on stability aspects.
	PO4	Students will be able to analyze various amplifier circuits
	PO6	Student will get an initiation to explore various electronic appliances
CO2	**PO1**	Students will be able to analyze the working BJT and FET amplifiers
	PO2	Student will be able apply to identify stability problems associated with amplifiers
	PO3	Student will be able to design a suitable amplifier circuits that meets the specific needs with due consideration on stability aspects.
CO3	**PO3**	Student will be able to choose suitable power amplifier for a specific application
CO4	**PO1**	Students will be able to identify problems associated with different types of oscillator circuits
	PO3	Students will be able to design suitable oscillator circuit
CO5	**PO3**	Students will be able to design proper opamap circuit for meeting specific requirements
CO6	**PO3**	Students will able to design circuits using OP-AMP.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO3	**PSO1**	To Apply the Engineering knowledge to identify, Analyze, Design biasing circuits for amplifiers
CO3	**PSO2**	Explore the technical knowledge and development of professional methodologies in the emerging technologies of amplifiers
CO4	**PSO1**	To Apply the Engineering knowledge to identify, Analyze, Design oscillator circuits
CO6	**PSO1**	To Apply the Engineering knowledge to identify, Analyze, generate different waveforms.
CO6	**PSO2**	Explore the technical knowledge and development of professional methodologies in the design of OP-AMP circuits.

EE205 DC MACHINES & TRANSFORMERS

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: DC Machines & Transformers**	Course code**: EE 205**
L-T-P**:3-1-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Electromagnetic principles for Machines Electro dynamical equations and their solution – rotational motion system – mutually coupled coils – construction of DC machines – energy conversion in rotating electrical machines – eddy currents and eddy current losses – flux distribution curve in the airgap – armature windings – lap and wave windings – selection criteria – equalizer rings – dummy coils.	9	15
II	DC generators – EMF equation – methods of excitation – separately and self excited – shunt, series, compound – armature reaction – effects of armature reaction – demagnetizing & cross magnetizing ampere-turns – compensating windings – interpoles – commutation – methods to improve commutation – voltage build-upcharacteristics – load characteristics – losses and efficiency – power flow diagram – parallel operation – applications of dc generators	9	15
III	DC motor – principle of operation – back emf – classification – torque equation – losses and efficiency – power flow diagram – performance characteristics of shunt, series and compound motors – starting of dc motors – necessity and types of starters – speed control – methods of speed control – testing – Swinburne's test – Hopkinson's test – separation of losses – retardation test – applications of dc motors	9	15
IV	Transformers–principleofoperation–types andconstruction,coretypeandshelltypeconstruction, Dry type transformers,cooling of transformers–ideal transformer–transformationratio–dot convention–polarity test–practical transformer–Kva rating–equivalent circuit–phasordiagram.	8	15
V	Transformer losses and efficiency – voltage regulation –	9	20

	OC & SC test – Sumpner's test – all day efficiency Autotransformer – saving of copper – current rating and kVA rating of autotransformers, parallel operation of single phase transformers, necessary and desirable conditions of parallel operation, on load and off load tap changers.		
VI	3-phase transformer – 3-phase transformer connections – Δ-Δ, Y-Y , Δ-Y , Y-Δ, V-V – vector groupings Yy0, Dd0, Yd1, Yd11, Dy1, Dy11 – Scott connection – three winding transformer – tertiary winding – percentage and per unit impedance – parallel operation of three phase transformer.	9	20

TEXT BOOKS:

1	BimbraP.S.,ElectricalMachinery,7/e,KhannaPublishers,2011
2	NagrathJ.andD.P.Kothari,TheoryofACMachines,TataMcGrawHill, 2006

REFERENCES:

1	FitzgeraldA.E.,C.KingsleyandS.Umans,ElectricMachinery,5/e,McGrawHill,1990.
2	LangsdorfM.N.,TheoryofAlternatingCurrentMachinery,TataMcGrawHill,2001
3	AbhijithChakrabarti,SudiptaDebnath,ElectricalMachines,McGrawHillEducation,NewDelhi2015
4	DeshpandeM.V.,ElectricalMachines,PrenticeHallIndia,NewDelhi,2011.
5	TheodoreWilde,ElectricalMachines,DrivesandPowerSystem,PearsonEd.Asia2001.

PREREQUISITE:NIL

COURSE OBJECTIVES:

1	Togiveexposuretothestudentsabouttheconceptsofdirectcurrentmachinesandtransformers,includingtheir constructionaldetails,principleofoperationandperformanceanalysis

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Understand** the principle and construction of DC machines
2	**Explain** the working of DC generators
3	**Analyze** DC motor principle and testing of DC machines.
4	**Analyze** the operation and construction of single phase transformers

5	**Identify** and test transformers and parallel operation of transformers
6	**Analyze** three phase transformers connection and parallel operation of the same

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	PO1	Student will be able to apply the fundamental knowledge of mathematics& electrical engineering in representing the DC maxchines..
	PO2	Student will be able toanalyze problems in DC machines
CO2	PO1	Apply the knowledge of Mathematical Modeling of DC machines to solve armature reaction and commutation.
	PO2	Student will beable to identify different problem analysis in DC machines.
	PO9	Student will be able to formulate the different characteristics of DC generators.
	PO10	Student will be able to apply the knowledge gained in DC generators for effective communication and presentation.
CO3	PO2	Student will be able to analyze DC motors principle and operation. Formulate the armature reaction commutation.
	PO5	Student will be to use appropriate techniques to test DC motors.
CO4	PO1	Student will be able to apply the knowledge of mathematics for identifying single phase transformers.
	PO2	Analyze the construction of transformers and dot conventions.
	PO4	Student will be able to compute complex problems in single phase transformers and interpret the data to provide valid conclusions.
	PO12	Student will be able to formulate the problems in the area of single phase

		transformers and recognize the need for life –long learning in context of technological change in single phase transformers.
CO5	**PO1**	Student will be able to the knowledge of mathematics to find out efficiency of single phase transformers
	PO2	Students will be able Analyse Economic Operation of Power system considering various constraints
	PO3	Design according to various constraints in power system.
	PO6	Student will be able to apply the knowledge of parallel operation in tp professional engineering practice.
	PO12	Student will be able to recognize parallel operation of transformers in the context of technological change.
CO6	**PO1**	Student will be able to apply the fundamental knowledge of mathematics & electrical engineering to understand the three phase transformers.
	PO2	Students will be able to apply three phase transformer connections and vector grouping in problem analysis
	PO7	Understand the importance of three phase transformers in the context of sustainable development.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Graduates will be able to apply the knowledge of Dc machine in electrical drives
CO2	**PSO2**	Graduates will able to apply the Mathematical model to Analyze DC generators.
CO3	**PSO1**	Graduates will able to apply the learned Knowledge to carry out speed control of DC motors.
CO4	**PSO1**	Graduates will able to apply the knowledge of single phase transformers in Industrial environment.
	PSO2	Graduates will be able to understand and solve the problem in single phase transformers in distributed system.
CO5	**PSO1**	Graduates will able to apply the learned Knowledge for parallel operation of single phase transformers in the industrial environment.
CO6	**PSO1**	Graduates will able to apply the knowledge of three phase transformers in Industrial environment.
	PSO2	Graduates will be able to understand and solve the problem in three phase transformers in distributed system.

EE 207 COMPUTER PROGRAMMING

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Computer Programming**	Course code**: EE 207**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction to Programming: Machine language, assembly language, and high level language. Compilers and assemblers. Flow chart and algorithm – Development of algorithms for simple problems. Basic elements of C: Structure of C program –Keywords, Identifiers, data types, Operators and expressions – Input and Output functions	7	15
II	ControlstatementsinC:if,if-else,while,do-while and for statements,switch,break,continue,goto,andlabels.Programmingexamples.	7	15
III	Arrays and Strings: Declaration, initialisation, processing arrays and strings– two dimensional and multi dimensional arrays –application of arrays. Example programs	7	15
IV	Functions:Functions declaring,defining,andaccessingfunctions–parameter passingmethods—passingarraystofunctions,Recursion. Storage classes– extern,auto,registerandstatic.Exampleprograms	7	15
V	Structures declaration,definition and initialization of structures,unions Pointers:Concepts,declaration,initializationofpointervariables,Accessing aVariable throughits Pointer Chain of Pointers,PointerExpressions,Pointer Increments and Scale Factor,Pointers and Arrays	8	20
VI	FileManagement File operations,Input/Output Operations on Files,RandomAccess to Files,Filepointer.Introduction to Python: Basic Syntax,Operators,control statements,functions-examples	8	20

TEXT BOOKS:

1	E.Balaguruswamy,Programming in ANSIC,Tata Mc Graw Hill,NewDelhi
2	JohnVGuttag,Introduction to Computation and programming using Python,PHI Learning,NewDelhi.

REFERENCES:

1	P. Norton, Peter Norton's Introduction to Computers, Tata McGraw Hill, New Delhi
2	Byron S. Gottfried, Programming with C, Schaun Outlines –McGraw Hill
3	Ashok Kamthane, Programming with ANSI & Turbo C- Pearson education
4	K.R Venugopal and S.R Prasad, Mastering C - Tata McGraw Hill
5	Kelley, Al & Pohl, A Book on C- Programming in C, 4th Ed,, Pearson Educati

PREREQUISITE:Nil

COURSE OBJECTIVES:

1	To understand the concepts of algorithms and flowcharts
2	Familiarize with C programming constructs
3	To know the fundamental concepts arrays and pointers
4	To identify the method ofdividing a program into various functions
5	To differentiate between the concept of Structures and unions
6	To know the use of file system in a C program
7	To familiarize with Python programming

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Develop** algorithms and flowcharts using various C-programming constructs
2	**Identify** suitable C language constructs to solve problems
3	**Apply** sorting & searching techniques to solve application programs using arrays and pointers
4	**Analyze** problems, identify subtasks and implement them as functions
5	**Analyze** and implement the concept of structures and unions
6	**Explain** the concept of file system for handling data storage and apply it for solving problems
7	**Impart** knowledge about Programming in Python

CO-PO-PSO MAPPING:

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

CO2	3	2	3		1							1		2	2	
CO3	3	2	2		2							1		2	2	
CO4	3	2	2		2							1		2	1	
CO5	3	2	2		2							1		2	1	
CO6	3		2		2							1		2		
CO7	2	2	2									1		2	2	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	PO1	Apply the knowledge of mathematics to design algorithms and flowcharts for various computational problems and hence to find its solution
	PO2	Analyze problems by developing algorithms and flowchart to arrive at solutions
	PO3	Design algorithms and flowcharts for complex engineering problems and design hardware components
	PO5	Select and apply appropriate techniques, and IT toolsto develop software programs by developing algorithms and flowcharts
	PO12	Recognize the need for programming language and have the ability to engage in learning in the context of computer hardware and software
CO2	PO1	Apply the basic knowledge of branching and looping statements in C to develop simple C programsinorder to find the solution of engineering problems
	PO2	Analyzeproblemsby using branching and looping statements to arrive at solutions
	PO3	Design solutions for complex engineering problems by using the concept of branching and looping statements
	PO5	Apply appropriate techniques, and IT toolsto develop software programs using the concept of branching and looping statements
	PO12	Recognize the need for computer programs and have the ability to engage in learning in the context of looping statements
CO3	PO1	Apply the knowledge of arrays and pointers concepts in C to develop readable C programs
	PO2	Analyze problems by using the concept of arrays and pointersto arrive at solutions
	PO3	Design solutionsfor complex engineering problems by using the concept of arrays and pointers
	PO5	Apply appropriate techniques, and IT toolsto develop software programs using the concept of arrays and pointers
	PO12	Recognize the need for computer programs and have the ability to engage in learning in the context of using arrays
CO4	PO1	Apply the knowledge of functions in C to develop complex C programs
	PO2	Analyze problems by dividingitinto a number of modulesto arrive at solution
	PO3	Design solutions for complex engineering problems by using the concept of functions

	PO5	Apply IT toolsto develop software programs using functions
	PO12	Recognize the need for computer programs have the ability to engage in learning the programming using functions
CO5	**PO1**	Apply the knowledge of structures in C to analyse and develop complex C programs
	PO2	Analyzeproblemsby using the concept of structuresto arrive at solutions
	PO3	Design solutions for complex engineering problems by using the concept of structures
	PO5	Apply IT toolsto develop software programs using structures
	PO12	Recognize the need for computer programs have the ability to engage in learning in the context of structures
CO6	**PO1**	Apply the concept of files in C to read inputs and store outputs while developing C programs
	PO3	Design solutions for complex engineering problems by using the concept of files
	PO5	Apply appropriate techniques, and IT toolsto develop software programs t by storing the data in files
	PO12	Recognize the need for computer programs have the ability to engage in learning to store datas in files
CO7	**PO1**	Apply the knowledge of Python programming to develop simple Python programs inorder to find the solution of engineering problems
	PO2	Analyzeproblems by using the concept of Python programmingto arrive at solutions
	PO3	Design solutions for complex engineering problems by using the concept of Python programming
	PO12	Recognize the need for computer programs have the ability to engage in learning about Python programming

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	The graduates of the programme are able to apply knowledge of computer hardware, software and also able to develop algorithms and flowcharts to various problems
	PSO2	The graduates of the programme are able to explore the technical knowledge of computers in the emerging technologies in Electrical and electronics engineering
CO2	**PSO1**	Graduates will apply the knowledge of looping statements to analyze and solve various problems
	PSO2	The graduates of the programme are able to explore the technical knowledge of computer programming and development of computer programs using the concept of looping statements in the emerging technologies in Electrical and Electronics engineering

CO3	**PSO1**	Graduates will apply the knowledge of arrays and structures to store data for analyzing and solve various problems
	PSO2	The graduates of the programme are able to explore the technical knowledge of computer programming and development of computer programs using the concept of arrays and structures in the emerging technologies in Electrical and Electronics engineering
CO4	**PSO1**	Graduates will apply the knowledge of functions to analyze and solve various problems by dividing them into a number of modules
	PSO2	The graduates of the programme are able to explore the technical knowledge of computer programming and development of computer programs using the concept of functions in the emerging technologies in Electrical and Electronics engineering
CO5	**PSO1**	Graduates will apply the knowledge of pointers to analyze and solve problems
	PSO2	The graduates of the programme are able to explore the technical knowledge of computer programming and development of computer programs using the concept of pointers in the emerging technologies in Electrical and Electronics engineering
CO6	**PSO1**	Graduates will apply the concept of files to store data for solving various problems
CO7	**PSO1**	Graduates will apply the knowledge of Python programming to analyze and solve various problems
	PSO2	The graduates of the programme are able to explore the technical knowledge of computer programming and development of Python programs in the emerging technologies in Electrical and Electronics engineering

MA201 LINEAR ALGEBRA AND COMPLEX ANALYSIS

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Linera 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	9	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)	10	15

	Integrals of rational functions of sinT and cosT (ii)Integrals of the type ³ f ff (x)dx (Type I, Integrals from 0 to f) (Assignment : Application of Complex integration in Engineering)		
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 ResidueTheorem
6	**Identify** conformal mappings(vi) find regions that are mapped under certainTransformations

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														
CO4	3	3														
CO5	3	3														
CO6	3	3														

CO-PO MAPPING JUSTIFICATION:

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

CO2	**PO1**	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems
	PO2	Identify, formulate and analyze engineering problems using first principle of mathematics and engineering sciences
CO3	**PO1**	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems
	PO2	Identify, formulate and analyze engineering problems using first principle of mathematics and engineering sciences
CO4	**PO1**	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems
	PO2	Identify, formulate and analyze engineering problems using first principle of mathematics and engineering sciences
CO5	**PO1**	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems
	PO2	Identify, formulate and analyze engineering problems using first principle of mathematics and engineering sciences
CO6	**PO1**	Apply the knowledge of ,mathematics, science and engineering fundamentals and engineering specialization to the complex engineering problems
	PO2	Identify, formulate and analyze engineering problems using first principle of mathematics and engineering sciences

HS200 BUSINESS ECONOMICS

COURSE INFORMATION SHEET:

Program: **ELECTRICAL & ELECTRONICS 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 (2 Hrs.), Economic Systems, meaning of Business or Managerial Economics (2 Hrs.)and its role and relevance in managerial decision making in an industrial setting (2 Hrs).	6	15
II	Demand and Supply Analysis Demand Curve, Demand function (2 Hrs.), Elasticity of demand and its estimation (2 Hrs.), Supply curve, equilibrium price and price mechanism (2 Hrs).	6	15
III	Production Economics Economies of Scale and Diseconomies of Scale (1 Hr.), Production and Cost Functions. Factors of Production (2 Hrs.), Law of Diminishing marginal Productivity. Construction and analysis of Break Even Charts (3 Hrs.)	6	15
IV	Market Structure and Price-Output Decisions Price and output determination under Perfect Competition, Monopoly and Monopolistic Competition (3 Hrs.). Collusion and Cartel, Nash Equilibrium (3 Hrs.)	6	15
V	Money, National Income and Taxation Money, Emerging Bit Coin concept, Quantity Theory of Money, Interest Rate Management (2 Hrs), Open Market Operations by RBI, Selective Credit Controls, SLR, CRR (2 Hrs), Definition & Measurement of National Income, methods, sectors of economy (3 Hrs), inflation, deflation, trade cycles- ValueAdded Tax (2 Hrs).	9	20
VI	Investment Decisions and Balance Sheet Analysis Capital Budgeting, Investment Analysis – NPV, IRR, Profitability Index, ARR, Payback Period (3 Hrs), Depreciation, Time value of money. Business Forecasting– Elementary techniques (2 Hrs). Balance sheet preparation principles and interpretation (4 Hrs)	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 OUTCOMES:

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

CO's	DESCRIPTION
1	To familiarize the elementary perspectives of economics
2	To acquaint the students about the concepts of demand, supply and general production theory related to economics
3	To apply business analysis to the firm under different market conditions
4	To apply economic models to examine current economic scenario and to solve the economic issues
5	To apply various economic tools for analyzing the projects and decision making process
6	To 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		PSO1	PSO2	PSO3
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	JUSTIFICATION
CO1	PO11	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	Simple kind of mathematical equations are used to identify the degree of elasticities related to demand and supply and production function
	PO11	With help of management and business practices students can analyze the changing patterns of demand, supply and production function
	PO12	The demand and supply functions are lifelong learning concepts
CO3	PO2	To analyze the market conditions of a firm, break even concepts is used. It is a mathematical concept.
	PO11	The marketing functions are highly correlated with the business practices and principles in economics
CO4	PO8	To analyze the current economic scenario it necessary to take into consider the social and legal procedures and programmed related to them
	PO12	Corrective action related to economic scenario helps the students to analyze the various economic conditions faced throughout their life
CO5	PO1	The decision making and evaluation of projects are based on different economic tools which are used mathematical and statistical equations.
	PO11	Some kind of decision making functions are based on the principles that is used in economics like risk, uncertainty etc
CO6	PO1	Mathematical tools are used to analyze the various economic tools. Eg, trend projection method, balance sheet
	PO12	These are helpful to students to identify the various opportunities in their life within outside the nation

EE231 ELECTRONIC CIRCUITS LAB

Program: **Electrical & Electronics Engineering**	Degree : **B-Tech**
Course **:Electronic Circuits Lab**	Course code**: EE 231**
L-T-P**:0-0-3**	Credit**:1**

Experiments:

1. Study&UseofCRO:Measurementofcurrentvoltage,frequencyandphaseshift.
2. HalfwaveandFullwave(Centre-tappedandbridge)Rectifiers with and without filter
3. Clipping circuits using diodes
4. Clamping circuits using diodes
5. RC coupled amplifier using BJT in CE configuration
6. JFETamplifier-Measurementofvoltagegain,currentgain,inputand output impedance.
7. OPAMP crcuits-Design and setup of inverting and noninverting amplifier, scalechanger, adder, integrator,differentiator.
8. PhaseshiftoscillatorusingOPAMPs.
9. Wein'sBridgeoscillatorusingOPAMPs
10. WaveformgenerationSquare,triangularandsawtoothwaveformgenerationusingOPAMPs.
11. Introductiontocircuitsimulationusingesimsimulationsoftware.
12. IntroductiontoPCBlayoutsoftware

PREREQUISITE: NIL

COURSE OBJECTIVES:

1	To design and develop various electronic circuits using discrete components and OPAMPs.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Design** biasing circuit for transistor amplifier circuit.
2	**Explain** the working of electronic circuits.
3	**Analyze** an electronic circuits
4	**Create** electronic circuits using e-Sim
5	**Select** and implement analog circuits using OPAMPs.
6	**Familiarize** with simulation and PCB designing

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Students will be able to apply knowledge of engineering mathematics, science and engineering fundamentals to design biasing schemes for a particular application.
	PO2	Students will have an understanding on which analysis and design of an electronic circuit is based on mathematics and engineering sciences.
	PO3	Students will have the capability to analyze and design simple circuits containing non-linear elements such as transistors using the concepts of load lines, operating points etc.
	PO4	Students will be able to apply their knowledge about characteristics of BJT for conducting investigations on stability problems associated with amplifier circuits
CO2	**PO1**	Students will get an understanding about role of complex devices such as semiconductor diodes, BJTSs and op-amps are used in the working of circuits
	PO2	Students will get an understanding of how complex devices such as semiconductor diodes, BJTSs and op-amps are used in the design and analysis of useful circuits.
	PO3	Students will be able to develop a suitable electronic circuit that meets the specific needs.

	PO12	Students will gain an intuitive understanding about behavior of various active and passive components in various electronic circuits which motivates them to explore new technologies in their pursuit of engineering
CO3	**PO1**	Students will get an understanding of basic EE abstractions on which analysis and design of electrical and electronic circuits and systems are based.
	PO2	Students will be able to apply the different network equations and equations associated with semiconductor devices for analyzing the circuit
	PO3	Students will be able to develop solutions for the various problems associated with electronic circuits.
	PO4	Students will be able to investigate various problems associated with electronic circuits
CO4	**PO3**	Students will be able to design a circuit that meets the specific needs by simulating circuit using multisim
	PO4	Students will be able to understand the working of a circuit for a complex engineering application by simulating circuit using eSim
	PO5	Students will be able to develop a circuit and analyze its working using eSim
CO5	**PO1**	Students will understand the working of various op-amp circuits used to perform operations such as integration, differentiation etc.
	PO2	Students will learn how operational amplifiers are modelled to design op-amp circuits to perform operations such as integration, differentiation and filtering on electronic signals
	PO3	Students will analyze the design op-amp circuits to perform operations such as integration, differentiation and filtering on electronic signals
	PO4	Students will be able to apply their knowledge of op-amps for understanding complex circuits using op-amps.
CO6	**PO1**	Use modern tools to design electronic circuits

CO- PSO MAPPING

CO's	PSO's	
CO1	**PSO1**	Basic knowledge of circuits applied to study different experiments

EE233 PROGRAMMING LAB

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Programming Lab**	Course code**: EE233**
L-T-P**:0-0-3**	Credit**:1**

Experiments:

1. At least four simple programs using input output statements(example:area of rectangle,circle

2.At least four Simple programs using decision statements (Example:Evenorodd,passorfail)

3. Program to add n numbers

4. Programs to print patterns

5. Program to check whether a number is prime

6. Array manipulation (searching,insertion and sorting)

7. Few programs using pointers

8. Stringmanipulation–compare,copy,reverse operations

9. Matrix operations:addition multiplication,determinant and inverse

10. Solution of algebraic and transcendentale quations:Bisection,Newton-Raphsonmethod-comparison

11. Introductory programs usingPython

12. Function call sin Python

PREREQUISITE:

NIL

COURSE OBJECTIVES:

1	To understand the C programing constructs
2	Familiarize with Python programming

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Design** programs using C language
2	**Develop** simple programs using Python

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	PO1	Apply the knowledge of mathematics to design C programs for various computational problems and hence to find its solution
	PO2	Analyze problems by developing C programsto arrive at solutions
	PO3	Design C programs for complex engineering problems
	PO5	Select and apply appropriate techniques, and IT toolsto develop C programs
	PO12	Recognize the need for programming language and have the ability to engage in learning in the context of C programming
CO2	PO1	Apply the basic knowledge of C programming construct sto develop simple Python programs in order to find the solution of engineering problems
	PO2	Analyze problems and make use of Python programming constructs to arrive at solutions
	PO3	Design solutions for complex engineering problems by using the concept in Python programming
	PO5	Apply appropriate techniques, and IT toolsto develop software programs using the Python
	PO12	Recognize the need for computer programs and have the ability to engage in learning advanced concepts in Python programming

CO- PSO MAPPING

CO's	PSO's	JUSTIFICATION
CO1	PSO1	The graduates of the programme are able toapply knowledge of C programming constructs to various problems
	PSO2	The graduates of the programme are able to explore the technical knowledge of computer programming in the emerging technologies in Electrical and electronics engineering
CO2	PSO1	Graduates will apply the knowledge of Python language to analyze and solve various problems
	PSO2	The graduates of the programme are able to explore the technical knowledge of computer programming and development of computer programs using the concept of Python programming in the emerging technologies in Electrical and Electronics engineering
	PSO3	The graduates of the programme are able to explore the technical knowledge of computer programming and development of Python programs in the emerging technologies in Electrical and Electronics engineering

SREEPATHY INSTITUTE OF MANAGEMENT AND TECHNOLOGY

COURSE HANDBOOK

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

SEMESTER 4

EE 202 SYNCHRONOUS & INDUCTION MACHINES

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Synchronous& Induction Machines**	Course code**: EE 202**
L-T-P**:3-1-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Alternators - basic principle, constructional features of salient pole type and cylindrical type alternators, advantages of stationary armature, turbo-alternator.Armature winding – types of armature winding- single layer, double layer, full pitched and short pitched winding slot angle, pitch factor and distribution factor – numerical problems. Effect of pitch factor on harmonics – advantages of short chorded winding, EMF Equation – numerical problems. Harmonics in generated EMF – suppression of harmonics.	8	15
II	Performance of an alternator – Causes for voltage drop in alternators – armature resistance, armature leakage reactance – armature reaction, synchronous reactance, synchronous impedance, experimental determination – phasor diagram of a loaded alternator. Voltage regulation – EMF, MMF, ZPF and ASA methods – numerical problems.	9	15
III	Theory of salient pole machine – Blondel's two reaction theory – direct axis and quadrature axis synchronous reactances – phasor diagram and determination of X_d and X_q by slip test. Parallel operation of alternators – necessity of parallel operation of alternators, methods of synchronisation– dark lamp method and bright lamp method, synchroscope, Synchronising current, synchronising power, synchronising torque. Effects of changing excitation of alternators, load sharing of two alternators in parallel operation.	9	15
IV	Synchronous motor – construction and principle of synchronous motor, methods of starting. Effects of excitation on armature current and power factor, v-curve and inverter v-curve, load angle, torque and power relationship, phasor diagram, losses and efficiency calculations. Three phase induction motor – constructional features,	9	15

	slip ring and cage types. Theory of induction motor with constant mutual flux, slip, phasor diagram, expression for mechanical power and torque, torque-slip characteristics, starting torque, full load and pull out torque, equivalent circuit.		
V	Circle diagrams – tests on induction motors for determination of equivalent circuit and circle diagram. Cogging, crawling and noise production in cage motors – remedial measures. Double cage induction motor – principle, torque-slip curves. Starting of induction motors – types of starters – DOL starter, autotransformer starter, star-delta starter, rotor resistance starter – starting torque and starting currentr numerical problems. Braking of induction motors – plugging, dynamic braking and regenerative braking (no numerical problems). Speed control – stator voltage control, V/f control, rotor resistance control.	10	20
VI	Induction generator – principle of operation, grid connected and self excited operation, comparison of induction generator with synchronous generators. Synchronous induction motor – principle of operation. Single-phase induction motor – double field revolving theory, equivalent circuit, torque slip curve. Types of single phase induction motor – split phase, capacitor start, capacitor start and run types. Principle of shaded pole motor – applications.	10	20

TEXT BOOKS:

1	Bimbra P. S., Electrical Machinery, 7/e, Khanna Publishers, 2011.
2	Nagrath J. and D. P. Kothari, Theory of AC Machines, Tata McGraw Hill,2006

REFERENCES:

1	Say M. G., The Performance and Design of A. C. Machines, C B S Publishers, New Delhi, 2002
2	Fitzgerald A. E., C. Kingsley and S. Umans, Electric Machinery, 6/e, McGraw Hill, 2003.
3	Langsdorf M. N., Theory of Alternating Current Mac hinery, Tata McGraw Hill, 2001.
4	Deshpande M. V., Electrical Machines, Prentice Hall India, New Delhi, 2011.
5	Charles I. Hubert, Electric Machines, Pearson, New Delhi 2007

6	Theodore Wilde, Electrical Machines, Drives and Power System, Pearson Ed. Asia 2001.

PREREQUISITE: NIL

COURSE OBJECTIVES:

1	To give exposure to the students about the concepts of alternating current machines including the Constructional details, principle of operation and performance analysis.
2	To learn the characteristics of induction machines and to learn how it can be employed for various applications.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Differentiate** the different types of Synchronous machines and types of AC armature windings.
2	**Demonstrate** knowledge on importance of Voltage regulation of Alternators and how to pre-determine the voltage regulation of Synchronous machines in laboratory.
3	**Acquire knowledge** on how Alternators can be paralleled to Infinite bus and how loads can be shared including blondel's two reaction theory
4	**Understand** all about Synchronous Motors and applications of various starting methods. Students will be able to **differentiate** the different types of Induction machines. .
5	**Analyse** the performance of induction machines in order to implement in household and industrial applications.
6	Acquire knowledge on performance characteristics of synchronous induction motors **relating** the features of synchronous machines and induction machines. Ability to **differentiate** different types of single phase Induction motors .

CO-PO-PSO MAPPING:

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

CO6	2							1						2		2

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Student will be able to apply the fundamental knowledge of mathematics ,science& electrical engineering in representing the synchronous machines.
	PO2	Student will be able to formulate the regulation of alternators by applying principles of Electrical Engineering.
CO2	**PO1**	Student will be able to formulate the regulation of alternators by applying principles of Electrical Engineering.
	PO2	Able to apply the knowledge of Mathematical Modeling of alternators for Solving different types of regulation using fundamental knowledge of mathematics
	PO3	Student will be able to formulate the regulation of alternators for design and development.
	PO4	Student will be able to apply the knowledge gained in alternators and consequently responsible in professional practice to analysis and design conclusions.
CO3	**PO2**	Student will be able to formulate the regulation of alternators using numerical solutions
	PO5	Student will be to use appropriate techniques and data for simulation tools to find out regulation.
CO4	**PO1**	Student will be able to apply the knowledge of starting of synchronous motors.or-load.
	PO4	Analyze the starting aspect of synchronous motors.
	PO12	Student will be able to formulate the problems in the area of synchronous motors and recognize the need for life –long learning in context of technological change.
CO5	**PO1**	Student will be able to analyse the knowledge to study the performance of induction machines.
	PO8	Students will be able Analyse Economic Operation of synchronous machines system considering various constraints
	PO12	Analyse the performance of induction machines in the context of technological change.
CO6	**PO1**	Student will be able to apply the fundamental knowledge of mathematics & electrical engineering to understand the induction machines.
	PO8	Students will be able to apply the engineering knowledge to fulfil ethical values and responsibilities of engineering practice.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Graduates will be able to solve problems in the area of intelligent machine control.
CO2	**PSO1**	Graduates will able to apply the Mathematical model to Analyze Regulation

		of alternators..
CO3	**PSO1**	Graduates will able to apply the learned Knowledge to carry out parallel operation of alternators.
CO4	**PSO1**	Graduates will able to apply Knowledge for starting of Induction motors.
CO5	**PSO1**	Graduates will able to apply the learned Knowledge of induction machines for different applications.
CO6	**PSO1**	Graduates will able to apply the knowledge to understand Stability studies in real time applications.
	PSO3	Interpret the knowledge on induction machines in context of new technologies for societal & environmental development

EE 204 DIGITAL ELECTRONICS & LOGIC DESIGN

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Digital Electronics & Logic Design**	Course code**: EE 204**
L-T-P**:3-1-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Number Systems and Codes : Binary, Octal and hexadecimal conversions- ASCII code, Excess -3 code, Gray code, Error detection and correction - Parity generators and checkers – Fixed point and floating point arithmetic. Binary addition and subtraction, unsigned and signed numbers, 1's complement and 2's complement arithmetic.	7	15
II	TTL logic and CMOS logic - Logic gates, Universal gates - Boolean Laws and theorems, Sum of Products method, Product of Sum method – K map representation and simplification(upto four variables) - Pairs, Quads, Octets, Dont care conditions..	7	15
III	Combinational circuits: Adders _ Full adder and half adder – Subtractors, halfsubtractor and fullsubtractor – Carry Look ahead adders – ALU(block diagram only). Multiplexers, Demultiplexers, Encoders, BCD to decimel decoders	7	15
IV	Sequential circuits: Flip-Flops, SR, JK, D and T flip-flops, JK Master Slave Flip-flop, Conversion of flip-flops, Registers - SISO,SIPO, PISO, PIPO. Counters : Asynchronous Counters – Modulus of a counter – Mod N counters	8	15
V	Synchronous counters: Preset and clear modes, Counter Synthesis: Ring counter, Johnson Counter, Mod N counter, Decade counter. State Machines: State transition diagram, Moore and Mealy Machines – Design equation and circuit diagram	7	20
VI	Digital to Analog conversion – R-2R ladder, weighted resistors. Analog to Digital Conversion - Flash ADC, Successive approximation, Integrating ADC.	8	20

TEXT BOOKS:

1	Floyd T.L, Digital Fundamentals , 10/e, Pearson Education, 2011
2	C.H.Roth and L.L.Kimney Fundamentals of Logic Design, 7/e, Cengage Learning, 2013

REFERENCES:

1	Donald P Leach, Albert Paul Malvino and GoutamSaha., Digital Principles and Applications, 8/e, by Mc Graw Hill
2	Mano M.M, Logic and Computer Design Fundamentals, 4/e, , Pearson Education.
3	Tocci R.J and N.S.Widmer, Digital Systems, Principles and Applications, 11/e, , Pearson Education.
4	John F. Wakerly, Digital Design: Principles and Practices, 4/e, , Pearson, 2005
5	Taub & Schilling: Digital Integrated Electronics, McGraw Hill,1997

PREREQUISITE:

EC 100 Basics of Electronics Engineering

EE 203 Circuits & Networks

COURSE OBJECTIVES:

1	To provide fundamental knowledge in different types of number system.
2	To impart knowledge about digital logic gates
3	To gain the ability to design various digital circuits
4	To familiarize different analog –digital conversion circuits

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Distinguish** the different number systems and be able to convert from one form to other.
2	**Use** the laws of Boolean algebra to simplify circuits.
3	**Design** combinational and sequential circuits.
4	**Define** the significance of state machines.

5	**Interpret** programmable logic circuit devices and it's usage.
6	**Acquire** basic knowledge of VHDL.

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	2	2		2							2		1	2	
CO3	2	2										2		1		2
CO4	2	2												1		1
CO5	1	1										2			1	
CO6	3											3			1	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Student will be able to apply the knowledge of Engineering fundamentals to convert analog signals to digital.
	PO2	Student will be able to formulate and analyze different number systems and represent signed numbers..
	PO3	Student will be to able to interpret digital representations for analysis
	PO5	Student will be able to predict and model complex systems using logic
	PO12	As technology is advancing at a fast rate the awareness of digital theory helps to understand the upcoming electronic devices
CO2	**PO1**	Student will be able apply the Boolean algebra to Engineering fundamentals
	PO2	Student will be able to identify, formulate and analyze complex problem with gate logic.
	PO3	Student will be able to design solutions for complex problems using the Boolean logic.
	PO5	Student will be able to apply appropriate digital technique
	PO12	Logic gate understanding aids in understanding the upcoming trends in technology
CO3	**PO1**	Student will be able apply the combinational and sequential circuit design
	PO2	The circuit design helps to understand the first principles of Engineering science
	PO12	Students will be able to understand the technology upgradation with the knowledge of combinational and sequential circuits.
CO4	**PO1**	State machines will help to understand complex Engineering problems.
	PO2	Students will be able to brief in conclusions for Engineering problems
CO5	**PO1**	Students will get some knowledge of programmable logic circuits
	PO2	Students will be able to understand the problems using programmable logic circuits

	PO12	The awareness of programmable logic circuits will help them to recognize and prepare for the technological changes.
CO6	**PO1**	Students will get some knowledge of programmable logic languages
	PO12	The awareness of programming will help them to recognize and prepare for the technological changes.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	To Apply the Engineering knowledge to study different number systems and code conversions
CO2	**PSO1**	To Apply the Engineering knowledge to identify, Analyze and design logic gates.
CO2	**PSO2**	Explore the technical knowledge and development of professional methodologies in the emerging technologies in digital logic words
CO3	**PSO1**	To Apply the Engineering knowledge to study combinational and sequential circuits.
CO3	**PSO3**	Gain sufficient competence to understand the technologies in different digital circuits
CO4	**PSO1**	To Apply the Engineering knowledge to identify, Analyze, Design state machine logics.
	PSO3	Gain sufficient competence to understand the technologies in moora and mealy state machines
CO5	**PSO2**	Explore the technical knowledge and development of professional methodologies in the emerging technologies in PLA,PLD etc
CO6	**PSO2**	Explore the technical knowledge and development of professional methodologies in the emerging technologies in VHDL programming and digital circuits.

EE 206 MATERIAL SCIENCE

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Material Science**	Course code**: EE 206**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Conducting Materials: Conductivity- dependence on temperature and composition – Materials for electrical applications such as resistance, machines, solders etc. Semiconductor Materials: Concept, materials and properties- – Basic ideas of Compound semiconductors, amorphous and organic semiconductors- applications. Dielectrics: Introduction to Dielectric polarization and classification –Clausius Mosotti relation- Behavior of dielectric in static and alternating fields	7	15
II	Insulating materials and classification- properties- Common insulating materials used in electrical apparatus-organic, liquid and gaseous insulators- capacitor materials- Electro-negative gases- properties and application of SF6 gas and its mixtures with nitrogen Ferro electricity	7	15
III	Dielectric Breakdown: Mechanism of breakdown in gases, liquids and solids –basic theories including Townsend's criterion, Streamer mechanism, suspended particle theory, intrinsic breakdown, electro-mechanical breakdown- Factors influencing Ageing of insulatorsb Application of vacuum insulation- Breakdown in high vacuum-Basics of treatment and testing of transformer oil .	7	15
IV	Magnetic Materials: Origin of permanent magnetic dipoles- Classification of magnetic materials -Curie-Weiss law- Properties and application of iron, alloys of iron- Hard and soft magnetic materials– Ferrites- Magnetic materials used in electrical machines, instruments and relays-	8	15
V	Superconductor Materials:-Basic Concept- types- characteristics-applications Solar Energy Materials: Photo thermal conversion- Solar selective coatings for enhanced solar thermal energy collection –Photovoltaic conversion – Solar cells - Silicon, Cadmium sulphide and Gallium arsenic – Organic solar cells.	7	20
VI	Modern Techniques for materials studies: Optical microscopy – Electron microscopy – Photo electron spectroscopy – Atomic absorption spectroscopy – Introduction to Biomaterials and Nanomaterials.	8	20

TEXT BOOKS:

1	Dekker A.J : Electrical Engineering Materials, Prentice Hall of India
2	G K Mithal : Electrical Engg Material Science. Khanna Publishers

REFERENCES:

1	Tareev, Electrical Engineerin Materials, Mir Publications
2	Meinal A.B and Meinal M. P., Applied Solar Energy – An Introduction, Addisos Wesley
3	Nasser E., Fundamentals of Gaseous Ionization and Plasma Electronics, Wiley Series in Plasma Physics, 1971
4	Naidu M. S. and V. Kamaraju, High Voltage Engineering, Tata McGraw Hill, 2004
5	Indulkar O.S &Thiruvegadam S., An Introduction to electrical Engineering Materials, S. Chand
6	Agnihotri O. P and Gupta B. K, Solar selective Surface, John wiley
7	Seth. S.P and Gupta P. V, A Course in Electrical Engineering Materials, Dhanpathrai

PREREQUISITE:NIL

COURSE OBJECTIVES:

1	To impart knowledge in the field of material science and their applications in electrical engineering

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Describe** the characteristics of conducting and semiconducting materials
2	**Classify** magnetic materials and describe different laws related to them
3	**Classify and describe** different insulators and to explain the behavior of dielectrics in static and alternating fields.
4	**Describe** the mechanisms of breakdown in solids, liquids and gases

5	**Classify** and describe Solar energy materials and superconducting materials
6	**Gain** knowledge in the modern techniques for material studies.

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Student will be able to understand the fundamentals of conducting, semiconducting and dielectric materials
CO2	**PO1**	Student will be able to understand the fundamentals of insulating materials
CO3	**PO1**	Student will understand the mechanism of dielectric break down related theories
CO4	**PO1**	Student will be able to understand the fundamentals of magnetic materials
CO5	**PO1**	Student will be able understand the fundamentals of superconductivity and solar energy materials
CO6	**PO1**	Student will be able understand modern techniques for materials studies
	PO2	Student will be able to comprehend the application of different characterization techniques for understanding specific material properties

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Explore the technical knowledge and development of professional methodologies in the emerging technologies in Electrical & Electronics Engineering such as Power Electronics, Electric drives, Smart Grid & Renewable technologies in Societal & Environmental context.
CO2	**PSO2**	To Apply the Engineering knowledge to identify, Analyze, Design and simulate the problems associated in the field of Electrical & Electronics Engineering.

CO3	**PSO1**	Explore the technical knowledge and development of professional methodologies in the emerging technologies in Electrical & Electronics Engineering such as Power Electronics, Electric drives, Smart Grid & Renewable technologies in Societal & Environmental context.
	PSO2	To Apply the Engineering knowledge to identify, Analyze, Design and simulate the problems associated in the field of Electrical & Electronics Engineering.
CO4	**PSO1**	Explore the technical knowledge and development of professional methodologies in the emerging technologies in Electrical & Electronics Engineering such as Power Electronics, Electric drives, Smart Grid & Renewable technologies in Societal & Environmental context.
	PSO2	To Apply the Engineering knowledge to identify, Analyze, Design and simulate the problems associated in the field of Electrical & Electronics Engineering.
CO5	**PSO1**	Explore the technical knowledge and development of professional methodologies in the emerging technologies in Electrical & Electronics Engineering such as Power Electronics, Electric drives, Smart Grid & Renewable technologies in Societal & Environmental context.
	PSO2	To Apply the Engineering knowledge to identify, Analyze, Design and simulate the problems associated in the field of Electrical & Electronics Engineering
CO6	**PSO1**	Explore the technical knowledge and development of professional methodologies in the emerging technologies in Electrical & Electronics Engineering such as Power Electronics, Electric drives, Smart Grid & Renewable technologies in Societal & Environmental context.

EE 208 MEASUREMENTS AND INSTRUMENTATION

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Measurements & Instrumentation**	Course code**: EE 208**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	General principles of measurements – measurement system- measurement standards – characteristics - errors in measurement- calibration of meters- significance of IS standards of Instruments. Classification of meters - operating forces - essentials of indicating instruments - deflecting, damping, controlling torques. Ammeters and voltmeters - moving coil, moving iron, constructional details and operating, principles shunts and multipliers – extension of range	7	15
II	Measurement of resistance: measurement of insulation resistance - loss of charge method, measurement of earth resistance. Measurement of power and energy: Dynamometer type wattmeter – 1-phase and 3-phase power measurement – 1-phase and 3-phase energy meters (induction type) – electronic energy meter, TOD meter.	7	15
III	Introduction to high voltage and high current measurements: Measurement of high DC voltages - measurement of high AC voltages - electrostatic voltmeters – sphere gaps - DC Hall effect sensors - high current measurements. Study of Phasor Measurement Units (PMU). Current transformers and potential transformers – principle working, ratio and phase angle errors – numerical problems, Clamp on meters.	7	15
IV	Magnetic Measurements: Measurement of flux and permeability - flux meter - hall effect Gaussmeter - BH curve and permeability measurement - hysteresis measurement- ballistic galvanometer – principle- determination of BH curve - hysteresis loop. Lloyd Fisher square — measurement of iron losses Measurement of rotational speed using proximity sensors	8	15
V	DC & AC potentiometers - General Principle - calibration of ammeter, voltmeter and wattmeter using potentiometer. AC Bridges: Maxwell's bridge- Schering bridge and Wien's bridge Oscilloscopes – Basic principle of signal display - Block diagram and principle of	7	20

	operation of general purpose CRO – vertical deflecting system – horizontal deflection system – basic sweep generator – XY mode and Lissajous patterns – applications of CRO – dual trace oscilloscope. digital storage oscilloscope		
VI	Transducers – Definition and classification – common transducers for measurement of displacement, velocity, flow, liquid level, force, pressure, strain and temperature – basic principles and working of LVDT, electromagnetic and ultrasonic flow meters, piezoelectricforce transducer, load cell, strain gauge- bridge configuration for four strain gauges, RTD, Thermistors, thermocouple, Need for instrumentation system, data acquisition system	8	20

TEXT BOOKS:

1	Sawhney A.K., A course in Electrical and Electronic Measurements & instrumentation, DhanpatRai .
2	J. B. Gupta, A course in Electrical & Electronic Measurement & Instrumentation., S K Kataria& Sons.
3	Kalsi H. S., Electronic Instrumentation, 3/e, Tata McGraw Hill, New Delhi, 2012

REFERENCES:

1	Golding E.W., Electrical Measurements & Measuring Instruments, Wheeler Pub.
2	Cooper W.D., Modern Electronics Instrumentation, Prentice Hall of India
3	Stout M.B., Basic Electrical Measurements, Prentice Hall
4	Oliver & Cage, Electronic Measurements & Instrumentation, McGraw Hill
5	E.O Doebelin and D.N Manik, Doebelin's Measurements Systems, sixth edition, McGraw Hill Education (India) Pvt. Ltd.
6	P.Purkait, B.Biswas, S.Das and C. Koley, Electrical and Electronics Measurements and Instrumentation, McGraw Hill Education (India) Pvt. Ltd.,2013

PREREQUISITE: BE101 03Introduction to Electrical Engineering

COURSE OBJECTIVES:

1	To develop understanding of various electrical measuring instruments and instrumentation

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Compare** different types of instruments, their working principles advantages and disadvantages
2	**Explain** the operating principles of various ammeters, voltmeters and ohm meters
3	**Measure** single phase & three phase power using wattmeters
4	**Summarize** different flux and permeability measurements methods
5	**Differentiate** AC potentiometers and bridges
6	**Explain** the working and applications of cathode ray oscilloscope

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										2				2		
CO3				3					2			2		3		2
CO4		3												2		
CO5	3	3												3		
CO6	3	2													2	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	PO1	Students will have a general idea of various types of measuring instruments
	PO2	Students will be able to identify and provide solutions to problems associated with instrument systems
	PO5	Students will be able to select the apt instrument based on the application requirements
CO2	PO1	Students can improve their communication skills while explaining the working of various instruments
CO3	PO4	Students will be able to design experimental setups to measure the power consumed in a circuit
	PO9	Students can improve their ability to work as a team while conducting power measurement experiments
	PO12	Students will be able to utilise the knowledge of power measurement while working in an industry
CO4	PO2	Students will be able to analyze the flux B-H curves of any magnetic specimen
CO5	PO1	Students can apply knowledge of Engineering fundamentals to study the working of various potentiometers

	PO2	Students can identify and analyse working of various bridges used for measurement
CO6	**PO1**	Students will be able to observe various waveforms of any circuit on a CRO
	PO2	Students will be able to observe waveforms and provide valid suggestions for the improvement of the circuit

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Graduates will able to identify type of instruments are used for different applications
	PSO2	Graduates will able to understand the type of control mechanisms are used in the instruments according to the field of application
CO2	**PSO1**	Graduates will able to design instruments depending on the requirements.
CO3	**PSO1**	Graduates will able to design wattmeter's suitable for single phase and three phase circuits
	PSO3	Graduates will able to understand problems and rectify the problems.
CO4	**PSO1**	Graduates will able to identify the different flux and permeability measurements methods
CO5	**PSO1**	Graduates will able to design different types of potentiometers and bridges..
CO6	**PSO1**	Graduates will able to understand the working of CRO

MA202 PROBABILITY DISTRIBUTIONS, TRANSFORM & NUMERICAL METHODS

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Probability Distributions, Transform & Numerical Methods**	Course code**: MA202**
L-T-P**:3-1-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Discrete Probability Distributions. (Relevant topics in section 4.1,4,2,4.4,4.6 Text1) Discrete Random Variables, Probability distribution function, Cumulative distribution function. Mean and Variance of Discrete Probability Distribution. Binomial Distribution-Mean and variance. Poisson Approximation to the Binomial Distribution. Poisson distribution-Mean and variance.	7	15
II	Continuous Probability Distributions. (Relevant topics in section 5.1,5.2,5.5,5.7 Text1) Continuous Random Variable, Probability density function, Cumulative density function, Mean and variance. Normal Distribution, Mean and variance (without proof). Uniform Distribution. Mean and variance. Exponential Distribution, Mean and variance.	7	15
III	Fourier Integrals and transforms. (Relevant topics in section 11.7, 11.8, 11.9 Text2) Fourier Integrals. Fourier integral theorem (without proof). Fourier Transform and inverse transform. Fourier Sine & Cosine Transform, inverse transform.	7	15
IV	Laplace transforms. (Relevant topics in section 6.1,6.2,6.3,6.5,6.6 Text2) Laplace Transforms, linearity, first shifting Theorem. Transform of derivative and Integral, Inverse Laplace transform, Solution of ordinary differential equation using Laplace transform. Unit step function, second shifting theorem. Convolution Theorem (without proof). Differentiation and Integration of transforms.	8	15
V	Numerical Techniques.(Relevant topics in section.19.1,19.2,19.3 Text2) Solution Of equations by Iteration, Newton- Raphson Method. Interpolation of Unequal intervals-Lagrange's Interpolation formula. Interpolation of Equal intervals-Newton's forward difference formula, Newton's Backward difference formula.	7	20
VI	Numerical Techniques. (Relevant topics in section	8	20

	19.5,20.1,20.3, 21.1 Text2) Solution to linear System-Gauss Elimination, Gauss Seidal Iteration Method. Numeric Integration-Trapezoidal Rule, Simpson's 1/3 Rule. Numerical solution of firstorder ODE-Euler method, Runge-Kutta Method (fourth order)..		

TEXT BOOKS:

1	Miller and Freund's "Probability and statistics for Engineers"-Pearson-Eighth Edition
2	Erwin Kreyszig, "Advanced Engineering Mathematics", 10th edition, Wiley, 2015.

REFERENCES:

1	V. Sundarapandian, "Probability, Statistics and Queuing theory", PHI Learning, 2009.
2	C. Ray Wylie and Louis C. Barrett, "Advanced Engineering Mathematics"-Sixth Edition
3	Jay L. Devore, "Probability and Statistics for Engineering and Science"-Eight Edition
4	Steven C. Chapra and Raymond P. Canale, "Numerical Methods for Engineers"-Sixth Edition-Mc Graw Hill.

PREREQUISITE:NIL

COURSE OBJECTIVES:

1	To introduce the concept of random variables, probability distributions, specific discrete and continuous distributions with practical application in various Engineering and social life situations
2	To know Laplace and Fourier transforms, that has wide applications in all Engineering courses.
3	To enable the students to solve various engineering problems using numerical methods.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	To have a concept of discrete probability density functions and probability distributions like Binomial Distribution and Poisson Distribution
2	To have a concept of continuous probability density functions and probability distributions like Normal, Uniform and Exponential distribution
3	To use Fourier integrals and Fourier transforms in solving various engineering problems

4	To understand the concept of Laplace and inverse Laplace transforms and apply them to solve ordinary differential equations
5	To use the iteration and interpolation methods to solve engineering problems.
6	To use the concept of numerical methods and their applications to solve linear systems and first order ODE's.

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	PO1	Students use the knowledge in data analysis
	PO2	Helps students to Check for the possibilities
	PO3	Helps students to conclude from data distribution
	PO4	Help students in interpreting the
	PO5	students would be able to predict from the statistical analysis of the data
	PO6	Help students to analyze the population interests
	PO7	Help students in taking safety measures by past data analysis
CO2	PO1	Students use the knowledge in data analysis
	PO2	Helps students to Check for the possibilities
	PO3	Helps students to conclude from data distribution
	PO4	Help students in interpreting the
	PO5	students would be able to predict from the statistical analysis of the data
	PO6	Help students to analyze the population interests
	PO7	Help students in taking safety measures by past data analysis
CO3	PO1	Help students in using in signals and image processing

	PO3	Help students in using compression and decompression of signals
	PO4	Help students to solve some complex mathematics problems
	PO5	Like FFT, students can use in communication systems
CO4	**PO1**	Help students in solving the differential equations
	PO3	Help students in using in data interpolation
CO5	**PO1**	Help students Analysing the data from interpolation
	PO3	Help students to provide valid conclusion using the approximation methods
CO6	**PO1**	Help students in solving complex integration and differential equations
	PO3	Help students to provide valid conclusion using the approximation methods

EE232 ELECTRICAL MACHINES LAB I

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Electrical Machines Lab I**	Course code**: EE232**
L-T-P**:0-0-3**	Credit**:1**

Experiments:

1. Open circuit characteristics of DC shunt Generator
2. Load test on DC shunt Generator
3. Brake test on DC shunt motor
4. Brake test on DC series motor
5. Swinburne's test on DC shunt machine
6. .Hopkinson's test on a pair of DC machines
7. Three phase connection on single phase transformers.
8. OC and SC test on single phase transformers.
9. Load test on single phase transformers
10. Separation of losses in a single phase transformer.
11. Sumpner's test.
12. Scott connection of single phase transformers.

PREREQUISITE:NIL

COURSE OBJECTIVES:

1	To learn the working and testing methods of DC machines and transformers.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Students will be able to analyze the characteristics of different DC generators
2	Students will be able to analyze the performance characteristics of single phase transformers.
3	Students will be able to predict the performance of dc machines and transformers

4	Students will be able to select appropriate machines based on the application requirements.
5	Students will be able to identify the faults occurring in machines and take necessary corrective actions

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	PO1	Students will be to apply the fundamental knowledge of electrical engineering to analyse the characteristics.
	PO3	Students will be able to identify the faults and design solutions for machines.
CO2	PO1	Students will be able to apply the knowledge of electrical engineering to analyze the performance of single phase transformers.
	PO3	Students will be able to design system components based on the applications.
CO3	PO1	Students will be able to apply the fundamental knowledge of DC machines to predict their performance.
	PO3	Students will be able to design system components based on the performance characteristics of DC machines and transformers.
CO4	PO1	Students will be able to apply the knowledge of basic engineering to select machines based on the application
	PO2	Students will be able to analyse the characteristics of various machines and provide substantiated conclusions.
CO5	PO2	Students will be able to formulate the problems of fault analysis of transformers and Dc machines.
	PO3	Students will be able to design solutions for faults occuring in machines.
	PO4	Students will be able to conduct studies on machines faults and provide corrective measures.

CO- PSO MAPPING

CO's	PSO's	JUSTIFICATION
CO1	PSO1	Graduates will be able to analyze the characteristics of different DC generator.

CO2	**PSO1**	Graduates will be able to analyze the performance characteristics of single phase transformers.
CO3	**PSO1**	Graduates will able to predict the performance of DC machine and transformer.
CO4	**PSO1**	Graduates will able to select appropriate machines based on the application requirements.
CO5	**PSO2**	Graduates will be able to explore the technical knowledge and can identify the faults occurring in machines and so corrective measures can be added

EE234 CIRCUTS& MEASUREMENTS LAB

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Circuts& Measurements Lab**	Course code**: EE234**
L-T-P**:0-0-3**	Credit**:1**

Experiments:

1. Calibration of single phase energy meter by direct loading
2. Measurement of self inductance ,mutual inductance and coefficient of coupling of an iron cored coil
3. Measurement of displacement using LVDT
4. Measurement of strain
5. 3-phase power measurement using one wattmeter and two watt meters
6. Verification of Thevenin's theorem in DC circuit
7. Extension of range of wattmeter using CT & PT
8. Calibration of Single Phase Energy meter by Phantom Loading
9. Measurement of Temperature By RTD Method
10. Verification of Superposition Theorem in DC Circuit
11. R-L-C Series & Parallel Circuit
12. Calibration of three phase energy meter

PREREQUISITE:

EE 201-Circuits & Networks,

EE 208 Electrical Measurements& Instrumentation

COURSE OBJECTIVES:

1	To develop measurement systems for various electrical circuits and systems and to use different transducers for measurement of physical variables.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Students will be able to **analyze** RLC circuits and coupled circuit to obtain the voltage -current relations
2	Students will be able to **justify** DC network theorems by setting up various networks
3	Students will be able to **perform** calibration of single phase and three phase energy meter at various power factors

4	Students will be able to **measure** power in a single and three phase circuits by various methods.

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	PO1	Students will be able to apply the knowledge of Electrical Engineering analyse various circuits
	PO3	Students will be able to identify & formulate voltage –current relations of RLC Circuits
CO2	PO1	Students will be able to apply the knowledge of network theory to verify various network theorems experimentally
	PO3	Students will be able to design system components based on network theorems
CO3	PO1	Students will be able to apply appropriate techniques to calibrate energy meters
	PO9	Students will be able to work as a team while conducting experiments
CO4	PO1	Students will be able to provide valid conclusions based on the power in single phase and three phase circuits
	PO3	Students will be able to predict the performance of electrical circuits based on the power measurement

CO- PSO MAPPING

CO's	PSO's	JUSTIFICATION
CO1	PSO1	Graduates will be able to **analyze** RLC circuits and coupled circuit to obtain the voltage -current relations
CO2	PSO1	Graduates will be able to **justify** DC network theorems by setting up various networks
CO3	PSO1	Graduates will able to **perform** calibration of single phase and three phase energy meter at various power factors
CO4	PSO1	Graduates will able to **measure** power in a single and three phase circuits by various methods.

SREEPATHY INSTITUTE OF MANAGEMENT AND TECHNOLOGY

COURSE HANDBOOK

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

SEMESTER 5

EE301 POWER GENERATION, TRANSMISSION AND PROTECTION

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Power Generation Transmission & Protection**	Course code**: EE301**
L-T-P**: 3-1-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction: Typical layout of Power system Network Generation of Electric Power: Overview of conventional (Hydro, Thermal and Nuclear) and Nonconventional Sources (Solar and Wind) (Block Diagram and Brief Description Only) Economics of Generation: Load factor, diversity factor, Load curve (Brief description only) Numerical Problems. Methods of power factor improvement using capacitors	9	15%
II	Power Transmission Transmission Line Parameters: Resistance, inductance and capacitance of 1-Φ, 2 wire lines-composite conductors (Derivation Required). Inductance and capacitance of 3-Φ lines. Symmetrical and unsymmetrical spacing-transposition-double circuit linesbundled conductors (Derivation Required) .Numerical Problems Modelling of Transmission Lines: Classification of lines-short lines-voltage regulation and efficiency-medium lines-nominal T and Π configurations-ABCD constants- long lines-rigorous solution- interpretation of long line equation-Ferranti effect. Tuned power lines-power flow through lines-Basics only	10	15%
III	Introduction of Overhead transmission and underground transmission Conductors -types of conductors -copper, Aluminium and ACSR conductors -Volume of conductor required for various systems of transmission-Choice of transmission voltage, conductor size -Kelvin's law. Mechanical Characteristics of transmission lines – configuration-Types of Towers. Calculation of sag and tensionsupports at equal and unequal heights -effect of wind and icesag template Insulators -Different types -Voltage distribution, grading and string efficiency of suspension insulators. Corona -disruptive critical voltage -visual critical voltage -power loss due to corona -Factors affecting corona - interference on	9	15%

	communication lines. Underground Cables -types of cables -insulation resistance - voltage stress -grading of cables -capacitance of single core and 3 -core cables - current rating resistance - voltage stress -grading of cables -capacitance of single core and3 -core cables - current rating.		
IV	HVDC Transmission: Comparison between AC &DC Transmission ,Power flow equations and control, Types of DC links Flexible AC Transmission systems: Need and Benefits, SCV, Configuration of FC + TCR, Series compensation, Configuration of TCSC Power distribution systems –Radial and Ring Main Systems - DC and AC distribution: Types of distributors- bus bar arrangement -Concentrated and Uniform loading - Methods of solving distribution problems.	8	15%
V	Need for power system protection. Circuit breakers – principle of operation- formation of arcArc quenching theory- Restriking Voltage-Recovery voltage, RRRV (Derivation Required). Interruption of Capacitive currents and current chopping (Brief Description Only). Types of Circuit Breakers: Air blast CB – Oil CB – SF6 CB – Vacuum CB – CB ratings. Protective Relays- Zones of Protection, Essential QualitiesClassification of Relays -Electro mechanical, Static Relays, Microprocessor Based Relay. Electromechanical Relays-Attracted Armature, Balanced Beam, Induction disc, Thermal Relays (Brief Description only) Static Relays-Merits and Demerits, Basic components, Comparison and duality of Amplitude and Phase comparators. Static overcurrent, Differential, Distance Relays, Directional Relay-(principle and Block diagram only) Microprocessor Based Relay-Block diagram and flow chart of Over current Relay, Numerical Relay(Basics Only)	12	20%
VI	Protection of alternator: Stator inter turn, Earth fault Protection and Differential protection Protection of transformers- Percentage Differential Protection-Buchholz Relay Protection of transmission lines-Differential Protectioncarrier current protection Causes of over voltages – surges and traveling waves – voltage waves on loss less transmission lines, Bewley Lattice diagram. Protection against over voltages - Surge diverters - Insulation co-ordination	8	20%

TEXT BOOKS:

1	B.R.Gupta:"Power system Analysis and Design",Wheeler publishers
2	J.B.Gupta,"A course in Electrical Power",Kataria and sons,2004.
3	Wadhwa,"Electrical Power system",Wiley Eastern Ltd.2005

REFERENCES:

1	A.Chakrabarti, ML.Soni, P.V.Gupta, V.S.Bhatnagar,"A textbook of Power system Engineering" DhanpatRai,2000
2	.Grainer J.J, Stevenson W.D, "Power system Analysis", McGraw Hill
3	I.J.Nagarath & D.P. Kothari, "Power System Engineering", TMH Publication,
4	K.R Padiyar," FACTS Controllers for Transmission and Distribution" New Age International, New Delhi
5	Stevenson Jr. Elements of Power System Analysis, TMH
6	Sunil S Rao ,"Switch gear and Protection",Khanna Publishers

PREREQUISITE: NIL

COURSE OBJECTIVES:

This course will help students to achieve the following objective:

1	To impart knowledge on the basic aspects in the area of power generation and power factor correction
2	To impart knowledge on various transmission line constants (Resistance, Inductance and capacitance) and to do the performance analysis of transmission lines..
3	To be able to do the mechanical designing of overhead lines and underground cables
4	To impart the knowledge on HVDC transmission, FACTS devices and power distribution systems.
5	To develop an understanding of various protection schemes used in power systems.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Understand** the basic aspectsin the area of power generation and power factor correction.
2	**Learn** transmission line constants such as Resistance, Inductance,and Capacitance and do the Performance analysis of Transmission lines
3	**Perform** the Mechanical Design of Transmission lines.
4	**Select** the cables according to voltage rating & application. Also write about HVDC transmission & Facts Controllers.

5	**List various** circuit breakers and Relays and identify for particular voltage rating.
6	**Summarize** different protection schemes for Alternator, Transformer & Transmission Lines.

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Students will be able to acquire knowledge about the basic aspects in the area of power generation and power factor correction
	PO2	Student will be able to explain about various Power generation methods.
CO2	**PO1**	Students will be able to apply the basic knowledge of Transmission line constants and mathematics for design of Transmission line.
	PO2	Students will be able to explain the Performance parameters of transmission network.
	PO3	Student will be able to do the performance analysis of Transmission lines.
	PO5	Students can evaluate the performance of the various transmission network models using modern simulation tools
	PO12	Students will be able to suggest improvements in the power transmission system for increasing its efficiecy leading to lifelong learning.
CO3	**PO1**	Students will be able to apply the basic knowledge of Electrical Engineering and Mathematics for Mechanical design of Overhead lines
	PO3	Students will be able to do the Mechanical design of Transmission lines.
CO4	**PO1**	Student will be able to apply the knowledge of mathematics & electrical engineering for selection of Cables & FACTS devices.

	PO2	Students will demonstrate an ability to identify, formulate and solve Electrical and Electronics Engineering problems using the power system techniques
	PO4	Students will be able to design FACTS devices for compensation.
CO5	**PO1**	Student will be able Select the ratings of circuit breakers from the fundamental knowledge of Electrical engineering.
	PO2	Students will be able Identify the ratings of Circuit breakers for different applications.
	PO6	Students will be able to design transmission to meet safety, economic and societal considerations.
CO6	**PO1**	Student will be able to apply the fundamental knowledge of mathematics & electrical engineering for protection of power system.
	PO2	Students will be able explain the different protection schemes.
	PO3	Students can design a system for the protection of generators.
	PO6	Understand the importance of stability and use the knowledge for sustainable development.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Graduates will be able to Analyze power system network.
CO2	**PSO1**	Graduates will able to apply the Electrical & mathematics knowledge for design of Various Power system components.
CO3	**PSO1**	Graduates will able to apply the learned Knowledge to carry the mechanical design of OH Transmission lines.
CO4	**PSO1**	Graduates will able to apply Knowledge for selection of circuit breakers.
	PSO2	Advanced technologies to improve power system reliability.
CO5	**PSO1**	Graduates will able to apply the learned Knowledge toIdentify & design the Circuit breakers according to the ratings.
CO6	**PSO1**	Graduates will able to apply the knowledge to understand the different protection schemes and reliability of network.

EE303 LINEAR CONTROL SYSTEMS

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Linear Control Systems**	Course code**: EE303**
L-T-P**:2-1-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Open loop-and closed loop control systems: Transfer function of LTI systems-Mechanical and Electromechanical systems – Force voltage and force current analogy - block diagram representation - block diagram reduction - signal flow graph - Mason's gain formula - characteristic equation.	8	15%
II	Control system components: DC and AC servo motors – synchro - gyroscope - stepper motor - Tacho generator. Time domain analysis of control systems: Transient and steady state responses - time domain specifications - first and second order systems - step responses of first and second order systems	6	15%
III	Error analysis - steady state error analysis - static error coefficient of type 0,1, 2 systems - Dynamic error coefficients. Concept of stability: Time response for various pole locations - stability of feedback system - Routh's stability criterion	7	15%
IV	Root locus - General rules for constructing Root loci – stability from root loci - effect of addition of poles and zeros.	7	15%
V	Frequency domain analysis: Frequency domain specifications- Analysis based on Bode plot - Log magnitude vs. phase plot,	7	20%
VI	Polar plot- Nyquist stability criterion-Nichols chart - Non-minimum phase system - transportation lag	7	20%

TEXT BOOKS:

1	DorfR.C.and R.H.Bishop,Modern Control Systems,Pearson Education,2011.
2	NagarathI.J.andGopalM.,Control System Engineering,Wiley Eastern,2008.
3	Nise N.S.,Control Systems Engineering,6/e,Wiley Eastern,2010.
4	Ogata K.,ModernControlEngineering,Prentice Hall of India,New Delhi,2010.

REFERENCES:

1	Gibson J.E.,F.B.TuteurandJ.R.Ragazzini,Control SystemComponents,TataMcGrawHill,2013
2	Gopal M.,ControlSystems Principles and Design,TataMcGrawHill,2008.
3	Imthias Ahamed T P,Control Systems,Phasor Books,2016
4	KuoB.C.,Automatic Control Systems,Prentice Hall of India,NewDelhi,2002.

PREREQUISITE:NIL

COURSE OBJECTIVES:

1	To provide a strong foundation on the analytical and design techniques on classical control Theory and modeling of dynamic systems

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Explain** the various practices of modeling physical systems.
2	**Differentiate** between various control system components and will be able to explain the time domain specifications.
3	**Develop** basic knowledge in error and stability analysis
4	**Analyze** the stability aspects of linear time invariant systems using root locus.
5	**Analyze** the stability aspects of linear time invariant systems by bode plot
6	**Analyze** the stability aspects of linear time invariant systems by polar plot & Nyquist plot

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Students will be apply the knowledge of mathematics and science to solve various fundamental problems in modelling physical systems.
	PO2	Students will be able to formulate and analyze complex Engineering problems using the principles of mathematics
CO2	**PO1**	Students will be apply the knowledge of mathematics and science to solve various fundamental problems in various time domain specifications
	PO2	Students will be able to formulate and analyze complex Engineering problems using the principles of mathematics
CO3	**PO1**	Students will be able to Identify, formulate, review research literature, and analyze complex Engineering problems using error and stability analysis.
	PO2	Students will be able to formulate and analyze complex Engineering problems using the principles of mathematics
CO4	**PO1**	Students will be apply the knowledge of mathematics to solve various fundamental problems in stability by root locus method
	PO2	Students will be able to create, select, and apply appropriate techniques, resources for stability of control systems
CO5	**PO1**	Students will be able to apply knowledge in calculus in stability by bode plot method
	PO2	Students will be able to formulate and analyze complex Engineering problems using the principles of mathematics
CO6	**POI**	Students will be able to apply knowledge in calculus in stability by polar plot & Nyquist plot
	PO2	Students will be able to formulate and analyze complex Engineering problems using the principles of mathematics

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Graduates will be able to identify, Analyze, Design and simulate the problems associated in the field of Control systems.
	PSO3	Graduates will be able to Gain sufficient competence to understand the technologies in Control System to solve present problems in the Industry & Society.
CO2	**PSO1**	Graduates will be able to identify, Analyze, Design and simulate the problems associated in the field of Control systems
	PSO3	Graduates will be able to Gain sufficient competence to understand the technologies in Control System to solve present problems in the Industry & Society.
CO3	**PSO1**	Graduates will able to gain the fundamental knowledge stability & error analysis
	PSO3	Graduates will be able to Gain sufficient competence to understand the modern technologies in Control Systems
CO4	**PSO1**	Graduates will able to understand stability study in control systems
CO5	**PSO1**	Graduates will able to apply the learned Knowledge for stability analysis
CO6	**PSO1**	Graduates will able to apply the learned Knowledge for stability analysis

EE305 POWER ELECTRONICS

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Power Electronics**	Course code**: EE305**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	SCR-Structure, static characteristics & switching (turn-on & turnoff) characteristics - di/dt & dv/dt protection – turn-on methods of SCR - two transistor analogy - series and parallel connection of SCRs Structure and principle of operation of power diode, TRIAC, GTO, Power MOSFET & IGBT – Comparison.	6	15
II	Gate triggering circuits – R, RC, UJT triggering circuits – natural and forced commutation (concept only). Requirements of isolation and synchronisation in gate drive circuits- Opto and pulse transformer based isolation. Controlled rectifiers – half-wave controlled rectifier with R load – 1-phase fully controlled bridge rectifier with R, RL and RLE loads (continuous & discontinuous conduction) – output voltageequation – 1-phase half controlled bridge rectifier with R, RL and RLE loads – displacement power factor – distortion factor	8	15
III	3-phase half-wave controlled rectifier with R load – 3-phase fully controlled & half-controlled converter with RLE load (continuous conduction, ripple free) – output voltage equation-waveforms for various triggering angles (no analysis) – 1-phase & 3-phase dual converter with & without circulating current – four-quadrant operation.	7	15
IV	Inverters – voltage source inverters– 1-phase half-bridge & full bridge inverter with R & RL loads – THD in output voltage – 3- phase bridge inverter with R load – 120° & 180° conduction mode – current source inverters	7	15
V	Voltage control in inverters – Pulse Width Modulation – single pulse width, multiple pulse width & sine PWM – modulation index & frequency modulation ratio. AC voltage controllers (ACVC) – 1-phase full-wave ACVC with R, & RL loads – waveforms – RMS output voltage, input power factor with R load – sequence control (two stage) with R load	7	20
VI	DC-DC converters – step down and step up choppers – singlequadrant, two-quadrant & four quadrant chopper –	7	20

	pulse width modulation & current limit control in dc-dc converters. Switching regulators – buck, boost & buck-boost - continuous conduction mode only – waveforms – design of filter inductance & capacitance		

TEXT BOOKS:

1	Muhammad H.Rashid,*Power Electronics Circuits, Device and Applications*,Pearson Education

REFERENCES:

1	MohanN.,T.M.UndelandandW.P.Robbins.,PowerElectronics,Converters,Applications&Design,Wiley-India
2	KreinP.T.,ElementsofPowerElectronics,OxfordUniversityPress,1998.
3	P.S.Bimbhra,PowerElectronics,KhannaPublishers,NewDelhi.
4	L.Umanand,PowerElectronics–Essentials&Applications,Wiley-India
5	SinghM.D.andK.B.Khanchandani,PowerElectronics,TataMcGrawHill,NewDelhi,2008

PREREQUISITE:

1. EE 203Analog Electronics
2. EE 100 Basics of Electronics Engineering

COURSE OBJECTIVES:

This course will help students to achieve the following objectives:

1	To get an overview of different types of power semiconductor devices and their switchingcharacteristics
2	To study the operation and characteristics of various types of power electronic converters
3	To study the operation and characteristics of various types of power electronic inverters

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Evluate** appropriate semiconductor device in converter circuits
2	**Create** the appropriate triggering circuits
3	**Analyse** various power electronic converters and apply different switching techniques
4	**Analyse** various power electronic inverters and apply different switching techniques.
5	**Analyse** various AC voltage controllers
6	**Design** different power semiconductor devices.

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	PO1	Students will be able apply the knowledge science & electrical engineering for analyzing the operation of different semiconductor devices
	PO3	Students will be able apply their ideas to develop applications with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
	PO6	Students will be able to apply the knowledge of series parallel operation of SCR
CO2	PO1	Students will be able apply the knowledge science & electrical engineering for analyzing the operation of different rectifier circuits..
	PO2	Students will be able to identify and provide solutions to complex problems associated with gate triggering circuits
	PO3	Students will be able apply their ideas to develop applications with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

CO3	**PO1**	Students will be able apply the knowledge science & electrical engineering to understand the different converter circuits.
	PO3	Students will be able apply their ideas to develop applications with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
	PO4	Students will be able apply the knowledge science & electrical engineering to understand the control techniques of rectifier and converter circuits
CO4	**PO1**	Students will be able apply the knowledge science & electrical engineering to understand the control techniques of inverter circuits
	PO4	Students will be able to use research based knowledge to develop advanced speed control techniques.
	PO6	Students will be able to apply the different switching characteristics of inverter circuits
CO5	**PO1**	Students will be able apply the knowledge science & electrical engineering to understand and relate various aspects of AC voltage controllers
	PO4	Students can get an exposure AC controllers and build platform to perform interpretation of data, and synthesis the information.
CO6	**PO1**	Students will be able apply the knowledge science & electrical engineering to understand and relate various aspects of AC voltage controllers
	PO3	Students will be able apply their ideas to develop applications with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Graduates will able to applythe operation of different semiconductor devices
CO2	**PSO2**	Graduates will able to apply the knowledge of Power electronics for the analysis design and application of innovative, dynamic and challenging industrial environment
CO3	**PSO1**	Graduates will be able apply the knowledge science & electrical engineering to understand and apply suitable converter circuits for various applications.
CO4	**PSO1**	Graduates will be able apply the knowledge science & electrical engineering to understand the control techniques of inverters and power semiconductor devices
CO5	**PSO3**	Graduates will able to understand the technique used for AC voltage controllers
CO6	**PSO1**	Graduates will able to develop the different converter circuits

EE307 SIGNALS AND SYSTEMS

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Signals And Systems**	Course code**: EE307**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction to signals and systems - Classification of signals - Basic operations on signals – Elementary signals – Concept of system - Properties of systems - Stability, inevitability- time invariance- Linearity - Causality – MemoryConvolution- Impulse response- Representation of LTI systems - Differential equation representations of LTI systems	7	15
II	Laplace transform analysis of systems - Relation between the transfer function and differential equation –Causality and stability - Inverse system - Determining the time domain and frequency response from poles and zeros.	7	15
III	Fourier representation of continuous time signals – Fourier Series-Harmonic analysis of common signalsFourier transform - Existence –properties of FT- Energy spectral density and power spectral density - Frequency response of LTI systems -.	7	15
IV	Sampled data systems- Sampling process-sampling theoremsignal re construction- Zero order and First order hold circuitsDifference equation representations of LTI systems - Discrete form of special functions- Discrete convolution and its properties 7 15% S	7	15
V	Z Transform - Region of convergence- Properties of the Z transform – Inverse ZT-methods Z-transfer function- Analysis of difference equation of LTI systems – Basic idea on Stability and causality conditions	7	20
VI	Fourier representation of discrete time signals - Discrete Fourier series–properties- Frequency response of simple DT systems Basics of Non linear systems-types and properties Introduction to random signals and processes (concepts only).	7	20

TEXT BOOKS:

1	HaykinS.&VeenB.V.,Signals&Systems,JohnWiley

2	Oppenheim A.V.,WillskyA.S.&NawabS.H.,SignalsandSystems,TataMcGrawHill
3	Signals and Systems:IJ Nagrarth-Tata Mc Graw Hill

REFERENCES:

1	BracewellR.N.,FourierTransform&ItsApplications,McGrawHill
2	FarooqHusain,SignalsandSystems,Umeshpub.
3	PapoulisA.,FourierIntegral&ItsApplications,McGrawHill
4	TaylorF.H.,PrinciplesofSignals&Systems,McGrawHill

PREREQUISITE: NIL

COURSE OBJECTIVES:

1	To impart knowledge about the representation and properties of signal and systems
2	To impart knowledge about the applications of signals and systems in engineering

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Represent** various signals and systems
2	**Analyze** the continuous time system with Laplace Transforms
3	**Recall and Analyze** signals using Fourier representation
4	**Analyze** the discrete time system using Z Transforms.
5	**Analyze** the DT systems with DFS
6	**Acquire** basic knowledge in nonlinear systems

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Students will be able to ability to acquire basic knowledge of various signals and systems
CO2	**PO1**	Students will be able to apply knowledge of mathematics to solve the continuous time system
	PO2	Students will be able to analyze different problems related to signals using Laplace Transforms
CO3	**PO1**	Students will be able to recollect Fourier transform
	PO2	Students will be able to apply knowledge of mathematics to analyze signals using Fourier representations.
CO4	**PO1**	Students will be apply the knowledge of mathematics to solve discrete time system
	PO2	Students will be able to apply knowledge of mathematics to analyze signals using Z Transforms.
CO5	**PO1**	Students will be apply the knowledge of mathematics to solve discrete time systems using DFS
	PO2	Students will be able to apply knowledge of mathematics to analyze signals using DFS.
CO6	**PO1**	Students will be able to acquire basic knowledge about nonlinear systems

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Basic knowledge of mathematics is applied to analyze signals.
CO2	**PSO1**	Basic knowledge of Laplace Transforms is applied to analyze signals.
CO3	**PSO1**	Basic knowledge of Fourier Transforms is applied to analyze signals.
CO4	**PSO1**	Basic knowledge of Z Transforms is applied to analyze signals.
CO5	**PSO1**	Basic knowledge of DFS is applied to analyze signals
CO6	**PSO1**	Basic concepts of nonlinear systems is understood

EE309 MICROPROCESSOR AND EMBEDDED SYSTEMS

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Microprocessor and Embedded Systems**	Course code**: EE309**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Internal architecture of 8085 microprocessor –Instruction set - Addressing modes – Classification of instructions. Assembly language programming –standard programs in assembly language – code conversion, sorting – binary and BCD arithmetic.	7	15
II	Stack and Subroutines – CALL and RETURN instructions – Delay subroutines. Timing and control – Machine cycles, instruction cycle and T states – fetch and execute cycles – Timing diagram for instructions.	7	15
III	IO and memory interfacing – Address decoding– interrupt structure of 8085. I/O ports- Programmable peripheral interface PPI 8255 - Modes of operation. Interfacing of LEDs, ADC and DAC with 8085	7	15
IV	Internal Architecture of 8086 – Segment Registers - Instruction Pointer – Flag Register – Index Registers - Stack Pointer Register. Segmentation and Pipe lining, Minimum and maximum modes of operation of 8086. Addressing modes	7	15
V	Assembler and assembler directives –Instruction set of 8086, Assembly language programming, Simple programs- Addition of 8 bit binary and decimal numbers, Subtraction of 2 decimal numbers, Addition and subtraction of two 16 bit numbers, Multiplication and division of 8 bit numbers, Sorting of a series of 8 bit numbers, Code conversion-BCD to Binary, Binary to BCD.	7	20
VI	Intel 8051 Microcontroller, Internal Architecture - I/O port structure, memory organisation, general purpose RAM, Bit addressable RAM, register banks, special function registers; Instruction set summary-addressing modes, instruction types, Introduction to 8051 C programming-pulse wave generation, buzzer interface.	7	20

TEXT BOOKS:

1	DouglasV.Hall,Microprocessors and Interfacing, TataMcGrawHill, Education, NewDelhi, Third Edition
2	MathurA.,IntroductiontoMicroprocessors,TataMcGrawHill,NewDelhi,1992
3	Mohamed Ali Mazidi,Janice Gillispie Mazidi,"The8051microcontroller and embedded systems using Assembly and C",2/e,Pearson education/PHI
4	Rafiq uzzaman,Microprocessor Theory and Application ,PHI Learning,First Edition
5	RameshGaonkar,Microprocessor,Architecture,Programming and Applications,Penram International Publishing;Sixthedition,2014.
6	Ray Ajoy and Burchandi ,Advanced Microprocessor &Peripherals,Tata Mc Graw Hill,Education,NewDelhi,Second Edition
7	Scott Mac Kenzie,Raphael C WPhan, "The 8051 Microcontroller", Fourth Edition, Pearson education

REFERENCES:

1	BracewellR.N.,FourierTransform&ItsApplications,McGrawHill
2	FarooqHusain,SignalsandSystems,Umeshpub.
3	PapoulisA.,FourierIntegral&ItsApplications,McGrawHill
4	TaylorF.H.,PrinciplesofSignals&Systems,McGrawHill

PREREQUISITE: EE 207- Basics of Programming in C

COURSE OBJECTIVES:

1	To give an understanding on the Microprocessor 8085 and programming
2	To program 8085 microprocessor for different applications
3	To impart an insight into the architecture of 8051 microcontroller.
4	To develop sound understanding about programming and interfacing of 8051 microcontroller.
5	To give an understanding on the embedded system
6	To design an embedded system for different applications

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Apply** the fundamentals of assembly level programming of 8085 microprocessor
2	**Analyze** the machine cycles of 8085 microprocessor programs
3	**Work** with standard microprocessor real time interfaces

4	**Understand** the basic principles of embedded system.
5	**Develop** skill for writing C programs for 8051 microcontroller
6	**Design** and interface microprocessors/microcontrollers-based systems**.**

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Students will be able to make use of the basic knowledge on microprocessors to find solutions for the engineering problems
	PO2	Students will be able to analyse engineering problems to reach conclusions
	PO3	Students will be able to design solutions for complex engineering problems
	PO5	Students will be able to apply modern techniques to model engineeringactivities
	PO6	Students will be able to make use of their knowledge for the betterment ofthe society
	PO7	Students will be able to give a sustainable and constructive developmentfor the society
	PO9	Students will be able to work in a group with their background in microprocessors
	PO10	Students will be able to communicate and comprehend properly in a groupwork
	PO11	Students will be able to manage a project properly
	PO12	Students will be able to acquire more knowledge in the advanced fields ofprocessors
CO2	**PO1**	Students will be able to make use of the basic knowledge on microprocessors to find solutions for the engineering problems
	PO2	Students will be able to analyse engineering problems to reach conclusions
	PO3	Students will be able to design solutions for complex engineering problems
	PO5	Students will be able to apply modern techniques to model engineering activities

	PO6	Students will be able to make use of their knowledge for the betterment ofthe society
	PO7	Students will be able to give a sustainable and constructive developmentfor the society
	PO9	Students will be able to work in a group with their background in microprocessors
	PO10	Students will be able to communicate and comprehend properly in a group work
	PO11	Students will be able to manage a project properly
CO3	**PO1**	Students will be able to combine their knowledge for different applications
	PO2	Students will be able to analyse engineering problems properly
	PO6	Students will be able to make use of their knowledge for the betterment of the society as a whole
	PO9	Students will be able to work in a group understanding each other properly
	PO10	Students will be able to communicate the ideas properly
	PO11	Students will be able to handle a project considering the financial constraints too.
	PO12	Students will be able to acquire good knowledge on advanced fields andwill help them to be familiar with advanced technologies.
CO4	**PO1**	Students will be able to reach solutions of many problems with the help of basic knowledge in the embedded systems and microcontrollers.
	PO2	The knowledge on the microcontroller and embedded system will help to analyse the problem properly.
	PO3	Students will be able to design solutions keeping in mind the safety of thesociety.
	PO5	Students will be at a better position to use the modern tools of IT for solutions.
	PO6	Students will have a better stand for the societal problems from the perspective of an engineer
	PO7	Students can help for a sustainable development with their proper Understanding of technology.
	PO9	Students can contribute for a team work with their basic knowledge in Different fields.
	PO11	As a team students will be able to manage the team in a project in a betterway.
	PO12	For further development in their intellectual level the basics will be verymuch helpful for students.
CO5	**PO1**	Students will be able to combine their knowledge for different applications
	PO2	Students will be able to analyse engineering problems properly
	PO6	Students will be able to make use of their knowledge for the betterment ofthe society as a whole
	PO9	Students will be able to work in a group understanding each other properly
	PO10	Students will be able to communicate the ideas properly

	PO11	Students will be able to handle a project considering the financial constraints too
	PO12	Students will be able to acquire good knowledge on advanced fields andwill help them to be familiar with advanced technologies.
CO6	**PO1**	Students will be able to make use of the basic knowledge on microprocessors to find solutions for the engineering problems
	PO2	Students will be able to analyse engineering problems to reach conclusions
	PO3	Students will be able to design solutions for complex engineering problems
	PO5	Students will be able to apply modern techniques to model engineeringactivities
	PO6	Students will be able to make use of their knowledge for the betterment of the society
	PO7	Students will be able to give a sustainable and constructive developmentfor the society
	PO9	Students will be able to work in a group with their background in microprocessors
	PO10	Students will be able to communicate and comprehend properly in a group work
	PO11	Students will be able to manage a project properly

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
Co1	**PSO1**	To Apply the Engineering knowledge to Develop programs in 8085 microprocessor
CO3	**PSO2**	Explore the technical knowledge and development of professional methodologies in interfacing microprocessor and digital circuits.
CO4	**PSO1**	To Apply the Engineering knowledge to develop embedded system
CO5	**PSO1**	To Apply the Engineering knowledge to develop microcontroller.
CO6	**PSO2**	Explore the technical knowledge and development of professional methodologies in interfacing microcontroller with motors.

EE367 NEW AND RENEWABLE SOURCES OF ENERGY

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course **NewandRenewableSourcesofEnergy**	Course code**: EE367**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction, Classification of Energy Resources; Conventional Energy Resources - Availability and their limitations; Non-Conventional Energy Resources – Classification, Advantages, Limitations; Comparison of Conventional and Non-Conventional Energy Resources; World Energy Scenario; Indian Energy Scenario. ENERGY STORAGE: Sizing and Necessity of Energy Storage.	5	15
II	SOLAR THERMAL SYSTEMS: Introduction, Solar Constant, Basic Sun-Earth Angles, Measurement of Solar Radiation Data – Pyranometer and Pyrheliometer .Principle of Conversion of Solar Radiation into Heat, – Solar thermal collectors – General description and characteristics – Flat plate collectors – Heat transfer processes – Solar concentrators (parabolic trough, parabolic dish, Central Tower Collector) –performance evaluation.	11	15
III	SOLAR ELECTRIC SYSTEMS: Solar Thermal Electric Power Generation –; Solar Photovoltaic – Solar Cell fundamentals, characteristics, classification, construction of module, panel and array. Solar PV Systems – stand-alone and grid connected; Applications – Street lighting, Domestic lighting and Solar Water pumping systems.	5	15
IV	ENERGY FROM OCEAN: Tidal Energy – Principle of Tidal Power, Components of Tidal Power Plant (TPP), Classification of Tidal Power Plants, Advantages and Limitations of TPP. Ocean Thermal Energy Conversion (OTEC): Principle of OTEC system, Methods of OTEC power generation – Open Cycle (Claude cycle), Closed Cycle (Anderson cycle) and Hybrid cycle (block diagram description of OTEC); Site-selection criteria, Biofouling, Advantages & Limitations of OTEC.	7	15
V	WIND ENERGY: Introduction, Wind and its Properties, History of Wind Energy, Wind Energy Scenario – World and India. Basic principles of Wind Energy Conversion	7	20

	Systems (WECS), Classification of WECS, Parts of WECS, Derivation for Power in the wind, Electrical Power Output and Capacity Factor of WECS, Advantages and Disadvantages of WECS.		
VI	BIOMASS ENERGY: Introduction, Photosynthesis process, Biomass fuels, Biomass conversion technologies, Urban waste to Energy Conversion, Biomass Gasification, Biomass to Ethanol Production, Biogas production from waste biomass, factors affecting biogas generation, types of biogas plants – KVIC and Janata model; Biomass program in India. Small hydro power: Classification as micro, mini and small hydro projects - Basic concepts and types of turbines - Design and selection considerations. EMERGING TECHNOLOGIES: Fuel Cell, Small Hydro Resources, Hydrogen Energy, alcohol energy, nuclear fusion and power from satellite stations.	7	20

REFERENCES:

1	A.A.M. Saigh (Ed): Solar Energy Engineering, Academic Press, 1977
2	Abbasi S. A. and N. Abbasi, Renewable Energy Sources and Their Environmental Impact, Prentice Hall of India, 2001.
3	Boyle G. (ed.), Renewable Energy - Power for Sustainable Future, Oxford University Press, 1996
4	Earnest J. and T. Wizelius, Wind Power Plants and Project Development, PHI Learning, 2011.
5	F. Kreith and J.F. Kreider: Principles of Solar Engineering, McGraw Hill, 1978
6	G.N. Tiwari: Solar Energy-Fundamentals, Design, Modelling and Applications, Narosa Publishers, 2002
7	J.A. Duffie and W.A. Beckman: Solar Energy Thermal Processes, J. Wiley, 1994
8	Johansson T. B., H. Kelly, A. K. N. Reddy and R. H. Williams, Renewable Energy – Sources for Fuel and Electricity, Earth scan Publications, London, 1993.
9	Khan B. H., Non-Conventional Energy Resources, Tata McGraw Hill, 2009
10	Sawhney G. S., Non-Conventional Energy Resources, PHI Learning, 2012
11	Rao S. and B. B. Parulekar, Energy Technology, Khanna Publishers, 1999.

PREREQUISITE: NIL

COURSE OBJECTIVES:

1	To give sufficient knowledge about the promising new and renewable sources of energy
2	To equip students in working with projects and to take up research work in connected areas.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Recognize and understand** the world and Indian energy scenario and necessity of sustainable development utilizing Renewable Energy recourses.
2	**Analyze and infer** the potentials and design systems based on solar thermal systems.
3	**Illustrate, design and implement** solar electric systems
4	**Understand** the fundamentals and interpret basic components of energy from the ocean
5	**Understand** the fundamentals and interpret basic components of energy from the wind
6	**Understand** the fundamentals and interpret basic components of energy from the biomass and emerging technologies

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO5**	Students will be able to identify renewable energy sources and suggest the apt one for the society
	PO7	Students will be able to understand the importance of Renewable energy for sustainable development and importance of climate change
CO2	**PO3**	Students will be able to design solar thermal systems which is required for the society to improve environmental conditions

	PO7	Students will be able to understand the Solar thermal systems that will reduce the pollution in the Environment
CO3	**PO3**	Students will be able to illustrate and design solar electric systems.
	PO7	Students will be able to understand the Solar photovoltaic systems that will reduce the pollution in the Environment
CO4	**PO6**	Students will be able to become an Engineer to implement ocean based systems and benefit the society
	PO7	Students will be able to understand the energy from the ocean that will reduce the pollution in the Environment
CO5	PO3	Students will be able to illustrate and design wind electric systems
	PO6	Students will be able to become an Engineer to implement wind energy based systems and benefit the society
CO6	**PO4**	Students will be able to research, analyse and interpret data in the new area of renewable
	PO10	Students will be able to apply the knowledge of basic renewable energy systems and communicate effectively with public its need for societal development like biomas energy

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Students will be able to apply the knowledge about renewable energy resources.
CO2	**PSO1**	Students will be able to apply knowledge on solar thermal system for innovative & dynamic industrial environment
CO3	**PSO1**	Students will be able to apply the knowledge of solar electric system for different applications.
CO4	**PSO2**	Students will be able to explore the knowledge of harnessing ocean energy for microgrid
CO5	**PSO2**	Students will be able to explore and develop wind energy conversion system for grid applications
CO6	**PSO2**	Students will be able to

EE331 DIGITAL CIRCUITS & EMBEDDED SYSTEMS LAB

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**Digital circuits & Embedded system lab**	Course code**: EE331**
L-T-P**:0-0-3**	Credit**:1**

Experiments:

1. Realisation of SOP & POS functions after K map reduction
2. 2. Half adder & Full adder realization using NAND gates
3. 4-bit adder/subtractor & BCD adder using IC 7483
4. . Study of multiplexer IC and Realization of combinational circuits using multiplexers.
5. Study of counter ICs (7490, 7493)
6. Study of shift register IC 7495, ring counter and Johnsons counter
7. VHDL implementation of full adder, 4 bit magnitude comparator
8. Data transfer instructions using different addressing modes and block transfer.
9. Arithmetic operations in binary and BCD-addition, subtraction, multiplication and division
10. Interfacing D/A converter- generation of simple waveforms-triangular wave, ramp etc
11. Interfacing A/D converter
12. Square wave generation.

PREREQUISITE:

1. EE204-Digital electronics & Logic Design
2. EE309-Microprocessor&Embedded system

COURSE OBJECTIVES:

1	To impart practical experience in the design and setup of digital circuits and Embedded systems.
2	To impart practical experience in the development of 8085 microprocessor and 8086 micro controller

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Design, setup and analyse** various digital circuits.
2	**Program and explain** 8085 microprocessor for different applications
3	**program and use** advanced microprocessors
4	**Program and interface** 8051 microcontroller
5	**Understand** the fundamentals and interpret basic components of energy from the wind
6	**Combine** different system for a practical applications

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	PO1	With the basic knowledge, students will be able to find solutions for engineering problems
	PO3	Students will be able to find solutions for specific needs of the society
	PO7	Students can contribute for the sustainable development of the society
	PO9	Students can contribute in group for different solutions, helping the teamwork
	PO12	Students can build up from the basic knowledge to higher levels of digital circuits
CO2	PO1	Students will be able to make use of their basic knowledge on programmingand interfacing of 8085 microprocessor to find solutions for engineeringproblems
	PO3	Students will be able to design solutions for the issues of society with their knowledge on microprocessors
	PO5	With the help of knowledge on microprocessors and programming, they willbe able to extend the area to the modern IT tools for many situations.
	PO7	Students will be able to contribute for the sustainable development of thesociety.
	PO9	The knowledge on microprocessors will help students for the team work
	PO12	Students will be able to build up their knowlege in advanced systems
CO3	PO1	The basic knowledge on advanced microcontrollers can help students toreach solutions in many problems

	PO3	Students will be able to design solutions in many areas
	PO5	Modern IT tools can be made use in many situations
	PO7	Students will be able to contribute for the sustainable development of the society
	PO9	Will be able to contribute for the team work in reaching solutions for theproblems
	PO12	Students can build on their basics to go to the depths of knowledge
CO4	**PO1**	Students will be able to make use of their basic knowledge on programming and interfacing of 8051 microcontroller to find solutions for engineering problems
	PO3	Students will be able to design solutions for the issues of society with their knowledge on microcontrollers
	PO5	With the help of knowledge on microcontrollers and programming.They will be able to extend the area to the modern IT tools for many situations.
	PO7	Students will be able to contribute for the sustainable development of the society.
	PO9	The knowledge on microcontrollers will help students for the team work
	PO12	Students will be able to build up their knowledge in advanced systems
CO5	**PO1**	Students will be able to make use of their basic knowledge in embedded systems to find solutions for engineering problems
	PO3	Students will be able to design solutions for the issues of society with their knowledge on embedded systems
	PO5	With the help of knowledge on embedded systems and programming skill, they will be able to extend the area to the modern IT tools for many situations.
	PO7	Students will be able to contribute for the sustainable development of the society.
	PO9	The knowledge on embedded systems will help students for team work
	PO12	Students will be able to build up their knowledge in advanced systems

CO- PSO MAPPING

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	To Apply the Engineering knowledge to identify, Analyze, Design various digital circuits
CO3	**PSO2**	Explore the technical knowledge and development of professional methodologies in interfacing microprocessor and digital converters
CO4	**PSO1**	To Apply the Engineering knowledge to develop microprocessor and microcontroller programs
CO5	**PSO2**	Explore the technical knowledge and development of professional methodologies in interfacing microcontrollers in motors and digital circuits

EE 333 ELECTRICAL MACHINES LAB II

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course:**Electrical Machines Lab II**	Course code**: EE 333**
L-T-P**:0-0-3**	Credit**:1**

Experiments:

.

1) Load test on three phase Squirrel cage Induction Motor
2) Load test on three phase slip ring induction motor
3) No load & Blocked rotor test on Slip ring induction motor
4) Voltage regulation of Alternator
5) Load test on ploe changing induction motor
6) No load & Blocked rotor test on Single Phase induction motor
7) V curve of a synchronous motor
8) Performance characteristics of induction generator
9) Slip test on 3-phase salient pole synchronous machine
10) Regulation of alternator by direct loading
11) Study of Induction Motor Starters

PREREQUISITE:

1. BE101-03 Introduction to electrical Engineering
2. EE 202 Synchronous& Induction Machines

3. COURSE OBJECTIVES:

1	To give hands on experience in testing Alternators, Three phase and Single Phase Induction Motors and Induction generators.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Predict the performance of Induction machines using standard equivalent circuit models
2	**Select** the appropriate machines based on the application requirements
3	**Illustrate** laboratory data and experimental results using professional quality graphical representations
4	**Work** in teams to conduct experiments, analyze results, and develop technically sound reports of outcomes
5	**Identify** faults occurring in machines and take necessary corrective measures
6	**Combine** different system for a practical applications

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	PO1	Students will be able to apply the knowledge of AC machines to predict their performance
	PO3	Students will be able to design system components based on the performance characteristics of AC machines
	PO4	Students will be able to provide valid conclusions regarding complex engineering based on the characteristics of machines
CO2	PO1	Students can apply the knowledge of basic engineering to select machines based on the application
	PO2	Students will be able to analyse the characteristics of various machines and provide substantiated conclusions
	PO4	Students will be able to interpret the data the from various experiments and provide suggestions for different applications
CO3	PO1	Student will be able to easily analyze the characteristics of machinesusing graphical representations
	PO3	Student will be able to design solutions for engineering problems from graphical representations
CO4	PO4	Student will be able to conduct experiments on AC Machines and interpret the data and provide valid suggestions
	PO9	Student will be able to work as a team and function effectively in multidisciplinary environments
CO5	PO2	Student will be able to formulate the problems in the area of fault analysis of Synchronous and Induction machines
	PO3	Student will be able to design solutions for faults occurring in machines

	PO4	Students will be able to conduct investigations on machine faults and provide valid suggestions.

CO- PSO MAPPING

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Graduates will able to applythe operation of different ac machines
CO2	**PSO2**	Graduates will able to apply the knowledge of ac machines for the analysis design and application of innovative, dynamic and challenging industrial environment
CO5	**PSO2**	Graduates will be able apply the knowledge science & electrical engineering to understand and apply suitable ac machines for various applications.

EE 341 DESIGN PROJECT

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Design Project**	Course code**: EE341**
L-T-P**:0-0-6**	Credit**:3**

COURSE OBJECTIVES:

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, the students should be able to:

CO's	DESCRIPTION
1	**Think** innovatively to develop new hardware solutions
2	**Apply** the fundamental knowledge of Electrical and Electronics 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 codeing 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

SREEPATHY INSTITUTE OF MANAGEMENT AND TECHNOLOGY

COURSE HANDBOOK

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

SEMESTER 6

EE 302 ELECTROMAGNETICS

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Electromagnetics**	Course code**: EE 302**
L-T-P**:2-1-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	STATIC ELECTRIC FIELDS: Introduction to Co-ordinate System –Rectangular – Cylindrical and Spherical Co- ordinate System – Gradient of a Scalar field, Divergence of a Vector field and Curl of a Vector field-Their Physical interpretation. Divergence Theorem, Stokes'Theorem. Numerical problems.	8	15
II	Coulomb's Law, Electric field intensity. Field due to a line charge,Sheet Charge and Continuous Volume Charge distribution. ElectricFlux and Flux Density; Gauss's law and its application. ElectricPotential-The Potential Gradient. The Electric dipole. TheEquipotential surfaces. Capacitance - capacitance of co-axial cable,two wire line. Poisson's and Laplace's equations	9	15
III	STATIC MAGNETIC FIELD: Biot-Savart Law, Amperes Force Law.– Magnetic Field intensity due to a finite and infinite wire carrying a current–Magnetic field intensity on the axis of a circular and rectangular loop carrying a current –Magnetic vector potential, Magnetic flux Density and Ampere's circuital law and simple applications	9	15
IV	ELECTRIC AND MAGNETIC FIELDS IN MATERIALS–Electric Polarization-Nature of dielectric materials-Electrostatic energy and energy density– Boundary conditions for electric fields and magnetic fields–Conduction current and displacement current densities– continuity equation for current. Maxwell's Equation in Differential and integral form from Modified form of Ampere's circuital law, Faraday's Law and Gauss Law .	9	15
V	TIME VARYING ELECTRIC AND MAGNETIC FIELDS:. Poynting Vector and Poynting Theorem – Power flow in a co-axial cable – Complex Average Poynting Vector. ELECTROMAGNETIC WAVES: Wave Equation from Maxwell's Equation – Uniform	10	20

	Plane Waves –Wave equation in Phasor form		
VI	Plane waves propagation in loss less and lossy dielectric medium and conducting medium. Plane wave in good conductor, surface resistance, Skin depth, Intrinsic Impedance and Propagation Constant in all medium. Phase and group velocity. Transmission lines: waves in transmission line –solution for loss less lines – characteristic impedance – VSWR – impedance matching. Introduction to Electromagnetic interference and compatibility	10	20

TEXT BOOKS:

1	Nannapeni Narayana Rao, "Elements of Engineering Electromagnetics", Prentice Hall India
2	Sadiku M. N. O, Elements of Electromagnetics, Oxford university Press, 2010

REFERENCES:

1	Cheng D. K., Field and Wave Electromagnetic, Pearson Education, 2013.
2	Edminister J. A., Electromagnetics, Schaum Outline Series , Tata McGraw-Hill, 2006
3	Gangadhar K. A. and P. M. Ramanathan , Electromagnetic field theory , Khanna Publishers, 2009.
4	Hayt W. H. and J. A. Buck , Engineering Electromagnetics, 8/e, McGraw-Hill, 2012.
5	Inan U. S. and A. S. Inan, Engineering Electromagnetics, Pearson Education, 2010.
6	John Krauss and Daniel A. Fleisch, Electromagnetics with Applications, McGraw-Hill, 5th edition
7	Murthy T. V. S. A, Electromagnetic field, S. Chand Ltd, 2008.
8	Premlet B., Electromagnetic theory with applications, Phasor Books, 2000.
9	S.C.Mahapatra and Sudipta Mahapatra ,Principles of Electromagnetics, McGraw-Hill, 2015

PREREQUISITE:

1. Engineering Mathematics & Differential Equations
2. Engineering Physics

COURSE OBJECTIVES:

1	To develop a conceptual basis of electrostatic fields.
2	To develop a conceptual basis of magnetostatic fields.
3	To develop a conceptual basis of electromagnetic waves.

4	To understand various engineering applications of electromagnetics
5	To understand the application of electromagnetic in communication system

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Define** different coordinate system and apply them to analyze fields & potentials due to static charges
2	**Explain** the physical meaning of the differential equations for electrostatic and magnetic fields.
3	**Understand** how materials are affected by electric and magnetic fields.
4	**Understand** the relation between the fields under time varying situations.
5	**Understand** principles of propagation of uniform plane waves
6	**Be aware of** electromagnetic interference and compatibility.

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Student will be able to recall and apply the appropriate coordinates systems to solve the engineering problems in the area of Fields and potentials.
	PO12	Students will be able to apply the knowledge in the static fields for Life - long learning process
CO2	**PO2**	Student will be able to reach substantiated conclusions using gathered first principles in the area of static fields the techniques of problem analysis
	PO12	Students will be able to apply the knowledge physical significance of differential equations for Life -long learning process
CO3	**PO2**	Student will be able to explain the physical meaning of the differential equations for electrostatic and magnetic fields and use for problem analysis
	PO7	Student will be able to relate materials which are affected by electric and

		magnetic fields and apply them as needed for sustainable development.
	PO12	Students will be able to apply the knowledge in the behavior of materials under influence of electric and magnetic fields for Life -long learning process.
CO4	**PO1**	Student will be able to apply knowledge acquired from time varying fields to solve the engineering problems
	PO12	Students will be able to concepts gathered from time varying fields for Life -long learning process.
CO5	**PO1**	Student will be able to apply knowledge acquired regarding propagation of uniform plane waves to solve the engineering problems
CO6	**PO1**	Student will be able to apply knowledge acquired related to electromagnetic interference to solve the engineering problems.
	PO6	Student will be aware of electromagnetic interference and compatibility And Apply as relevant to the professional Engineering practice
	PO7	Student will be aware of electromagnetic interference & compatibility, helping to apply for sustainable development initiatives.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO3	**PSO1**	To Apply the Engineering knowledge to identify, Analyze, Design and simulate the problems associated in the field of electromagnetic.
CO3	**PSO2**	Explore the technical knowledge and development of professional methodologies in the emerging technologies in wave communication
CO4	**PSO1**	To Apply the Engineering knowledge to identify, Analyze, Design and simulate the problems associated in the field of electromagnetics
CO6	**PSO1**	To Apply the Engineering knowledge to identify, Analyze, Design and simulate the problems associated in the field of electromagnetic.
CO6	**PSO2**	Explore the technical knowledge and development of professional methodologies in the emerging technologies in wave communication

EE 304 ADVANCED CONTROL THEORY

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Advanced Control Theory**	Course code**: EE 304**
L-T-P**:3-1-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Types of controller- Feedforward-feedback-cascade-P, PI and PID. Compensator design: Realization of compensators – lag, lead and lag-lead -Design of compensator using bode plot.	7	15
II	Compensator design: Realization of compensators – lag, lead and lag-lead. Design of compensator using rootlocus. Design of P, PI and PID controller using Ziegler-Nichols tuning method.	7	15
III	State space analysis of systems: Introduction to state concept - state equation of linear continuous time systems, matrix representation of state equations. Phase variable and canonicalforms of state representation-controllable, observable, diagonaland Jordan canonical forms-solution of time invariantautonomous systems, forced system-state transition matrixrelationship between state equations and transfer function.Properties of state transition matrix-Computation of statetransition matrix using Laplace transform-Cayley-Hamiltonmethod. Conversion from canonical form to phase variable form	7	15
IV	State feedback controller design: Controllability & observability. State feed-back design via pole placement technique. Sampled data control system: Pulse Transfer function-Stability of sampled data system -Routh Hurwitz criterion and Jury's test. Introduction to state-space representation of sampled data systems	7	15
V	Nonlinear systems: Introduction - characteristics of nonlinear systems. Types of nonlinearities. Analysis through harmonic linearisation - Determination of describing function of nonlinearities (relay, dead zone and saturation only) – application of describing function for stability analysis of autonomous system with single nonlinearity.	7	20
VI	Phase Plane Analysis: Concepts- Construction of phase trajectories for nonlinear systems and linear systems with	7	20

	static nonlinearities - Singular points – Classification of singular points. Definition of stability- asymptotic stability and instability Liapunov methods to stability of linear and nonlinear, continuous time systems.		

TEXT BOOKS:

1	Hassan K Khalil, Nonlinear Systems, Prentice - Hall International (UK), 2002
2	Kuo B.C, Analysis and Synthesis of Sampled Data Systems, Prentice Hall Publications
3	Nagarath I. J. and Gopal M., Control System Engineering, Wiley Eastern, 2008.
4	Nise N. S., Control Systems Engineering, 6/e, Wiley Eastern, 2010
5	Ogata K., Modern Control Engineering, Prentice Hall of India, New Delhi, 2010.

REFERENCES:

1	Alberto Isidori, Nonlinear Control Systems, Springer Verlag, 1995.
2	Gibson J. E., F.B. Tuteur and J. R. Ragazzini, Control System Components, Tata McGraw Hill, 2013 3.
3	Gopal M., Control Systems Principles and Design, Tata McGraw Hill, 2008
4	Jean-Jacques E. Slotine & Weiping Li, Applied Nonlinear Control, Prentice-Hall., NJ, 1991

PREREQUISITE:

EE 303 Linear Control Systems

COURSE OBJECTIVES:

1	Design compensators using classical techniques.
2	To analyze both linear and nonlinear system using state space analysis
3	To analyze the behavior of discrete time systems and nonlinear control systems

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Design** compensators in time domain
2	**Design** compensators in frequency domain
3	**Acquire the fundamental knowledge about state space modeling**
4	**Design controllers and observers** and there by acquire full knowledge about the stability of systems.
5	**Acquire knowledge** about stability of nonlinear systems by describing function method.
6	**Acquire knowledge** about stability of nonlinear systems by phase plane & lyapunov's stability mehod

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Students will be apply the knowledge of mathematics and science to solve various fundamental problems in design of compensators in time domain
	PO2	Students will be able to formulate and analyze complex Engineering problems using the principles of mathematics
	PO3	Students will be able to design system components
CO2	**PO1**	Students will be apply the knowledge of mathematics and science to solve various fundamental problems in design of compensators in frequency domain.
	PO2	Students will be able to formulate and analyze complex Engineering problems using the principles of mathematics
	PO3	Students will be able to design system components
CO3	**PO1**	Students will be able to Identify, formulate, review research literature, and analyze complex Engineering problems using state space analysis
	PO2	Students will be able to formulate and analyze complex Engineering problems using the principles of mathematics
	PO5	Students will be able to use modern tools to create system model in state space
CO4	**PO1**	Students will be apply the knowledge of mathematics to solve various fundamental problems in design of controllers and observers

	PO5	Students will be able to create, select, and apply appropriate techniques, resources, to develop controllers and observers
CO5	**PO1**	Students will be able to apply knowledge in calculus to find the describing function of nonlinear systems
	PO2	Students will be able to formulate and analyze complex Engineering problems using the principles of mathematics
CO6	**POI**	Students will be able to formulate & analyze stability of nonlinear system by phase plane & lyapunov's stability mehod
	PO2	Students will be able to formulate and analyze complex Engineering problems using the principles of mathematics

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Graduates will be able to identify, Analyze, Design and simulate the problems associated in the field of Control systems.
	PSO3	Graduates will be able to Gain sufficient competence to understand the technologies in Control System to solve present problems in the Industry & Society.
CO2	**PSO1**	Graduates will be able to identify, Analyze, Design and simulate the problems associated in the field of Control systems
	PSO3	Graduates will be able to Gain sufficient competence to understand the technologies in Control System to solve present problems in the Industry & Society.
CO3	**PSO1**	Graduates will able to gain the fundamental knowledge about state space modeling
	PSO3	Graduates will be able to Gain sufficient competence to understand the modern technologies in Control Systems
CO4	**PSO1**	Graduates will able to design controllers and observers in control systems
CO5	**PSO1**	Graduates will able to apply the learned Knowledge for stability analysis of nonlinear systems
CO6	**PSO1**	Graduates will able to apply the learned Knowledge for stability analysis of nonlinear systems

EE 306 POWER SYSTEM ANALYSIS

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Power System Analysis**	Course code**: EE 306**
L-T-P**:3-1-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Per unit quantities-single phase and three phase-selection of base quantities -advantages of per unit system – changing the base of per unit quantities-Simple problems. Modelling of power system components - single line diagram – per unit quantities. Symmetrical components- sequence impedances and sequence networks of generators, transformers and transmission lines.	5	15
II	Methods of analyzing faults in symmetrical and unsymmetrical case- effects of faults - Power system faults - symmetrical faults - short circuit MVA - current limiting reactors. Unsymmetrical faults - single line to ground, line to line, double line to ground faults - consideration of prefault currentproblems.	8	15
III	Load flow studies – Introduction-types-network model formulation - formation of bus impedance and admittance matrix, Gauss-Siedel (two iterations), Newton-Raphson (Qualitative analysis only) and Fast Decoupled method (two iterations) - principle of DC load flow.	8	15
IV	Automatic Generation Control: Load frequency control: single area and two area systems - Automatic voltage control.	6	15
V	Economic Operation - Distribution of load between units within a plant - transmission loss as a function of plant generation - distribution of load between plants - Method of computing penalty factors and loss coefficients. Unit commitment: Introduction — Constraints on unit commitments: Spinning reserve, Thermal unit constraintsHydro constraints. -	7	20
VI	Power system stability - steady state, dynamic and transient stability-power angle curve-steady state stability limit. Mechanics of angular motion-Swing equation – Solution of swing equation - Point by Point method - RK method - Equal area criterion application - Methods of improving stability limits.	8	20

REFERENCES:

1	Cotton H. and H. Barber, Transmission & Distribution of Electrical Energy, 3/e, Hodder and Stoughton, 1978.
2	Gupta B. R., Power System Analysis and Design, S. Chand, New Delhi, 2006
3	Gupta J.B., Transmission & Distribution of Electrical Power, S.K. Kataria & Sons, 2009.
4	Hadi Saadat, Power System Analysis, 2/e, McGraw Hill, 2002.
5	Kothari D. P. and I. J. Nagrath, Modern Power System Analysis, 2/e, TMH, 2009.
6	Kundur P., Power system Stability and Control, McGraw Hill, 199
7	Soni, M.L., P. V. Gupta and U. S. Bhatnagar, A Course in Electrical Power, Dhanpat Rai & Sons, New Delhi, 1984.
8	Stevenson W. D., Elements of Power System Analysis, 4/e, McGraw Hill, 1982.
9	Uppal S. L. and S. Rao, Electrical Power Systems, Khanna Publishers, 2009.
10	Wadhwa C. L., Electrical Power Systems, 33/e, New Age International, 2004.
11	Weedy B. M., B. J. Cory, N. Jenkins, J. B. Ekanayake and G. Strbac, Electric Power System, John Wiley & Sons, 2012.

PREREQUISITE:NIL

COURSE OBJECTIVES:

1	To enable the students to analyse power system under normal & abnormal conditions
2	To understand the need for load flow analysis and different methods.
3	To understand Power system Modeling
4	To understand the need for stability studies and their analysis

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Recall** the concepts of per unit reactance diagram representation of 3 phase power system & **Formulate** Power system components in the Positive, Negative & Zero Sequence networks
2	**Compute** Symmetrical & Unsymmetrical fault studies on the power system network and **design** the ratings of Circuit breakers
3	**Write** Y bus & **compute** out load flow studies using different iterative methods

	like NR, GS& FDLF methods.
4	**Perform modeling** of single area and two area load frequency control and **analyze** the steady state and dynamic response of power system control.
5	**Predic**t thoroughly the constraints involved in the load dispatch and **compute** optimal solution through unit commitment and Economic load dispatch including transmission losses.
6	**Interpret** the steady state and transient stability studies in the power system network using equal area criterion method and **apply** numerical solutions to swing equations.

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	PO1	Student will be able to apply the fundamental knowledge of mathematics & electrical engineering in representing the power system network components in p.u system.
	PO2	Student will be able to formulate the sequence impedance and networks applying principles of Electrical engineering during fault conditions.
CO2	PO1	Apply the knowledge of Mathematical Modeling of Power system for Solving different types of Faults using fundamental knowledge of mathematics & electrical engineering like Thevenins Theorem.
	PO2	Able to identify different types of faults in power system network and analyze the various Faults and calculate fault current & fault MVA.
	PO4	Student will be able to formulate the fault level in power system network

		and to suitably design the circuit breaker ratings for the protection purpose.
	PO6	Student will be able to apply the knowledge gained in fault calculation and consequently responsible in professional practice to assess the societal safety & energy issues in the society.
CO3	**PO2**	Student will be able to formulate the load flow problems of a Power system network and analyse using numerical solutions
	PO5	Student will be to use power system network data for simulation tools to compare & Predict the Load flow solution
CO4	**PO1**	Student will be able to apply the knowledge of mathematics & control system for modelling of components like turbine, speed-governor, and generator-load.
	PO2	Analyze the control aspects involved in load frequency control and automatic voltage control.
	PO4	Student will be able to compute the steady state and dynamic response of single area and two area controls and interpret the data to provide valid conclusions.
	PO12	Student will be able to formulate the problems in the area of power system control and recognize the need for life –long learning in context of technological change in integrated power system operation and control.
CO5	**PO1**	Student will be able to predict the constraints involved in load dispatch of different types of power plant and find an optimal solution using basic mathematical optimization techniques.
	PO2	Students will be able Analyse Economic Operation of Power system considering various constraints
	PO3	Design according to various constraints in power system.
	PO6	Student will be able to apply the optimal unit commitment realizing the societal, health, safety issues involved in power generation of different types of power plants and considering the transmission losses.
	PO7	Student will be able to understand the crew constraints, maintenance constraints involved in power system economics For sustainable development.
CO6	**PO1**	Student will be able to apply the fundamental knowledge of mathematics & electrical engineering to understand the power system stability.

	PO2	Students will be able to apply Graphical methods like equal area criterion to analyse the stability of the Power system network and to meet the specified needs like critical clearing angle and time during the occurrence of fault in the system.
	PO7	Understand the importance of stability and use the knowledge for sustainable development.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Graduates will be able to Model Power System Components
CO2	**PSO1**	Graduates will able to apply the Mathematical model to Analyze Symmetrical & Unsymmetrical faults.
CO3	**PSO1**	Graduates will able to apply the learned Knowledge to carry out Load Flow Studies
	PSO1	Graduates will able to apply Control system Knowledge for Automatic Generation Control.
CO4	**PSO2**	Novel approaches to different Control Strategies for Economic Power generation & Control.
	PSO1	Graduates will able to apply the learned Knowledge for Economic Dispatch & different Solutions
CO5	**PSO1**	Graduates will able to apply the knowledge to understand Stability studies in real time applications.
	PSO2	Interpret the knowledge to reduce failures & blackouts in context of new technologies for societal & environmental development.
CO6	**PSO1**	Graduates will be able to Model Power System Components

EE 308 ELECTRIC DRIVES

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Electric Drives**	Course code**: EE 308**
L-T-P**:3-0-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction to electric drives – Block diagram – advantages of electric drives – Dynamics of motor load system, fundamental equations, and types of load – classification of load torque, four quadrant operation of drives. Steady state stability. Introduction to closed loop control of drives.	7	15
II	DC motor drives- constant torque and constant power operation, separately excited dc motor drives using controlled rectifiers, single phase semi converter and single phase fully controlled converter drives. Three phase semi converter and fully controlled converter drives. Dual converters, applications of dual converter for speed control of DC motor. Closed loop control of separately excited dc motor drive. DC series motor drive for traction application.	7	15
III	Chopper controlled DC drives. Analysis of single quadrant chopper drives. Regenerative braking control. Two quadrant chopper drives. Four quadrant chopper drives. Cycloconverters for drive applications – different types – basic principle.	7	15
IV	Three phase induction motor speed control. Using semiconductor devices. Stator voltage control – stator frequency control - Stator voltage and frequency control (v/f). Rotor chopper speed control - slip power recovery control schemes – sub synchronous and super synchronous speed variations.	7	15
V	Voltage source inverter fed induction motor drives, Current source inverter fed induction motor drives. Concept of space vector – Basic transformation in reference frame theory – field orientation principle.	7	20
VI	Synchronous motor drives – introduction to v/f control. Permanent Magnet synchronous motor drives – different types – control requirements, converter circuits, modes of operation. Microcontroller based permanent magnet synchronous motor drives (schematic only).	7	20

TEXT BOOKS:

1	Bimal K. Bose “Modern power electronics and AC drives” Pearson Education, Asia 2003.
2	. Dubey G. K. “Power semiconductor control drives” Prentice Hall, Englewood Cliffs, New Jersey, 1989

REFERENCES:

1	Dewan S.B. , G. R. Slemon, A. Strauvhen, “Power semiconductor drives”, John Wiley and sons
2	Dr. P. S. Bimbra “Power electronics”, Khanna publishers
3	J. M. D. Murphy “Thyristor control of AC drives”
4	N. K. De, P. K. Sen “Electric drives” Prentice Hall of India 2002
5	Ned Mohan, Tore m Undeland, William P Robbins, “Power electronics converters applications and design”, John Wiley and Sons.
6	Pillai S. K. “A first course on electric drives”, Wieley Eastern Ltd, New Delhi
7	Vedam Subrahmanyam, “Electric Drives”, MC Graw Hill Education, New Delhi
8	W. Shepherd, L. N. Hulley and D. T. Liang, “Power Electronocs and motor control”, Second Edition, Cambridge University Press, 1995.

PREREQUISITE:

1. EE 202 DC Machines &Tranformers
2. EE 205 Synchronous & Induction Machines
3. EE 305 Power Electronics

COURSE OBJECTIVES:

1	To provide fundamental knowledge in dynamics and control of Electric Drives.
2	To justify the selection of Drives for various applications
3	To familiarize the various semiconductor controlled drives employing various motors
4	To familiarize the operation principles, and design of starting, braking, and speed control

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Analyse** a drive being applied in 4 different quadrants
2	**Analyse** types of electric drives systems based on nature of loads, control objectives,performance and reliability
3	**Apply** drives being used in real applications
4	**Understand** the various speed control techniques used in the control of the machine.
5	**Understand** the concept for DC drive
6	**Understand** the concept of speed control for AC drives

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Students will be able apply the knowledge science & electrical engineering for analyzing the operation of drive in different quadrants.
	PO2	Students will be able to identify and provide solutions to complex problems associated operation of drive in different quadrants.
	PO6	Students will be able to apply the knowledge of quadrant operations deveop products like (hybrid electric vehicles) to assess the societal and safety issues
CO2	**PO1**	Students will be able apply the knowledge science & electrical engineering for analyzing the operation of drive in different quadrants..
	PO6	Students will be able to apply the knowledge of quadrant operations deveop products like (hybrid electric vehicles) to assess the societal and safety issues
CO3	**PO1**	Students will be able apply the knowledge science & electrical engineering to understand and apply suitable drives for various applications.
	PO3	Students will be able apply their ideas to develop applications with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
	PO4	Students will be able apply the knowledge science & electrical engineering to understand the control techniques of electrical machines.

CO4	**PO1**	Students will be able apply the knowledge science & electrical engineering to understand the control techniques of electrical machines
	PO2	Students will be able to identify and provide solutions to complex problems associated with speed control techniques.
	PO4	Students will be able to use research based knowledge to develop advanced speed control techniques.
	PO10	Students can communicate on complex engineering activities with the engineering community on speed control of machines
	PO12	Students will be able to communicate effectively on complex engineering in area of speed control techniques with the engineering community.
CO5	**PO1**	Students will be able apply the knowledge science & electrical engineering to understand and relate various aspects of DC Drives.
	PO4	Students can get an exposure DC drives and build platform to perform interpretation of data, and synthesis the information.
CO6	**PO1**	Students will be able apply the knowledge science & electrical engineering to understand and relate various aspects of AC Drives.
	PO4	Students can get an exposure AC drives and build platform to perform interpretation of data, and synthesis the information.
	PO12	Student will get an initiation to study advanced control techniques used in control of induction Motors

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Graduates will able to applythe operation of drives in different quadrants
	PSO2	Graduates will able to apply the knowledge of Power electronics and electric drives for the analysis design and application of innovative, dynamic and challenging industrial environment
CO2	**PSO1**	Graduates will be able apply the knowledge science & electrical engineering to understand and apply suitable drives for various applications.
CO3	**PSO1**	Graduates will be able apply the knowledge science & electrical engineering to understand the control techniques of electrical machines
	PSO3	Graduates will able to understand the technique used for the drive systems
CO4	**PSO1**	Graduates will able to develop the different drive systems.
CO5	**PSO1**	Graduates will able to applythe operation of drives in different quadrants
CO6	**PSO2**	Graduates will able to apply the knowledge of Power electronics and electric drives for the analysis design and application of innovative, dynamic and challenging industrial environment

EE 372 BIOMEDICAL INSTRUMENTATION

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Biomedical Instrumentation**	Course code**: EE372**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Development of biomedical instrumentation, biometrics, man instrument system components block diagram, physiological systems of the body (brief discussion on Heart and cardio vascular system, Anatomy of nervous system, Physiology of respiratory systems) problems encountered in biomedical measurements. Sources of bioelectric potentials – resting and action potentials - propagation of action potentials – bio electric potentials example (ECG, EEG, EMG, ERG, EOG,EGG etc.)	7	15
II	Bio potential electrodes – theory – microelectrodes – skin surface electrodes – needle electrodes – biochemical transducers – transducers for biomedical applications. Electro-conduction system of the heart. Electro cardiography – electrodes and leads – Einthoven triangle, ECG read out devices, ECG machine – block diagram.	7	15
III	Measurement of blood pressure – direct and indirect measurement – oscillometric measurement –ultrasonic method, measurement of blood flow and cardiac output, plethysmography –photo electric and impedance plethysmographs Measurement of heart sounds –phonocardiography.	7	15
IV	Cardiac pacemakers – internal and external pacemakers, defibrillators. Electro encephalogram –neuronal communication – EEG measurement. Muscle response– Electromyogram (EMG) – Nerve Conduction velocity measurements- Electromyogram Measurements. Respiratory parameters – Spiro meter, pneumograph	7	15
V	Ventilators, heart lung machine, hemodialysis, lithotripsy, infant incubators X-rays- principles of generation, uses of X-rays- diagnostic still picture, fluoroscopy, angiography, endoscopy, diathermy. Basic principle of computed tomography, magnetic resonance imaging system and nuclear medicine system – radiation therapy. Ultrasonic imaging system - introduction and basic principle.	6	20
VI	Instruments for clinical laboratory – test on blood cells – chemical tests - Electrical safety– physiological effects of	8	20

	electric current – shock hazards from electrical equipment – method of accident prevention, introduction to tele- medicine.		

TEXT BOOKS:

1	J. G. Webster, Medical Instrumentation, Application and Design, John Wiley and Sons
2	L. Cromwell, F. J. Weibell and L. A. Pfeiffer, Biomedical Instrumentation Measurements, Pearson education, Delhi, 1990.

REFERENCES:

1	R. S. Khandpur, Handbook of Biomedical Instrumentation, Tata Mc Graw Hill.
2	J. J. Carr and J. M. Brown, Introduction to Biomedical Equipment Technology, Pearson Education

PREREQUISITE:NIL

COURSE OBJECTIVES:

1	To understand human physiology
2	To understand the working of various instruments used in measurement of physiological parameters
3	To understand and analyse the various physiological parameters of the human body that can be measured.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Understand** the bioelectric potentials,the electrode theory, different types of electrodes and transducers.
2	**Understand and explain** the working and concepts of ECG,EMG,EEG, plethysmography, impedance cardiology, cardiac arrhythmia, pace makers, defibrillators
3	**Understand** Patient monitoring systems, patient monitoring through biotelemetry, Sources of electrical hazards and safety techniques.
4	**Understand** Patient monitoring systems, patient monitoring through biotelemetry,

	Sources of electrical hazards and safety techniques
5	**Understand and analyze** Clinical measurements ,spectrophotometer ,Colorimeter, Blood pH Measurement, Blood Cell Counters
6	**Understand and explain** Medical imaging, X Rays, ultrasound scanner, CT Scan MRI/NMR, endoscopy

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	The concept of multidisciplinary approach is well understood.
CO2	**PO1**	Various fundamental key elements are described.
CO3	**PO2**	Different concepts are being analyzed to produce engineering solutions.
	PO5	Understanding different systems, solutions for its development are identified.
CO4	**PO2**	Analysis of monitoring systems are made thorough
	PO5	Modern engineering idea has been out in the open
CO5	**PO1**	Different systems are analyzed.
	PO3	Basic concepts used in the latest technology advancement
CO6	**PO1**	Knowledge of traditional approach appropriate considerations for complex engineering problems can be designed.
	PO3	Interpretations of the systems are done with the acquired knowledge.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	New concepts are defined and learned.
CO2	**PSO1**	Instrument developing methods are made in focus.
CO3	**PSO2**	Instrument developing methods are made in focus.
	PSO3	New concepts in latest technologies are being described.
CO4	**PSO1**	Summarization of concepts that studied relating different modes of operation is improved
	PSO2	New concepts in biomedical instrumentation are described.
CO5	**PSO1**	With the knowledge of modern techniques and development of new concepts is capable.
CO6	**PSO1**	With the comparison study of different approaches new concepts are adapted.

HS300 PRINCIPLES OF MANAGEMENT

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics 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 environmentglobal, 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 makingEvaluation 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 designskills and personal characteristics needed in managersselection process, techniques and instruments (3 Hrs.)	9	20
VI	Leading and Controlling: Leading Vs Managing – Trait approach and Contingency approaches to leadership -	9	20

	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.)		

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

PREREQUISITE:NIL

COURSE OBJECTIVES:

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 organisational 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:

After successful completion of the course, the 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-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
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	JUSTIFICATION
CO1	PO8	To analyzing the managerial functions and roles it should concerned the related social and cultural issues
	PO9	The functions of management are highly correlated with the ethics related to management
CO2	PO9	To apply the managerial theories it is necessary to analyze the professional ethics and responsibilities
	PO11	The application of management theory is related to demonstration knowledge and understanding of theories
	PO11	Planning procedures are depends upon the different kinds of managerial practices and roles

CO3	PO12	Planning is a lifelong learning process which is changed according to programs, and levels of organizations
CO4	PO6	The decision making is an important tool which is connected to entire work forces
	PO11	The organizational pattern, structure and levels determination is depend on the business practices followed by them
CO5	PO7	The proper communication skills is essential for each staff with co workers
	PO9	It is necessary to understand the ethics and responsibilities related to an organization when a staff was appointed
CO6	PO6	Leader must have the ability to concerned about the group he posses
	PO7	Maintaining of effective communication among members is essential
	PO9	Understanding of ethics and responsibilities is crucial when a team is formed.

EE332 SYSTEMS & CONTROL LAB

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Systems & Control Lab**	Course code**: EE332**
L-T-P**:0-0-3**	Credit**:1**

SYLLABUS:

1. Predetermination and verification of frequency response characteristics of Lag and Lead networks.

2. Transfer Function of AC and DC servomotors

3. Step and frequency response of R-L-C circuit

4. Study of P, PI and PID controllers. Response analysis of a typical system with different controllers, using process control simulator.

5. Study of performance characteristics and response analysis of a typical temperature/ Flow/ Level control system.

6. MATLAB: Use of control system Tool box for the Time domain and frequency domain methods of system analysis and design

7. SIMULINK: Simulation and control of real time systems using SIMULINK

8. Compensator design using Bode plot with MATLAB control system Tool box

9. Simple experiments using Programmable Logic Controller- Realization of AND, OR logic, concept of latching, experiments with timers and counters- using ladder diagrams

10. Study of various types of synchros (TX, TR & TDX). Characteristics of transmitter, data transmission using TX-T R pair. Effect of TDX in data transmission.

PREREQUISITE: EE 303 Linear Control Systems

COURSE OBJECTIVES:

1	To impart knowledge of control systems through experiments
2	To develop mathematical models for electrical systems, analyses the systems and implement compensators for systems based on system performance.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Explain** and evaluate performance of basic closed loop and open loop systems.
2	**Analyze** the system by drawing plots in MATLAB.
3	**Learn and Write** mathematical programming in MATLAB applications.
4	**Design and analyze** control systems using mathematical models.
5	**Relate** the concepts to design controller to meet the desired specification.

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Student will be able to apply the knowledge of mathematics and Engineering fundamentals for the solution of problems related to control systems
	PO2	Students will be able to formulate, and analyze systems
CO2	**PO5**	Students will be able to create, select, and apply appropriate techniques, resources, and modern engineering tools.
CO3	**PO5**	Students will be able to apply appropriate techniques, resources, and modern engineering tools
CO4	**PO4**	Students will be able to apply the concepts to obtain mathematical models.
CO5	**PO4**	Students will be able to apply the concepts to design the controllers

CO- PSO MAPPING

CO's	PSO's	JUSTIFICATION
CO1	**PSO3**	Graduates will able to understand the closed loop and open loop systems
CO2	**PSO3**	Graduates will able to analyze and solve the problems using MATLAB.
CO3	**PSO2**	Graduates will able to develop a MATLAB program

CO4	**PSO1**	Graduates will able to design a control system using mathematical model
CO5	**PSO3**	Graduates will able to understand the concepts to design controller to meet the desired specification.

EE334 POWER ELECTRONICS & DRIVES LAB

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Power Electronics & Drives Lab**	Course code**: EE334**
L-T-P**:0-0-3**	Credit**:1**

SYLLABUS:

1 R and RC Firing circuits
2 UJT Trigger circuit with Single phase controlled Rectifier
3 AC Voltage Controller using TRIAC
4 Chopper Controlled DC Motor
5 Simulation of Buck, Boost & Buck Boost Converters
6 Simulation of Single Phase Fully Controlled & Half Controlled Rectifier Fed SEDC Motor
7 Simulation of Speed Control of 3 PhaseInduction Motor using V/F control and using Sine PWM
8 Simulation of Switched mode Rectifiers
9 IGBT Based PWM Inverter
10 Characteristics of SCR
11 Characteristics of MOSFET
12 Simulation of Dual Converter

PREREQUISITE: EE 305 – Power Electronics

COURSE OBJECTIVES:

1	Impart practical knowledge for the design and setup of different Power Electronic converters and its application for motor control.
2	Simulate the various power electronic converters, AC drives & DC drives

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Identify and explain** different circuits and corresponding waveforms in power electronic circuits
2	**Select** a firing circuit based on the application.
3	**Recognize** various power semiconductor devices that are used in power electronic applications.
4	**Analyze** various power electronic converters.
5	**Recall** the basic concepts which can be applied in advanced power electronic circuits.

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	PO1	Students will be able to apply knowledge of mathematics and engineering fundamentals to design power electronic circuits
	PO2	Students will be able to formulate innovative designs of power electronic circuits.
	PO4	Students will be able to conduct experiments, analyze the circuit and interpret the waveforms.
	PO5	Apply the Software tools for analyzing circuits under different conditions like MATLAB.
CO2	PO1	Students will be able to apply fundamental knowledge of mathematics and engineering to design firing circuits.
	PO4	Students will be able to select appropriate firing circuits to conduct experiments.
	PO5	Students will be able to model various firing circuits using MATLAB/Simulink and predict its performance.
CO3	PO2	identify the characteristics of different power electronic semiconductor devices
	PO9	Students can work as a team to choose a semiconductor device based on different application.
	PO11	Manage the different applications of Power electronic circuits considering the cost.
CO4	PO2	Students will be able to analyze different power electronic converters.
	PO5	Students will be able to simulate various power electronic converters like Buck, Boost, Buck boost converters.
	PO7	By using knowledge students can propose Energy efficient solutions
	PO2	Students will be able to analyze different power electronic converters.
CO5	PO2	Students will be able to design power electronics circuits for practical

		applications
	PO6	Design Voltage regulators, inverters & SMPS according to the requirement of Society.
	PO12	Student will be engaged in updating the emerging trends in the field of power electronics.

CO- PSO MAPPING

CO's	PSO's	JUSTIFICATION
CO1	PSO1	Graduates will be able to identify, Analyze and design power electronic circuits for different application.
	PSO2	Using advanced literatures develop energy efficient converters.
CO2	PSO1	Graduates will be able to select firing circuits.
CO3	PSO1	Graduates will be able to identify various Power semiconductor devices.
CO4	PSO1	Graduates will be able to identify, Analyze and design power electronic converters
	PSO2	Graduates will be able to design circuits such as Converters, Regulators & SMPS for the need of Society
CO5	PSO1	Graduates will be able to recall the Basic concepts in Power electronics
	PSO3	Graduates will be able to solve present problems in the Industry & Society by using advanced technologies in Power electronics.

EE 352 COMPREHENSIVE VIVA

COURSE INFORMATION SHEET:

Program:**Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Comprehensive Viva**	Course code**: EE 352**
L-T-P**:0-1-1**	Credit**:2**

PREREQUISITE:NIL

COURSE OBJECTIVES:

1	To assess the comprehensive knowledge gained in basic courses relevant to the branch of study
2	To comprehend the questions asked and answer them with confidence

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Identify the fundamental aspects of any engineering problem/situation and give answers in dealing with them

CO-PO-PSO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12		PSO1	PSO2	PSO3
CO1	3	3	3	0	0	0	1	0	0	2	0	2		**3**	**1**	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	LEVEL	JUSTIFICATION
CO1	**PO1**	**3**	Comprehensive knowledge gained from mathematics,science, Engineering fundamentals will contribute in solving complex engineering problem
	PO2	**3**	Students will be able to identify, formulate, review research literature and analyze complex engineering problems
	PO3	**3**	Comprehensive knowledge gained in basic courses can utilize in design and develop solutions for complex engineering problems
	PO7	**1**	Comprehensive knowledge gained in Basic Engineering courses will enable the student to have an impact on the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
	PO10	**3**	Students will able to Communicate effectively with the engineering

			Community
	PO12	**2**	The student will become aware of the need for lifelong learning and the continued upgrading of technical knowledge

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	LEVEL	JUSTIFICATION
CO1	**PSO1**	**3**	Graduates can demonstrate sound knowledge in different aspects of electrical engineering
	PSO2	**1**	Graduates will get a broad understanding of different factors involved in electrical engineering field

SREEPATHY INSTITUTE OF MANAGEMENT AND TECHNOLOGY

COURSE HANDBOOK

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

SEMESTER 7

EE 401 ELECTRONIC COMMUNICATION

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Electronic Communication**	Course code**: EE 401**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	AM and FM fundamentals AM – Frequency spectrum – vector representation – power relations – generation of AM – DSB, DSB/SC, SSB, VSB .FM – frequency spectrum – power relations	6	15
II	AM and FM transmitters and receivers Block diagrams of low power and high power AM transmission - AM receivers: straight receivers super hetrodyne receiver - choice of intermediate frequency - simple AVC circuit Block diagrams of direct FM transmitter and Armstrong transmitter - FM receivers (balanced - slope detector and Foster-Seely discriminator only).	8	15
III	Television and radar systems Principles of television engineering - Requirements and standards – need for scanning - types of camera tubes and picture tubes - B/W and colour systems - PAL - CCTV - Cable TV- high definition television. Radar and navigation: principle of radar and radar equation, block schematics of pulsed radar.	8	15
IV	Digital communication: Principles of digital communication – - Sampling process-pulse modulation Techniques- sampling process-PAM, PWM and PPM concepts - PCM encoder and decoder Applications of data communication	6	15
V	Satellite communication Multiple access (MA) techniques-FDMA, TDMA, CDMA, SDMA - applications in satellite communication wire, MA techniques applications in wired communication. in satellite communication, earth station; Fibers – types: sources, detectors used, digital filters, optical link	8	20
VI	Cellular telephone - Basic concepts, frequency reuse, interference cell splitting, sectoring, cell system layout, cell processing. Fibers – types: sources, detectors used, digital filters, optical link: Bluetooth, Zig-Bee, GPS, Wi-Fi, Wi-Max based communication	6	20

TEXT BOOKS:

1	Kennedy G., Electronic Communication Systems, McGraw-Hill, New York, 2008.
2	Roody and Coolen, Electronic Communication, Prentice Hall of India LTD., New Delhi, 2007

REFERENCES:

1	William Scheweber, Electronic Communication Systems, Prentice Hall of India LTD, New Delhi, 2004.
2	Wayne Tomasi, Electronic Communication Systems, Prentice Hall of India LTD, New Delhi, 2004.
3	Frank R. Dungan, Electronic Communication Systems, 3/e, Vikas Publishing House, 2002.
4	Simon Haykins, Communication Systems, John Wiley, USA, 2006
5	Bruce Carlson. Communication Systems, Tata McGraw Hill, New Delhi, 2001.
6	Taub and Schilling, Principles of Communication Systems, McGraw-Hill, New York, 2008.
7	Anokh Singh, Principles of Communication Engineering, S. Chand and Company Ltd., Delhi.

PREREQUISITE: NIL

COURSE OBJECTIVES:

1	To introduce the applications of communication technology.
2	To understand the methods and techniques used in the communication field.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Develop** basic knowledge in AM/FM
2	**Develop** basic knowledge in various AM/FM receiver and transmitter circuits
3	**Develop** knowledge in the basics of Monochrome and Colour TV systems
4	**Build** basic knowledge in digital communication and various digital modulation techniques
5	**Develop** basic knowledge in satellite communication systems and various multiple access techniques
6	**Develop** basic knowledge on cellular telephone

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Students will be able to acquire basic knowledge of AM & FM
CO2	**PO1**	Students will be able to understand different devices used in AM/FM transmission & reception
CO3	**PO1**	Students will be able to understand about Television systems
CO4	**PO1**	Students will be able to acquire basic knowledge of digital communication
CO5	**PO1**	Students will be able to understand about Satellite communication systems
CO6	**PO1**	Students will be able to acquire basic knowledge of cellular telephony

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Basic knowledge of communication can be acquired.

EE 403 DISTRIBUTED GENERATION AND SMART GRIDS

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Distributed Generation And Smart Grids**	Course code**: EE 403**
L-T-P**:3-1-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Distributed generation – Introduction - Integration of distributed generation to Grid – Concepts of Micro Grid - Typical Microgrid configurations - AC and DC micro grids - Interconnection of Microgrids - Technical and economical advantages of Microgrid - Challenges and disadvantages of Microgrid development Smart Grid: Evolution of Electric Grid - Definitions and Need for Smart Grid, Opportunities, challenges and benefits of Smart Grids	7	15
II	Distributed energy resources: Introduction - Combined heat and power (CHP) systems - Solar photovoltaic (PV) systems – Wind energy conversion systems (WECS) - Small-scale hydroelectric power generation - Storage devices: Batteries: Lead acid, nickel metal hydrate, and lithium ion batteries , ultra-capacitors, flywheels Control of Microgrids: Introduction to Central Controller (CC) and Microsource Controllers (MCs) - Control functions for microsource controller, Active and reactive power control, Voltage control, Storage requirement for fast load tracking, Load sharing through power-frequency control	7	15
III	Protection issues for Microgrids: Introduction, Islanding, Different islanding scenarios, Major protection issues of standalone Microgrid - Impact of DG integration on electricity market, environment, distribution system, communication standards and protocols. Smart Grid: Components – NIST Smart Grid Reference Architecture Introduction to Smart Meters, Electricity tariff – one part tariff, two tariff and maximum demand tariff - Dynamic pricing: timeof-use (TOU) pricing, critical-peak pricing (CPP) and Real Time Pricing- Automatic Meter Reading(AMR), Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation. Intelligent Electronic Devices (IED) and their	7	15

	application for monitoring & protection, Wide Area Measurement System (WAMS), Phase Measurement Unit (PMU).		
IV	Smart energy efficient end use devices-Smart distributed energy resources- Load Curves-Load Shaping Objectives-Methodologies - Peak load shaving - Energy management-Role of technology in demand response-Demand Side Management – Numerical Problem	8	15
V	Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighborhood-Area Networks (NANs), Sensor and Actuator Networks (SANETs) Smart Substations, Substation Automation, IEC 61850 Substation Architecture, Feeder Automation.	7	20
VI	Cloud computing in smart grid: Private, public and Hybrid cloud. Cloud architecture of smart grid. Power quality: Introduction - Types of power quality disturbances - Voltage sag (or dip), transients, short duration voltage variation, Long duration voltage variation, voltage imbalance, waveform distortion, and voltage flicker - Harmonic sources: SMPS, Three phase power converters, arcing devices, saturable devices, fluorescent lamps, harmonic indices (THD, TIF, DIN, C – message weights) Power quality aspects with smart grids.	8	20

TEXT BOOKS/ REFERENCES :

1	Ali Keyhani, Design of Smart Power Grid Renewable Energy Systems, ISBN: 978-0-470-62761-7, Wiley
2	James Momoh, Smart Grid: Fundamentals of Design and Analysis, ISBN: 978-0-470-88939- 8, Wiley
3	R. C. Durgan, M. F. Me Granaghen, H. W. Beaty, “Electrical Power System Quality”, McGraw-Hill
4	Remus Teodorescu, Marco Liserre, Pedro Rodriguez, Grid Converters for Photovoltaic and Wind Power Systems, ISBN: 978-0-470-05751-3, Wiley
5	S. Chowdhury, S.P. Chowdhury and P. Crossley, Microgrids and Active Distribution Networks, ISBN 978-1-84919-014-5, IET, 2009

PREREQUISITE: NIL

COURSE OBJECTIVES:

1	To develop a conceptual introduction to various distributed generation systems.
2	Give the idea of micro grids, smart grids and their control

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Define** Distributed generation and understand the concepts of Micro Grid
2	**Explain** various distributed Energy sources and understand the Control Scheme
3	**Explain** the protection issues and identify various developments
4	**Evaluate** Energy and do the steps for Energy management.
	Explain Advanced Metering Infrastructure.
6	**Explain** Power quality aspects with Micro grid. .

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	2			2								3	2	
CO3	3	2												3		
CO4	3	2	3			2								3		
CO5	3					2								3		
CO6	3					2								3	2	

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Student will be able to apply the fundamental knowledge to define distributed generation and understand the concepts of Micro grid.
CO2	**PO1**	Apply the knowledge to explain various distributed generating sources.
	PO2	Able to identify different types of Control schemes for Micro-grid
	PO3	Student will be able to design the Control scheme for protection of Micro-Grid
	PO6	Student will be able to apply the knowledge to apply the control &

		protection schemes for reliability of Power supply.
CO3	**PO2**	Student will be able to identify various protection schemes.
	PO3	Student will be to design protection schemes for Micro-Grid.
CO4	**PO1**	Student will be able to apply the knowledge of Electrical engineering to Evaluate Energy
	PO2	Student will be able to identify energy conservation measures.
	PO3	Student will be able to do the Energy management.
	PO6	Student will be able to formulate the problems in Energy usage and do the necessary steps for energy conservation for the benefit of society.
CO5	**PO1**	Student will be able to understand the Advanced technologies in Metering & Control.
	PO6	Student will be able to apply the Advanced Technologies for benefit of consumer and Utility.
CO6	**PO1**	Student will be able to apply the fundamental knowledge to identify Power quality issues in Micro-Grid.
	PO6	Student will be able to monitor and do corrective measures for quality of power supply to consumers.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Graduates will be able to understand Distributed Generation.
CO2	**PSO1**	Graduates will able to define various distributed Energy sources.
	PSO2	Graduates will able to Identify the different Modern control Schemes using advanced technologies.
CO3	**PSO1**	Graduates will able to apply the learned Knowledge to explain Protection Schemes.
CO4	**PSO1**	Graduates will able to apply the knowledge of Electrical engineering to Evaluate Energy
CO5	**PSO1**	Graduates will able to Explain advanced methods of Metering.
CO6	**PSO2**	Graduates will able to apply the knowledge to understand power quality issues in Micro grid.
	PSO1	Interpret the knowledge to reduce failures & blackouts in Micro grid and reduce the power quality issues.

EE 405 ELECTRICAL SYSTEM DESIGN

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Electrical System Design**	Course code**: EE 405**
L-T-P**:3-1-0**	Credit**:4**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	General awareness of IS Codes (IS 3043, IS 732, IS 2675, IS 5216-P1- 2, IS 2309), The Indian Electricity Act 1910, The Indian Electricity supply Act 1948, Indian Electricity Rules 1956, The Electricity Regulatory Commission Act 1998, Electricity Act 2003, Bureau of Energy Efficiency (BEE) and its labeling. National Electric Code (NEC) - scope and safety aspects applicable to low and medium (domestic) voltage installations, Electric services in buildings, Classification of voltages, standards and specifications.	8	15
II	Safety aspects applicable to low and medium voltage installations. General aspects of the design of electrical installations for domestic dwellings (low and medium voltage installations)–connected load calculation, sub circuit determination, selection of main distribution board, sub distribution board, MCB, ELCB, MCCB and cables for sub circuits. Pre-commissioning tests of domestic installations.	10	15
III	Medium and HV installations – selection of cables and cable glands, guidelines for cable installation in detail. Panel boards: LT & HT control panel boards. Installation of induction motors: Design of distribution systems with light power and motor loads. Design of automatic power factor correction (APFC) Panel. Selection and installation of transformers, switchgears and protective devices – Design of indoor and outdoor 11 kV substation upto 630 kVA.	10	15
IV	Air-conditioning loads and its specifications. Energy conservation techniques. Selection of standby generator – installation and its protection. Introduction to Automatic Main Failure (AMF) System. Precommissioning tests of cables, transformers and generators.	8	15
V	Design of earthing system for an HT consumer, Dimensions and drawings of typical earth electrodes (1) Pipe Earthing, (2) Plate Earthing. Touch, Step and Transfer potentials at EHT Sub-Stations, Earth-mat,	8	20

	installations of special equipment like X-Ray, Neon-Sign, Basics of lightning arresters		
VI	Design of illumination systems – Yard lighting, street lighting and flood lighting. Kerala Cinema Regulation Act – 1958, design and layout of installation for recreational or assembly buildings, cinema theatre and high rise building. Design of Electrical system related to firefighting, lifts and escalators.	10	20

TEXT BOOKS:

1	J. B. Gupta, A Course in Electrical Installation Estimating and Costing, S.K. Kataria & Sons; Reprint 2013 edition (2013).
2	K. B. Raina, S. K. Bhattacharya, Electrical Design Estimating Costing, NEW AGE; Reprint edition (2010).
3	M.K.Giridharan, Electrical Systems Design, , M/s I K International Publishers, New Delhi, 2nd edition, 2016

REFERENCES:

1	National Electric Code, Bureau of Indian Standards publications, 1986
2	Relevant Indian Standard – specifications (IS – 732, IS – 746, IS – 3043, IS – 900), etc
3	S.L.Uppal, Electrical Wiring Estimating & Costing, Khanna Publishers (2008)

PREREQUISITE: NIL

COURSE OBJECTIVES:

1	To gain the knowledge of acts and rules used for regulating the electrical supply in our country.
2	To impart sound knowledge in the design and estimation of low voltage and medium voltage electrical installations.
3	To gain the knowledge of selection of distribution transformers and their installations
4	To gain the knowledge of earthing designs in different installations and the standard dimensions ofearthing systems

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Understand** the rules and regulation in electrical installation
2	**Design** the electrical installation in domestic buildings
3	**Design** medium and HV installation
4	**Design** transformer and generator
5	**Design** earthing system of HV installation
6	**Design** Different illumination system

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Students will be able apply the knowledge science & electrical engineering for analyzing the regulation of electrical installation
	PO3	Students will be able apply their ideas to develop applications with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
CO2	**PO1**	Students will be able apply the knowledge science & electrical engineering for analysing the operation of different circuit breakers
	PO2	Students will be able to identify and provide solutions to complex problems associated with electrical installation of domestic building
	PO3	Students will be able apply their ideas to develop applications with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
	PO6	Students will be able to apply the different protecting devices for electrical installation.

CO3	**PO1**	Students will be able apply the knowledge science & electrical engineering to understand the medium and high voltage installation
	PO2	Students will be able to identify and provide solutions to complex problems associated with electrical installation of medium and high voltage installation
	PO3	Students will be able apply their ideas to develop applications with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
	PO4	Students will be able apply the knowledge science & electrical engineering to understand the control techniques of high voltage electrical installation
CO4	**PO1**	Students will be able apply the knowledge science & electrical engineering to understand the control techniques of transformer and generator
	PO2	Students will be able to identify and provide solutions to complex problems associated with electrical installation of transformer and generator
	PO12	Students will be able to recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change
CO5	**PO1**	Students will be able apply the knowledge science & electrical engineering to understand and relate various aspects of earthing system
	PO3	Students will be able apply their ideas to develop applications with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
CO6	**PO1**	Students will be able apply the knowledge science & electrical engineering to understand and relate various aspects of illumination system
	PO3	Students will be able apply their ideas to develop applications with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
	PO6	Students will be able to apply the different protecting devices for illumination systems

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Graduates will able to applythe rules and regulation of electrical installation
CO2	**PSO2**	Graduates will able to apply the knowledge of different protecting system for the analysis design and application of domestic installation
CO3	**PSO1**	Graduates will be able apply the knowledge science & electrical engineering to understand and apply suitable devices for medium and high voltage installation
CO4	**PSO1**	Graduates will be able apply the knowledge science & electrical engineering to understand the control techniques of electrical machines such as transformer and generator
CO5	**PSO3**	Graduates will able to understand the technique used for the earthing systems
CO6	**PSO1**	Graduates will able to develop the different illumination systems.

EE 407 DIGITAL SYSTEM PROCESSING

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Digital System Processing**	Course code**: EE 407**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction to signals and systems - Discrete Fourier transform: Frequency domain sampling, Discrete Fourier transform (DFT): DFT pair, properties of DFT, frequency response analysis of signals using the DFT, circular convolution using DFT , linear filtering based on DFT Fast Fourier transform (FFT); Introduction, Radix - 2 decimation in time FFT algorithm, Radix-2 decimation in frequency algorithm	7	15
II	Introduction to FIR and IIR systems : Structures for realization of discrete time systems – structures for FIR and IIR systems – signal flow graphs, direct-form, cascade-form, parallel form, lattice and transposed structures and linear Phase FIR filters.	7	15
III	Design of digital filters – general considerations – causality and its implications, characteristics of practical frequency selective filters IIR filter design : Discrete time IIR filter (Butterworth and Chebyshev) from analog filter – IIR filter (LPF, HPF, BPF, BRF) design by Impulse Invariance, Bilinear transfor mation, Approximation of derivatives. filter design	7	15
IV	FIR filter design : Structures of FIR filter- Linear phase FIR filter – Filter design using windowing techniques, frequency sampling techniques	7	15
V	Finite word length effects in digital Filters : Fixed point and floating point number representations - Comparison - Truncation and Rounding errors - Quantization noise - derivation for quantization noise power - coefficient quantization error - Product quantization error - Overflow error – Round-off noise power - limit cycle oscillations due to product round-off and overflow errors - signal scaling Introduction to FDA Toolbox in MATLAB: Design of filters using FDA toolbox (Demo/Assignment only)	7	20
VI	Introduction to TMS320 Family: Architecture, Implementation, C24x CPU Internal Bus Structure, Memory Central Processing unit , Memory and I/O	7	20

	Spaces , Overview of Memory and I/O Spaces, Program control Address Modes System Configuration and Interrupts clocks and low Power Modes Digital input / output (I/O), Assembly language Instruction , Instruction Set summary , Instruction Description, Accumulator, arithmetic and logic Instruction , Auxiliary Register and data page Pointer Instructions , TREG, PREG, and Multiply Instruction ,Branch Instructions , Control Instructions I/O and Memory Instruction Design & Implementation and Filter Structures: MATLAB functions and TMS320 Implementation (Demo/Assignment only) Introduction to Code Composer Studio (Demo only)		

TEXT BOOKS:

1	Alan V.Oppenheim, Ronald W. Schafer & Hohn. R.Back, "Discrete Time Signal Processing", Pearson Education, 2nd edition, 2005.
2	Emmanuel.C..Ifeachor, & Barrie.W.Jervis, "Digital Signal Processing", Second editi on, Pearson Education / Prentice Hall, 2002
3	John G. Proakis & Dimitris G.Manolakis, "Digital Signal Processing Principles, Algorithms &Applications", Fourth edition, Pearson education / Prentice Hall, 2007

REFERENCES:

1	Johny R. Johnson, Introduction to Digital Signal Processing, PHI, 2006
2	P.P.Vaidyanathan, Multirate Systems & Filter Banks, Prentice Hall, Englewood cliffs, NJ, 1993
3	S.K. Mitra, Digital Signal Processing, A Computer Based approach, Tata Mc GrawHill, 1998.

PREREQUISITE:

EE307- Signals & Systems

COURSE OBJECTIVES:

1	To provide an understanding of Digital Signal Processing principles, algorithms and applications.
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:

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

CO's	DESCRIPTION
1	**Analyse** Discrete time systems with Discrete Fourier Transform
2	**Design** digital filters IIR filter design technique
3	**Design** digital filters FIR filter design technique
4	**Develop** windowing techniques for filter design.
5	**Analyse** finite word length effects in signal processing
6	**Design** filters using Matlab FDA tool box and to understand Digital Signal Controllers and their Applications

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	PO1	Representation of signals and systems and their properties require mathematical background
	PO3	Design of systems with minimum hardware
	PO4	Sampling of data
	PO5	Use of overlap save and add methods
	PO6	Signals are useful for a wide range of day to day applications

CO2	**PO1**	IIR filter equations and derivations
	PO3	Different methods for IIR filter design
	PO5	Analysis of system transfer function
CO3	**PO1**	Different methods for FIR filter design
	PO3	Obtain the filter specifications such as order and cut-off frequency
CO4	**PO1**	FIR filter equations and derivations
	PO3	Identify drawbacks of commonly used window functions
	PO5	FIR Filter design using windows
	PO7	Use of different transformation techniques
CO5	**PO1**	Students will be able to work in a group with their background in The design of filters
	PO3	Students will be able to combine their knowledge for different applications
	PO5	Students will be able to work in a group understanding each other properly
	PO7	The knowledge on the errors in filter design will help to analyse the problem properly
CO6	**PO3**	The knowledge on the architecture of TMS320 will help to analyse the problem properly
	PO5	Students will be able to work in a group understanding each other properly

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	To Apply the Engineering knowledge to identify, Analyze, Design various IIR and FIR circuits
CO3	**PSO2**	Explore the technical knowledge and development of professional methodologies in developing windowing techniques
CO4	**PSO1**	To Apply the Engineering knowledge to analyse the errors in filter design
CO5	**PSO2**	Explore the technical knowledge and development of professional methodologies in the development of programming using TMS320 processor.

EE409 ELECTRICAL MACHINE DESIGN

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Electrical Machine Design**	Course code**: EE409**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Principles of electrical machine design - General design considerations - specifications of machines - types of enclosures - types of ventilation - heating - short time rating - overload capacity - temperature rise time curve - hot spot rating. Magnetic circuit calculation - calculation of field ampere turns - air gap mmf - effect of slot and ventilating duct - active iron length - mmf for teeth - real and apparent flux densities - mmf per pole Magnetic Leakage Calculation- Effects of Leakage. Armature Leakage –Components. Unbalanced Magnetic Pull-Practical aspects of unbalanced magnetic pull	7	15
II	Design of transformers - single phase and three phase transformers - distribution and power transformers - output equation - core design - window area - window space factor - overall dimensions of core. Windings – no. of turns - current density - conductor section - Cooling of transformers	7	15
III	Design of DC machines - output equation - specific loading - choice of speed and no of poles - calculation of main dimensions - choice of type of winding - number of slots - number of conductors per slot-current density - conductor section - slot insulation. length of air gap - design of field winding - conductor cross section - height of pole - design of inter pole - flux density under inter pole - calculation of turns of inter polar winding – design of compensating winding – brushes and commutators.	7	15
IV	Design of synchronous machines - specific loading - output equation - main dimensions - types of winding - number of turns - number of slots and slot design - field design for water wheel and turbo alternators - cooling of alternators.	8	15
V	Design of three phase induction motors - main dimensions - stator design - squirrel cage and slip ring types - number of stator and rotor slots - rotor bar current - design of rotor bar - end ring current - design of end	7	20

	ring - design of slip ring rotor winding.		
VI	Introduction to computer aided design. Analysis and synthesis methods -hybrid techniques. Introduction to Finite element method - historical background, applications, advantages. Study of new computer aided machine software using Finite Element Case study: Complete design of an ac machine –steps.(Assignment only)	8	20

TEXT BOOKS:

1	A K Sawhney, " A Course in Electrical Machine Design", Dhanpat rai and sons, Delhi

REFERENCES:

1	M. V. Deshpande, " Design and Testing of Electrical Machines", Wheeler Publishing
2	R. K. Agarwal, "Principles of Electrical Machine Design", Essakay Publications, Delhi.
3	Ramamoorthy M, "Computer Aided Design of Electrical Equipment", East-West Press
4	M. N. O. Sadiku, "Numerical techniques in Electromagnetics", CRC Press Edition-2001..

PREREQUISITE:

EE202,EE205

COURSE OBJECTIVES:

1	To impart knowledge on principles of design of static and rotating electrical machines.
2	To give a basic idea about computer aided design (CAD) and finite element method

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Understand** the principle of various rotating machines
2	**Analyze** the design problems of transformers by applying the standard design procedures
3	**Analyze** the design problems of dc machines by applying the standard design procedures
4	**Analyze** the design problems of synchronous machines by applying the standard design procedures
5	**Analyze** the design problems of induction motors by applying the standard

	design procedures
6	**Get** a basic idea about computer aided design (CAD) and finite element method

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Students will be apply the knowledge of mathematics and science to understand the principle of rotating machines
CO2	**PO1**	Students will be apply the knowledge of mathematics and science to solve design problems in transformers
	PO3	Students will be able to Design transformers
CO3	**PO1**	Students will be apply the knowledge of mathematics and science to solve design problems in dc machines
	PO3	Students will be able to Design dc machines
CO4	**PO1**	Students will be apply the knowledge of mathematics and science to solve design problems in alternators
	PO3	Students will be able to Design alternators
CO5	**PO1**	Students will be apply the knowledge of mathematics and science to solve design problems in induction motors
	PO3	Students will be able to Design alternators
CO6	**POI**	Students will be able to apply knowledge in modern tools in Electrical machine design
	PO5	Students will be able to Create, select, and apply appropriate techniques in machine design.

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Graduates will be able to identify, Analyze, Design and simulate the problems associated in the field of rotating machines.
CO2	**PSO1**	Graduates will be able to identify & Design the problems associated in dc machines.
CO3	**PSO1**	Graduates will be able to identify & Design the problems associated in transformers.
CO4	**PSO1**	Graduates will be able to identify identify & Design the problems associated in alternators.
CO5	**PSO1**	Graduates will be able to identify, Analyze, Design and simulate the problems associated in induction motors.
CO6	**PSO1**	Graduates will able to apply the learned Knowledge in design of machines.

EE469 ELECTRIC AND HYBRID VEHICLE

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Electric And Hybrid Vehicle**	Course code**: EE409**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance.	7	15
II	Hybrid Electric Drive-trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis. Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.	7	15
III	Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives	7	15
IV	Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Hybridization of different energy storage devices.	7	15
V	Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology	7	20
VI	Communications, supporting subsystems: In vehicle networks- CAN, Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies	7	20

TEXT BOOKS:

1	Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003

REFERENCES:

1	James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
2	Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.

PREREQUISITE:

EE202,EE205

COURSE OBJECTIVES:

1	. To present a comprehensive overview of Electric and Hybrid Electric Vehicles.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Analyze** vehicle performance
2	**Choose** a suitable drive scheme for developing an electric hybrid vehicle depending on resources
3	**Analyze** different control strategies for motors.
4	**Choose** proper energy storage systems for vehicle applications
5	**Design and develop** basic schemes of electric vehicles and hybrid electric vehicles
6	**Identify** various communication protocols and technologies used in vehicle networks

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CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Students will be able to analyze the vehicle performance
	PO4	Students will be able to make valid conclusion of vehicle performance
CO2	**PO2**	Students will be able to choose and interpret the drive system for hybrid electric vehicle
	PO5	Students will be able to select drive system according to the resource type
CO3	**PO3**	Students will be able to identify and formulate suitable control strategies
CO4	**PO3**	Students will be able to design and select components as per the energy storage characteristics
	PO5	Students will be able to select proper storage techniques
CO5	PO3	Students will be able to design and develop basic schemes of electric vehicles and hybrid electric vehicles.
CO6	**PO2**	Students will be able to identify different methodologies in vehicle communication

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Graduates will be able to analyze the vehicle dynamics
CO2	**PSO2**	Graduates will have deep Knowledge on different schemes of electric hybrid vehicle resources and its connections.
CO3	**PSO3**	Graduates will be able to find suitable control strategies for hybrid electric vehicle motors
CO4	**PSO1**	Graduate will be able to identify and analyze the energy storage for hybrid electric vehicle
CO5	**PSO1**	Graduates will be able to identify and analyze the scheme for electric hybrid vehicles
CO6	**PSO3**	Graduates will be able to form basic communication network for hybrid electric vehicle

EE431 POWER SYSTEM LAB

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Power System Lab**	Course code**: EE451**
L-T-P**:0-0-3**	Credit**:1**

Experiments:

1. Y Bus Formulation
2. Load Flow Analysis- Gauss-Seidal Method
3. Automatic Generation Control – Single Area
4. Short Circuit Analysis-Symmetrical Fault
5. Short Circuit Analysis-Unsymmetrical Fault
6. Power Factor Improvement
7. Testing of Polarity, Ratio and Magnetization characteristics of current Transformer
8. Insulation Testing – LT & HT Cable
9. Over Current Relay
10. Load Flow Analysis- Newton - Raphson Method
11. Measurement of Earth Resistance
12. Solar Power Calculations

PREREQUISITES:

EE301 Power generation, Transmission and Protection

EE306 Power System Analysis

COURSE OBJECTIVES:

1	Impart practical knowledge about various Power System components
2	Acquire knowledge about operation of Power system and the philosophy behind the relay settings, fault calculations

3	Simulate the power system operations which will be helpful in the design of power system.
4	Introduce the various testing procedures used in Power system.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Analyze** the network and find unknown voltages
2	**Identify** the fault and compute the fault current
3	**Estimate** the Power factor & Design the capacitor for Power factor improvement.
4	**Take part** in HT & LT Cable Testing.
5	**Test** Polarity, Ratio & Magnetization Characteristics of Transformer.

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	PO1	Students will be able to apply knowledge of mathematics and engineering fundamentals to Analyse Load flow solution for Networks.
	PO2	Students will be able to conduct experiments, analyze the circuit and interpret the waveforms.
	PO5	Apply the Software tools for analyzing circuits under different conditions like MATLAB for finding Unknown voltages.
CO2	PO1	Students will be able to apply fundamental knowledge of engineering to analyse fault.
	PO2	Students will be able to identify fault & Analyze Fault current.
	PO6	Students will be able to provide solution for fault and getting reliable power supply to consumers
CO3	PO1	Students will be able to apply fundamental knowledge of engineering to

		calculate power factor
	PO2	Students will be able to analyse Power factor
	PO 6	Students will be able to Improve power factor and reduce the per unit cost of Electricity
CO4	PO2	Students will be able to identify different methods of HT & LT cable testing
	PO5	Students will be able to use the modern methods for Testing HT cables
CO5	PO2	Students will be able to identify Polarity Ratio & Magnetization characteristics of Transformer
	PO3	Design Solutions for improving efficiency of transformer

CO- PSO MAPPING

CO's	PSO's	JUSTIFICATION
CO1	PSO1	Graduates will be able to identify, Analyze the network and find Solution for Load flow studies
	PSO2	Using advanced literatures develop Economical solution for load flow analysis
CO2	PSO1	Graduates will be able to identify fault and analyse fault current.
CO3	PSO1	Graduates will be able to analyse Power factor.
	PSO2	Graduates will be able identify methods for Power factor improvement.
CO4	PSO1	Graduates will be able to use different methods for LT & HT Cable testing
CO5	PSO1	Graduates will be able to identify Polarity, Ratio & magnetization characteristics of Transformer.
	PSO3	Graduates will be able to solve present problems in the Industry & Society by using advanced technologies in Power System.

EE451 SEMINAR & PROJECT PRELIMINARY

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Seminar & Project Preliminary**	Course code**: EE451**
L-T-P**:0-1-0**	Credit**:2**

PREREQUISITE: NIL

COURSE 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 project

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	Analyze a current topic of professional interest and present it before an audience
2	Identify an engineering problem, analyze it and propose a work plan to solve it.
3	Mould research capability on the selected topic

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	
CO 2			3												2
CO 3				3				2							

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	PO2	Students will be able to analyze a current topic of personal interest
	PO10	Students will be able to communicate the selected topic with engineering community and collect the response. Design documentation and effective presentation can be done
CO2	PO3	Students will be able to identify engineering problems and select a designed system for solution with the consideration of public as well as environment.

CO3	PO4	Students will be able to use research based knowledge and research methods to provide valid conclusions
	PO8	Students will be able to apply ethical principles and norms while the selection and presentation of a topic.

CO- PSO MAPPING

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Students will be able to apply engineering knowledge to identify, analyze a problem in the field of Electrical & Electronics
CO2	**PSO2**	Students will be able to identify and explore the current technical problems and find professional methodologies for the solution
CO3	**PSO3**	Students will be able to do research and gain the sufficient competence for the topic in different advanced fields of engineering.

SREEPATHY INSTITUTE OF MANAGEMENT AND TECHNOLOGY

COURSE HANDBOOK

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

SEMESTER 8

EE 402 SPECIAL ELECTRICAL MACHINES

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Synchronous& Induction Machines**	Course code**: EE 402**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	AC Servomotors- Construction-principle of operation – performance characteristics – damped AC servomotors – Drag cup servomotor – applications. DC servomotors – field and armature controlled DC servomotors – permanent magnet armature controlled – series split field DC servomotor. Hysteresis motor	8	15
II	Stepper motors – Basic principle – different types – variable reluctance- permanent magnet – hybrid type – comparison – theory of operation – monofilar and bifilar windings – modes of excitation – drive circuits – static and dynamic characteristics – applications	9	15
III	Single phase special electrical machines – AC series motor- construction – principle of working – phasor diagram – universal motor Hysteresis motor- constructional details- principle of operation – torque-slip characteristics – applications	9	15
IV	Hysteresis motor Reluctance motors – principle of operation – torque equation – torque slip characteristics-applications. Switched reluctance motors – principle of operation – power converter circuits – torque equation – different types – comparison – applications.	9	15
V	Permanent Magnet DC Motors – construction – principle of working. Brushless dc motor – construction – trapezoidal type-sinusoidal type – comparison – applications.Speed control – stator voltage control, V/f control, rotor resistance control.	10	20
VI	Linear motors – different types – linear reluctance motor – linear synchronous motors – construction – comparison. Linear induction motors – Expression for linear force – equivalent circuit –	10	20

	applications..		

TEXT BOOKS:

1	E. G. Janardhanan, '*Special Electrical Machines*' PHI Learning Private Limited.

REFERENCES:

1	Irving L. Kosow.'*ElectricalMachinery and Transformers*', Oxford Science Publications
2	T. J. E. Miller, '*Brushless PM and Reluctance Motor Drives*'.C.Larendon Press, Oxford
3	Theodore Wildi, '*Electric Machines, Drives and Power Systems*', Prentice Hall India Ltd.
4	Veinott & Martin,'*Fractional & Subfractional hp Electric Motors*'.McGraw Hill International Edn.

PREREQUISITE: NIL

COURSE OBJECTIVES:

1	To get an overview of some of the special machines for control and industrial applications.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Describe** the functions, operations and operating characteristics of AC and DC servomotors.
2	**Analyze** types, principle of operation and modes of operation of stepper motors.
3	**Explain** the working, principle of operation and construction of single phase AC series motors and hysteresis motors.
4	**Illustrate** the principle of operation, construction and working of various types of reluctance motors.
5	**Explain** the working and principle of operation of permanent magnet DC motor.
6	**Describe** the types and construction of linear motors.

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	PO1	Students will be able to use fundamentals of machienes for solutions of engineering problems.
	PO2	Students will be able to select servo motors for specified modern applications.
CO2	PO1	Students will be able to understand the fundamentals of stepper motors
	PO3	Students will be able to design efficient motors to meet the specified needs with appropriate environmental considerations.
	PO6	Students will be able to select efficient motors according to their principle of operation.
CO3	PO1	Students will be able to apply fundamentals of knowledge of special electrical machines for solutions of electrical engineering problems.
	PO2	Students will be able to select hysteresis motors according to their performance for specified modern applications.
	PO3	Students will be able to design particular motors for specified applications.
	PO6	Students will be respopnisble to apply the knowledge gained from the study of specified motor and consequently responsible in professional practice to access the energy issues in the society.
CO4	PO1	Students will be able to use fundamentals of machienes for solutions of electrical engineering problems.
	PO2	Students will be able to analyse the characteristics of the reluctance motors and can identify the efficient motors for specified applications.
	PO6	Students will be respopnisble to apply the knowledge gained from the study of specified motor and consequently responsible in professional practice to access the energy issues in the society
CO5	PO1	Students will be able to use the knowledge of electrical machienes to find solutions of electrical engineering problems.

	PO2	Students will be able to identify the problmes or faults associated with the specified machines.
	PO6	Students will be respopnisble to apply the knowledge gained from the study of motor and consequently responsible in professional practice to access the energy issues in the society
CO6	**PO1**	Students will be able to apply the fundamental knowledge of electrical engineering to understand different special electrical machines.
	PO2	Students will be able to select particular machienes for specified applications.
	PO6	Students will be respopnisble to apply the knowledge gained from the study of motor and consequently responsible in professional practice to access the energy issues in the society

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Graduates will be able to solve problems in the area of intelligent machine control.
CO2	**PSO1**	Graduates will able to apply the Mathematical model to Analyze Regulation of alternators..
CO3	**PSO1**	Graduates will able to apply the learned Knowledge to carry out parallel operation of alternators.
CO4	**PSO1**	Graduates will able to apply Knowledge for starting of Induction motors.
CO5	**PSO1**	Graduates will able to apply the learned Knowledge of induction machines for different applications.
CO6	**PSO1**	Graduates will able to apply the knowledge to understand Stability studies in real time applications.

EE404 INDUSTRIAL INSTRUMENTATION & AUTOMATION

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Industrial Instrumentation & Automation**	Course code**: EE 404**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction to Process Control - block diagram of process control loop, definition of elements. Sensor time response - first and second order responses. Review of Transducers: Characteristics and Choice of transducer- factors influencing choice of transducer.	6	15
II	Applications of Transducers Displace measurement: Resistance potentiometer, Capacitive and Inductive. Capacitive differential pressure measurement Torsional, shearing stress and rotating shaft Torque measurement using strain gauge. Flow measurement :Hotwire anemometer, constant resistance Constant current type Eddy current sensors, Variable reluctance tachometers Phase measurement :Analog and digital phase detectors Nano Instrumentation	8	15
III	Signal conditioning circuits-Instrumentation amplifiers- Unbalanced bridge. Bridge linearization using op amp Precision rectifiers, Log amplifiers, Charge amplifiers, Isolation amplifier, Switched capacitor circuits, Phase sensitive detectors, Noise problem in instrumentation and its minimisation	7	15
IV	Micro Electromechanical system (MEMS) Advantages and Applications, MEMS micro sensors and actuators, Manufacturing process: Bulk micro machining and surface micromachining, MEMS accelerometers Virtual instrumentation system: architecture of virtual instruments – Virtual instruments and traditional instruments – concepts of graphical programming	7	15
V	Overview of Automation System - Architecture of Industrial Automation Systems, Different devices used in Automation Actuators, definition, types, selection. Pneumatic, Hydraulic, Electrical, Electro-Pneumatic and valves , shape memory alloys	7	20
VI	Introduction to Sequence Control, PLCs - Working,	7	20

	Specifications of PLC Onboard/Inline/Remote IO's, Comparison of PLC & PC, Relay Ladder Logic- PLC Programming- realization of AND, OR logic, concept of latching, Introduction to Timer/Counters, Exercises based on Timers, Counters. Basic concepts of SCADA, DCS and CNC		

TEXT BOOKS:

1	Curtis D Johnson ," *Process Control Instrumentation Tec*hnology", PHI, 1986
2	Doeblin E.O, 'Measurement Systems: Application and Design, Fourth Edition, McGraw Hill, Newyork, 1992
3	. Murty, 'Transducers and Instrumentation' Second Edition, PHI Learning Pvt Ltd New Delhi ,2013
4	Madhuchhanda Mitra, Samarjit Sengupta, 'Programmable Logic Controllers and Industrial Automation An Introduction', Penram International Publishing (India) Pvt Ltd., 2009
5	Mickell. P. Groover 'Automation, Production and computer integrated manufacturing' Prentice Hall of India, 1992
6	Patranabis, D., 'Principles of Industrial Instrumentation', Second Edition Tata McGraw Hill Publishing Co. Ltd.. New Delhi
7	Robert B. Northrop, 'Introduction to instrumentation and measurements', CRC, Taylor

REFERENCES:

1	G.K.McMillan, 'Process/Industrial Instrument and control and hand book' McGraw Hill, New York,1999
2	Michael P .Lucas, 'Distributed Control system', Van Nastrant Reinhold Company, New York

PREREQUISITE: NIL

COURSE OBJECTIVES:

1	To impart knowledge about Industrial Instrumentation & Automation

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Select** Instruments and Transducers for various physical variables
2	**Get** an insight on Data acquisition, Processing & monitoring System
3	**Design** various signal conditioning systems for Transducers
4	**Analyze** dynamic response of various systems
5	**Get** the concepts of virtual instrumentation
6	**Understand** the Programming realization of PLC

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Student will be able to apply the fundamental knowledge of Science & Engineering for selection of Instruments for various physical variables
CO2	**PO1**	Apply the Knowledge & distinguish Data Acquisition, Processing & Monitoring System.
	PO2	Identify the different industrial applications.
CO3	**PO1**	Student will be able to apply the fundamental knowledge of Signals & Systems for Transducers
	PO2	Identify various signal conditioning systems for Transducers according to different applications.
	PO3	Students will be able to Analyse & design various signal conditioning Systems for Transducers
CO4	**PO1**	Student will be able to apply the fundamental knowledge of Control system to analyze different response of the system.
	PO2	Analyze various dynamic responses of Transducers.
CO5	**PO1**	Students will be able to Understand Virtual Instrumentation Systems and different measuring Instruments.
	PO2	Analyze the needs of Virtual Instrumentation Systems

CO6	**PO1**	Students will be able to Apply the knowledge of Programmable Logic Controllers for Industrial Instrumentation system.
	PO6	Interpret with real time industrial applications of Programmable Logic Controllers

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Graduates will be able to select & Identify Instruments & Transducer for measuring Physical variables.
CO2	**PSO1**	Graduates have deep Knowledge about Data Acquisition, Processing & Monitoring System.
CO2	**PSO1**	Graduates will able to Analyze various signal conditioning systems.
CO3	**PSO1**	Graduates will able to Analyze the response of different systems in industrial environment.
CO3	**PSO3**	Graduates will able to apply Control system Knowledge for getting response of industrial systems.
CO4	**PSO1**	Graduates will able to understand and apply the concepts of Virtual Instrumentation Systems.
	PSO1	Graduates will able to understand and write the program for PLC in automation.
CO5	**PSO1**	Graduates will be able to select & Identify Instruments & Transducer for measuring Physical variables.
CO6	**PSO1**	Graduates have deep Knowledge about Data Acquisition, Processing & Monitoring System.

EE 474 ENERGY MANAGEMENT & AUDITING

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Energy management & Auditing**	Course code**: EE 474**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	General principles of Energy management and Energy management planning. Peak Demand controls, Methodologies, Types of Industrial Loads, Optimal Load scheduling-Case studies.	6	15
II	Energy management opportunities in Lighting and Motors. Electrolytic Process and Electric heating, Case studies.	8	15
III	Types of boilers, Combustion in boilers, Performances evaluation, Feed water treatment, Blow down, Energy conservation opportunities in boiler.. Properties of steam, Assessment of steam distribution losses, Steam leakages, Steam trapping, Condensate and flash steam recovery system, Identifying opportunities for energy savings. Classification, General fuel economy measures in furnaces, Excess air, Heat Distribution, Temperature control, Draft control, Waste heat recovery.	8	15
IV	HVAC system: Coefficient of performance, Capacity, Factors affecting Refrigeration and Air conditioning system performance and savings opportunities. Classification and Advantages of Waste Heat Recovery system, analysis of waste heat recovery for Energy saving opportunities	7	15
V	Energy audit -Definition, Need, Types of energy audit, Energy audit Instruments. Cogeneration-Types and Schemes, Optimal operation of cogeneration plants- Case study. Computer aided energy management.	7	20
VI	Economic analysis methods-cash flow model, time value of money, evaluation of proposals, pay-back method, average rate of return method, internal rate of return method, present value method, life cycle costing approach, Case studies.	6	20

TEXT BOOKS:

1	Dekker A.J : Electrical Engineering Materials, Prentice Hall of India
2	G K Mithal : Electrical Engg Material Science. Khanna Publishers

REFERENCES:

1	Albert Thumann, William J. Younger, Handbook of Energy Audits, CRC Press, 2003.
2	Charles M. Gottschalk, Industrial energy conservation, John Wiley & Sons, 1996
3	Craig B. Smith, Energy management principles, Pergamon Press.
4	. D. Yogi Goswami, Frank Kreith, Energy Management and Conservation Handbook, CRC Press, 2007
5	G.G. Rajan, Optimizing energy efficiencies in industry -, Tata McGraw Hill, Pub. Co., 2001.
6	IEEE recommended practice for energy management in industrial and commercial facilities,
7	Seth. S.P and Gupta P. V, A Course in Electrical Engineering Materials, Dhanpathrai
8	M Jayaraju and Premlet, Introduction to Energy Conservation And Management, Phasor Books, 2008
9	Paul O'Callaghan, Energy management, McGraw Hill Book Co
10	Wayne C. Turner, Energy management Hand Book - - The Fairmount Press, Inc., 1997

PREREQUISITE: NIL

COURSE OBJECTIVES:

1	To enable the students to understand the concept of energy management and energy management opportunities
2	To understand the different methods used to control peak demand
3	To know energy auditing procedure
4	To understand the different methods used for the economic analysis of energy projects.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Create** an energy management model and form load schedule.
2	**Identify** the energy saving opportunities in different area of applications
3	**Explain** different energy saving opportunities in boilers and related systems
4	**Analyze** the performance and heat recovery for energy saving opportunities
5	**Apply** energy audit
6	**Do** economic analysis of energy projects

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO11**	Students will be able to create an energy management model
CO2	**PO5**	Apply appropriate techniques, resources, and modern engineering in energy saving applications
	PO7	Students will be able to find solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development.
CO3	**PO4**	Analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
CO4	**PO7**	Students will be able to find solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable development.
CO5	**PO4**	Analysis and interpretation of data, and synthesis of the nformation to provide valid conclusions.
	PO8	Apply ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.

CO6	**PO11**	Students will be able to demonstrate knowledge and understanding of the Engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.
	PO11	Students will be able to create an energy management model

CO-PSO MAPPING JUSTIFICATION:

CO's	PSO's	JUSTIFICATION
CO1	**PSO1**	Graduates will be able to impart technical knowledge and development of professional methodologies in the energy management field
CO2	**PSO2**	Graduates will have deep Knowledge about energy saving opportunities in different fields
CO3	**PSO3**	Graduates will able to control energy loss in power generation systems
CO4	**PSO3**	Control of energy usage in equipment for better energy management
CO5	**PSO2**	Graduates will able to do auditing
CO6	**PSO1**	Graduates will able to do economic analysis

EE472 INTERNET OF THINGS

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Internet Of Things**	Course code**: EE 472**
L-T-P**:3-0-0**	Credit**:3**

SYLLABUS:

MODULE	CONTENT	HOURS	UNIVERSITY % MARKS
I	Introduction : Definition , Internet of Things Vision, Internet of Things Today, Internet of Things Tomorrow , Potential Success Factors of Internet of Things , IoT Application Areas , IoT Functional View	6	15
II	IoT Technology Fundamentals : Internet of Things Layered Architecture , IoT Related future Internet Technologies: Cloud computing , IoT and Semantic Technologies; Networking Technology , Communication Technology : Devices and gateways , Local and wide area networking , IoT : Overview , Broadcast, Sensor Networks, Wi-Fi , Bluetooth ,Other Low Power Radios	8	15
III	Data management ,DCA, Big Data , Semantic Sensor Networks and Semantic Annotation of Data ,Virtual Sensors ; Security , Privacy and Trust for Internet of Things :Security for Internet of Things ,Privacy for Internet of Things , Trust for Internet of Things	8	15
IV	IoT related Standardisation : Role of Standardisation , Current Situation , Interoperability of IoT , Standards considerations and Protocols , IoT Protocols Convergence : MQTT ,CoAP , AMQP, DDS , API , REST , XMPP IoT Architectural Overview : Building an IoT architecture, Main design principles and needed capabilities, IoT Architecture Outline ;	8	15
V	Embedded Design for IoT : CPU, I/O devices, clock, memory, address and data buses, Tristate Logic ,Embedded System Definition & Real time applications ,CISC vs. RISC, OS vs. RTOS, Application Software vs. Embedded Software (Drivers & BSPs)	8	20
VI	Case Study & Advanced IoT Applications: Sensors and sensor Node and interfacing using any Embedded target boards (Raspberry Pi / ARM Cortex/ Arduino) Internet of Things SMART Applications :	8	20

	Energy management, Traffic management, IoT for Home ,Cities , Smart Energy and Smart Grid , Smart Logistics and Retails		

TEXT BOOKS:

1	Adrian McEwen (Author), Hakim Cassimally." Designing the Internet of Things" 1st Edition, Wiley, 2014
2	Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1stEdition, VPT, 2014

REFERENCES:

1	Ovidu Vermesan and Peter Friess (Ed) Internet of Things - From Research and Innovation to Market Deployment -RIVER PUBLISHERS
2	Ovidu Vermesan and Peter Friess (Ed), The Internet of Things : Converging Technologies for Smart Environments and Integrated Ecosystems, , River Publishers
3	Samuel Greengard, The Internet of Things (The MIT Press Essential Knowledge series)Paperback – March 20, 2015

PREREQUISITE: NIL

COURSE OBJECTIVES:

1	To understand the basic concepts of IoT
2	To understand IoT Market perspective.
3	To understand Data and Knowledge Management and use of Devices in IoT Technology
4	To understand State of the Art – IoT Architecture.

COURSE OUTCOMES:

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

CO's	DESCRIPTION
1	**Explain** in a concise manner how the general Internet as well as Internet of Things work

2	**Understand** constraints and opportunities of wireless and mobile networks for Internet of Things.
3	**Use** basic sensing and measurement and tools to determine the real-time performance of network of devices
4	**Develop** prototype models for various applications using IoT technology
5	**Implement** basic IoT applications on embedded platform
6	**Develop** smart applications

CO-PO-PSO MAPPING:

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

CO-PO MAPPING JUSTIFICATION:

CO's	PO's	JUSTIFICATION
CO1	**PO1**	Students will be able to apply the concept of IoT
	PO3	Students will be able to understand the basic IoT architecture
CO2	**PO1**	Students will be able to apply the basic IoT knowledge to different applications
CO3	**PO5**	Students will be able to use modern tools in communication engineering
CO4	**PO3**	Students will be able to design new applications using IoT
CO5	**PO3**	Students familiarize with embedded platforms and design new solutions
CO6	**PO3**	Students will be able to deploy new smart applications

EE 492 PROJECT

COURSE INFORMATION SHEET:

Program: **Electrical & Electronics Engineering**	Degree :**B-Tech**
Course**: Project**	Course code**: EE 492**
L-T-P**:0-0-6**	Credit**:6**

COURSE OBJECTIVES:

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, the students should be able to:

CO's	DESCRIPTION
1	**Think innovatively** to develop new hardware solutions
2	**Apply** the fundamental knowledge of Electrical and Electronics 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 codeing 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