I B. Tech I Semester Approved Course structure Common for ME/CE/EEE

S. No	Subject Code		Subject title	L	T	P	C
1	18CMEGT1010	HSMC	Technical English	3	1		3
2	18CMMAT1020	BSC	Engineering Mathematics-I	3	1		4
3	18CMCHT1030	BSC	Engineering Chemistry	2			4
4	18CMEET1040	ESC	Basic Electrical Engineering	3	1		4
5	18CMEGL1050	HSMC	English Communication Skills Lab			2	1
6	18CMCHL1060	BSC	Engineering Chemistry Lab			3	1.5
7	18CMEEL1070	ESC	Basic Electrical Engineering Lab			3	1.5
8	18CMMSM1080	MC	Constitution of India, Professional Ethics &Human Rights(MC)	2			
			Total	**13**	**3**	**8**	**19**

I B. Tech II Semester Approved Course structure Common for ME/CE/EEE

S. No	Subject Code		Subject title	L	T	P	C
1	18CMMAT2010	BSC	Engineering Mathematics II	3	1		4
2	18EEPHT2020	BSC	Engineering Physics	3	1		4
3	18CMCST2030	ESC	Programming for Problem solving	3			3
4	18CMMEL2040	ESC	Engineering Graphics	1		4	3
5	18EEPHL2050	BSC	Engineering Physics Lab			3	1.5
6	18CMCSL2060	ESC	Programming for Problem Solving Lab			4	2
7	18CMMEL2070	ESC	Work Shop /Manufacturing practice			3	1.5
8	18CMCHN2080	MC	Environmental Science(MC)	2			
			Total	**12**	**2**	**14**	**19**

TECHNICAL ENGLISH

Subject Code	18CMEGT1010	IA Marks	30
Number of Lecture Hours/ Week	2(T)	Exam Marks	70
Total Number of Lecture Hours	30	Exams Hours	03
Credits -02			

Unit-1 (Principles of Scientific Vocabulary)	**Hours**
Short and simple words, compact substitutes for wordy phrases, redundant words and expressions, Avoid hackneyed and stilted phrases, verbosity and incorrect use of words, role of roots in word building, prefixes and suffixes, confusing wordsand expressions. 1-4 chapters of Karmayogi non-detail text book (N1)	**10**
Unit-2 (Writing Skills)	
Distinguishing between academic and personal styles of writing, use of clauses in technical phrases and sentences, Techniques of Sentence and paragraph writing**,** Measuring the clarity of a text through Fog Index or Clarity Index 5-8 chapters of Karmayogi non-detail text book (N1)	**10**
Unit-3 (Common Errors in Writing)	
Subject-verb agreement, concord of nouns, pronouns and possessive adjectives, Common errors in the use of articles, prepositions, adjectives and adverbs, Punctuation, Technical Guidelines for Communication, Avoiding the pitfalls 9-12 chapters of Karmayogi non-detail text book (N1)	**10**
Unit-4 (Nature and Style of Sensible Technical Writing)	
Academic Writing Process, Describing, processes and products, Defining, Classifying, Effective use of charts, graphs, and tables 13-16 chapters of Karmayogi non-detail text book (N1)	**10**
Unit-5 (Report writing and Letter writing)	
Writing Technical Reports, Précis writing, Letter Writing, Essay writing 17-20 chapters of Karmayogi non-detail text book (N1)	**10**

Text(T) / Reference(R) Books:	
T1	Effective Technical Communication by Barun K Mitra, Oxford University Publication
N1	Karmayogi: A Biography of E Sreedharan, M S Ashokan
R1	Communication Skills, Sanjay Kumar &PushpaLatha, OUP
R2	Study Writing, Liz Hamp-Lyons and Ben Heasly, Cambridge University Press
R3	Remedial English Grammar, F T Wood, Macmillan 2007
R4	Practical English Usage, Michael Swan, Oxford University Press
R5	English Collocations in Use, Michael McCarthy & Felicity O'Dell
R6	Effective Technical Communication, Arsahf Rizvi
R7	Essential English Grammar, Raymond Murphy, CUP, 2017

Course Outcomes: On completion of this course, students can	
CO1	Use scientific vocabulary confidently
CO2	Apply basic principles of writing clear sentences and paragraphs
CO3	Write error free simple technical passages
CO4	Frame sentences corresponding to different writing styles
CO5	Confidently write clear and coherent letters and technical reports
CO6	Convert inspirations in the form of achievements and values upheld by renowned technocrats to write ups

ENGINEERING MATHEMATICS-I			
Subject Code	18CMMAT1020	IA Marks	30

Number of Lecture Hours/Week	3(L) + 1(T)	Exam Marks	70
Total Number of Lecture Hours	50	Exam Hours	03
Credits – 04			

Unit -1	**Hours**
First order and first degree Ordinary Differential Equations Exact, reducible to exact, linear and Bernoulli's differential equations. Orthogonal trajectories in Cartesian and polar form. Simple problems on Newton's law of cooling. Law of natural growth and decay.	**10**
Unit -2	
Linear differential equations with constant coefficients: Solutions of secondand higher order differential equations - inverse differential operator methods, Method of variation of parameters. Application: LCR Circuits	**08**
Unit – 3	
Partial derivatives – Definition and Euler's theorem (without proof), total derivatives, partial differentiation of composite functions. Jacobian - Functional dependence. Taylor's and Maclaurin's theorems for function of two variables (statement only). Maxima and minima- LaGrange's method of undetermined multipliers	**10**
Unit – 4	
First order Partial differential equations: Formation of Partial differential equations by elimination of arbitrary constants and arbitrary functions – solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations **Higher order Partial differential equations:** Solutions of Homogeneous and Non Homogeneous partial differential equations with constant coefficients –Classification of partial differential equations.	**10**
Unit – 5	
Double and triple integrals: Evaluation of double and triple integrals.Evaluation of double integrals by changing the order of integration and bychanging into polar co-ordinates. Beta and gamma functions and their properties **Vector Calculus** – Gradient – Divergence - Curl - Line integrals-definition andproblems, surface and volume integrals definition, Green's theorem in a plane, Stokes and Gauss-divergence theorems (without proof) and problems.	**12**

Text(T) / Reference(R) Books:	
T1	Higher Engineering Mathematics, B S Grewal, Khanna Publishers, 44th edition, 2016
T2	Advanced Engineering Mathematics, Erwin Kreyszig, Wiley, 9th edition, 2013
R1	Higher Engineering Mathematics, B V Ramana, Tata Mc Graw-Hill, 2006
R2	A Text Book of Engineering Mathematics, NPBali and Manish Goyal, Laxmi publications
R3	Higher Engineering Mathematics, HKDass and Er. RajnishVerma, S.Chand publishing, 1st edition, 2011.

Course Outcomes: On completion of this course, students can	
CO1	Solve first order differential equations
CO2	Solve linear differential equations with constant coefficients
CO3	Find the extrema of a function
CO4	Solve partial differential equations
CO5	Evaluate multiple integrals
CO6	Verify vector integral theorems

ENGINEERING CHEMISTRY			
Subject Code	18CMCHT1030	IA Marks	30

Number of Lecture Hours/Week	3(T) + 1(T)	Exam Marks	70
Total Number of Lecture Hours	50	Exam Hours	03

Credits – 04

Unit -1	**Hours**
Periodic Properties Effective nuclear charge of chlorine and magnesium, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table,electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electro negativity, oxidation states, coordination numbers 2 & 3and geometries, hard soft acids and bases.	**10**
Unit -2 (Use of Free Energy in Chemical Equilibria)	
Thermodynamic functions State and Path functions, First and second laws of thermodynamics, GibbsHelmholtz Equation, concept of entropy and enthalpy. **Electro chemistry** Introduction, electrode potential, standard electrodes: Hydrogen and Calomelelectrodes, Nernst equation and applications. **Water chemistry** Surface and subsurface water quality parameters: turbidity, pH, total dissolved salts, chloride content, break point chlorination. **Corrosion** Wet chemical theory, control methods: proper designing, cathodic protection,Sacrificial anodic and impressed current cathodic protection.	**10**
Unit – 3	
Stereochemistry Principles of stereochemistry, representations of 3-dimensional structures of organic compounds, geometrical and stereoisomers, configuration and symmetry, enantiomers. **Organic Reactions and Synthesis of a Drug Molecule** Introduction to reactions involving Substitution: SN^1& SN^2 with mechanism, Addition, Free radical, Elimination: E1 & E2 with examples (mechanism is not involved), Synthesis of aspirin drug molecule.	**10**
Unit – 4	
Atomic, Molecular Structure and Advanced Materials Schrodinger equation. Particle in a box solution and their applications for conjugated molecules. **Nanoparticles** Introduction, preparation methods: Sol-gel method, Chemical reduction method, properties and applications.	**10**

Surface properties Determination of surface tension and viscosity of liquids. **Ceramics** Classification, examples and applications. Crystal field theory and the energy level diagrams for transition metal ions.	
Unit – 5	
Spectroscopic Techniques Regions of electromagnetic spectrum, Principles of vibrational and rotational spectroscopy, Vibrational and rotational spectroscopy of diatomic molecules: Rigid diatomic molecules, selection rule, simple Harmonic Oscillator, diatomic vibrating rotator, Nuclear magnetic resonance, Principle and Instrumentation, Principles of chromatography, TLC & Paper.	**10**

Text(T) / Reference(R) Books:	
T1	Stereochemistry of Carbon Compounds, Ernest Eliel, McGraw Hill Education
T2	Fundamentals of Molecular Spectroscopy, C N Banwell
T3	Concise Inorganic Chemistry, J.D.Lee, 5th Edition; Wiley India
T4	Engineering Chemistry – Fundamentals and applications, Shikha Agarwal, CUP
T5	Organic Chemistry: Structure and Function, K P C Volhardt and N E Schore, 5thEdition
T6	Engineering Chemistry, Jain &Jain,Dhanpat Rai Publishing Company
R1	Engineering Chemistry (NPTEL Webbook), B L Tembe, Kamaluddin and MSKrishnan
R2	Physical Chemistry, P. W. Atkins
R3	Physical Chemistry, Glasstone S
R4	Advanced Inorganic Chemistry, Wilkinson G and Cotton FA

Course Outcomes: On completion of this course, students can	
CO1	Rationalize periodic properties like ionization potential, electro negativity and oxidation states
CO2	Describe the nature and working of various electrodes
CO3	Analyze bulk properties and processes using thermodynamic considerations
CO4	Synthesize organic molecules using different types of chemical reactions
CO5	Explain the concepts of atomic and molecular orbitals
CO6	Gain knowledge on spectroscopic techniques and the ranges of the electromagnetic spectrum used for exciting different molecular energy levels

BASIC ELECTRICAL ENGINEERING

Subject Code	18CMEET1040	IA Marks	30
Number of Lecture Hours/week	3(L) +1(T)	Exam Marks	70
Total Number of Lecture Hours	60	Exam Hours	03
Credits – 04			

Unit -1	**Hours**
DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems (Simple numerical problems). Time-domain analysis of first-order RL and RC circuits.	**12**
Unit – 2	
AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasorrepresentation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLCcombinations (series and parallel), resonance. Three- phase balanced circuits, voltage and current relations in star and delta connections.	**12**
Unit – 3	
Transformers Magnetic materials, BH characteristics, ideal and practical transformer,equivalent circuit, losses in transformers,OC and SC tests, regulation and efficiency. Auto transformer and three-phase transformer connections.	**12**
Unit – 4 **Electrical Machines: AC machines** Generation of rotating magnetic fields, construction details and working of threephase induction motor, significance of torque – slip characteristics. Loss components and efficiency, starting and speed control of induction motor. Single phase induction motor. Construction and working of synchronous generators. **DC machines** Construction, working, torque- speed characteristics and speed control of dc shunt motor.	**14**
Unit – 5	
Power Converters and Electrical Installations DC Buck and boost converters, duty ratio control, PWM techniques, single phase voltage source inverters. Classification of batteries and Low Voltageswitch gear.	**10**

Text(T) / Reference(R) Books:	
T1	Electrical and Electronics Technology, E Hughes, Pearson, 2010
T2	Basic Electrical Engineering, DC Kulshreshtha, McGraw Hill, 2009
T3	Basic Electrical Engineering, DP Kothari, IJ Nagrath
T4	Basic Electrical Engineering, J P Tewari, New Age International Publishers, 2003
R1	Power Electronics, M D Singh, 2nd Edition
R2	Battery Energy Storage for Smart Grid Applications, Eurobat, 2013
R3	Fundamentals of Electrical Engineering, L S Bobrow, OUP, 1996
R4	Electrical Engineering Fundamentals, V D Toro, PHI, 1989
R5	Understanding Batteries, RM Dell, DAJ Rand, 2001
R6	Protection and Switchgear, Bhavesh Bhalja, RP Maheshwari, Nilesh G Chothani, 5th impression, OUP, 2014

Course Outcomes: On completion of this course, students can	
CO1	Analyze DC circuits by using KCL, KVL and Network theorems
CO2	Analyze AC circuits
CO3	Explain the operation and compute performance of transformer
CO4	Explain the construction and working of rotating electrical machines
CO5	Describe DC-DC and DC-AC converters
CO6	Explain about types of LV switch gear and types of batteries

ENGLISH & COMMUNICATION SKILLS LABORATORY			
Subject Code	18CMEGL1050	IA Marks	15

Number of Practice Hours/Week	2(P)	Exam Marks	35
Total Number of Practice Hours	24	Exam Hours	03

Credits – 1

List of Experiments

Exercise 1

Listening Comprehension.

Exercise 2

Pronunciation, Stress, Intonation & Rhythm.

Exercise 3

Common Everyday Situations: Conversations & Dialogues.

Exercise 4

Communication at Workplace: Job Application letter, Email & Resume.

Exercise 5

Interpersonal Communication Skills.

Exercise 6

Formal Presentations.

Learning Resources:	
R1	Interact – English Lab Manual for Undergraduate Students by Orient BlackSwan
R2	Ted Talks, Interviews with Achievers and select movies, https://www.ted.com/talk
R3	Toastmaster's speeches and table topics
R4	Book Reviews and movie reviews
R5	Exercises in Spoken English Parts: I-III, CIEFL, Hyderabad
R6	Oxford Guide to Effective Writing and Speaking by John Seely

Course Outcomes: On completion of this course, students can	
CO1	Improve listening comprehension
CO2	Pronounce words and sentences correctly
CO3	Dialogue with others
CO4	Upgrade interpersonal communication skills
CO5	Present ideas/concepts to audience

ENGINEERING CHEMISTRY LABORATORY			
Subject Code	18CMCHL1060	IA Marks	15
Number of Practice Hours/Week	3(P)	Exam Marks	35
Total Number of Practice Hours	36	Exam Hours	03
Credits – 1.5			

List of Experiments

(Any 10 experiments must be conducted)

Exercise 1

Determination of surface tension

Exercise 2

Determination of viscosity of a liquid by Ostwald viscometer

Exercise 3

Thin layer chromatography

Exercise 4

Determination of chloride content of water

Exercise 5

Determination Hardness of water by EDTA

Exercise 6

Determination of the rate constant of first order reaction (Ester hydrolysis)

Exercise 7

Determination of strength of strong acid using conductometric titration.

Exercise 8

Determination of strength of weak acid using conductometric titration.

Exercise 9

Determination of Ferrous iron using potentiometer.

Exercise 10

Synthesis of a drug – Aspirin

Exercise 11

Determination of the partition coefficient of a substance between two immiscibleliquids

Exercise 12

Determination of strength of acetic acid using charcoal adsorption.

Exercise 13

Preparation of lattice structure and determination of atomic packing factor.

Exercise 14

Chemical oscillations- Iodine clock reaction

Exercise 15

Synthesis of Phenol formaldehyde resin.

Exercise 16

Saponification of oil

Course Outcomes: On completion of this course, students can	
CO1	Measure molecular properties like surface tension and viscosity
CO2	Determine chloride content of water of given water sample
CO3	Synthesize a drug
CO4	Determine rate constant as a function of time
CO5	Determine strength of acids using conductivity meter
CO6	Determine amount of Fe (II) using potentiometer

BASIC ELECTRICAL ENGINEERING LAB			
Subject Code	18CMEEL1070	IA Marks	15
Number of Practice Hours/Week	2(P)	Exam Marks	35

Total Number of Practice Hours	24	Exam Hours	03

Credits – 01

List of Experiments

(Any 12 experiments must be conducted)

Exercise 1

Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors andinductors.

Exercise 2

Measuring the steady-state and transient time-response of R-L, R-C, and R-L-Ccircuits to a step change in voltage (transient may be observed on a storageoscilloscope).

Exercise 3

Series and Parallel resonance of RL and RC circuits.

Exercise 4

No-load and load test on single phase Transformer (measurement of primaryand secondary voltages and currents, and power).

Exercise 5

Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phasecurrents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.

Exercise 6

Torque Speed Characteristic of dc shuntmotor.

Exercise 7

Break test on single phase induction motor.

Exercise 8

Field excitation control of Synchronous Machine.

Exercise 9

OC & SC tests on a single-phase transformer.

Exercise 10

Characteristics of PN junction diode.

Exercise 11

Half and Full wave rectifier with and without filter.

Exercise 12

Demonstration of

dc-dc converters

dc-ac converters – PWM waveform

the use of dc-ac converter for speed control of an induction motor

Components of LTswitchgear.

Course Outcomes: On completion of this course, students can	
CO1	Know the importance of measuring instruments
CO2	Determine the response and resonance of given RL, RC and RLC circuits
CO3	Determine the voltage, current and performance characteristics of a single-phase transformer
CO4	Determine the speed torque characteristics of dc shunt motor
CO5	Determine the breakdown voltage of PN junction diode
CO6	Determine the ripple factor for half wave and full wave rectifier with and without filter

CONSTITUTION OF INDIA, PROFESSIONAL ETHICS & HUMAN RIGHTS (Common to all)			
Subject Code	18CMMSN1080	IA Marks	30
Number of Lecture Hours/Week	3(L)	Exam Marks	70

Total Number of Lecture Hours	50	Exam Hours	03

Credits – 00

Unit -1	**Hours**
Lesson: Introduction to the Constitution of India, The Making of the Constitutionand Salient features of the Constitution. Preamble to the Indian Constitution Fundamental Rights & its limitations.	**10**
Unit -2	
Lesson: Directive Principles of State Policy & Relevance of Directive PrinciplesState Policy Fundamental Duties. Union Executives – President, Prime Minister Parliament Supreme Court of India.	**10**
Unit – 3	
Lesson: State Executives – Governor, Chief Minister, State Legislature HighCourt of State. Electoral Process in India, Amendment Procedures, 42nd, 44th, 74th, 76th, 86th &91st Amendments.	**10**
Unit – 4	
Lesson: Special Provision for SC & ST Special Provision for Women, Children& Backward Classes Emergency Provisions. Human Rights –Meaning and Definitions, Legislation Specific Themes inHuman Rights-Working of National Human Rights Commission in India Powers and functions of Municipalities, Panchayats and Co-Operative Societies.	**10**
Unit – 5	
Lesson: Scope & Aims of Engineering Ethics, Responsibility of EngineersImpediments to Responsibility. Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering.	**10**

Text(T) / Reference(R) Books:

T1	Introduction to the Constitution on India, Durga Das Basu, (Students Edn.) Prentice – Hall EEE, 19th / 20th Edn., 2001
T2	Engineering Ethics, Charles E. Haries, Michael S Pritchard and Michael J. Robins Thompson Asia, 2003-08-05.
R1	An Introduction to Constitution of India, M.V.Pylee, Vikas Publishing, 2002.
R2	Engineering Ethics, M.Govindarajan, S.Natarajan, V.S.Senthilkumar, Prentice –Hall of India Pvt. Ltd. New Delhi, 2004
R3	Introduction to the Constitution of India, Brij Kishore Sharma, PHI Learning Pvt. Ltd., New Delhi, 2011.
R4	Latest Publications of Indian Institute of Human Rights, New Delhi

Course Outcomes: On completion of this course, students can

CO1	Have general knowledge and legal literacy and thereby to take up competitive examinations.

CO2	Understand state and central policies, fundamental duties
CO3	Understand Electoral Process, special provisions
CO4	Understand powers and functions of Municipalities, Panchayats and Co-operative Societies
CO5	Understand Engineering ethics and responsibilities of Engineers
CO6	Understand Engineering Integrity & Reliability

ENGINEERING MATHEMATICS-II			
Subject Code	18CMMAT2010	IA Marks	30
Number of Lecture Hours/Week	3(L)+ 1(T)	Exam Marks	70
Total Number of Lecture Hours	50	Exam Hours	03
Credits – 04			
Unit -1 (Linear Algebra)			**Hours**

Rank of a matrix by elementary transformations, solution of system of linear equations: Gauss-elimination method, Gauss-Jordan method, Jacobi method and Gauss-Seidel method, Eigen values and Eigen vectors, Properties of Eigen values and Eigen vectors, Linear transformation, Diagonalization of a square matrix. Cayley-Hamilton theorem (without proof), Reduction of Quadratic form to Canonical form.	**10**
Unit -2 (Laplace Transforms)	
Laplace transforms of standard functions, shifting theorems, Transforms ofderivatives and integrals, Unit step function, Dirac's delta function Inverse Laplace transforms, Convolution theorem (without proof) Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms	**10**
Unit – 3 (Numerical Methods-I)	
Numerical solution of algebraic and transcendental equations Regula-Falsi Method and Newton-Raphson method **Finite differences** Error functions, Forward, backward and central differences, Newton's forward and backward interpolation formulae. Gauss`s forward and backward interpolation formulae, Lagrange's interpolation formula (all formulae without proof)	**10**
Unit – 4 (Numerical Methods-II)	
Numerical integration Trapezoidal rule - Simpson's $(1/3)^{rd}$ and $(3/8)^{th}$ rules. **Numerical solutions of ordinary differential equations** Taylors series method, Picard's method, Euler's method, Modified Euler's method, Runge-Kutta method	**10**
Unit – 5 (Fourier Series and Transforms)	
Fourier Series Periodic functions, Dirichlet's condition, Fourier Series of periodic functions with period 2π and with arbitrary period. Fourier series of even and odd functions, Half range Fourier Series. **Fourier Transforms** Infinite Fourier transforms, Fourier sine and cosine transforms, Inverse Fourier transforms.	**10**

Text(T) / Reference(R) Books:	
T1	Higher Engineering Mathematics, B S Grewal, 44th Edition, Khanna publishers, 2016
T2	Advanced Engineering Mathematics, Kreyszig, 9th Edition, Wiley, 2013
R1	Higher Engineering Mathematics, B V Ramana, Tata McGrawHill, 2006
R2	A text book of Engineering Mathematics, N P Bali and Manish Goyal, 7th edition, Laxmi publications
R3	Higher Engineering Mathematics, H. K Dass and Er. Rajnish Verma, 1st edition, S. Chand publishing, 2011
R4	Engineering Mathematics, Volume II, Dr.KVNageswara Reddy and Dr.BRamaBhupal Reddy, Scitech Publications, 2017

Course Outcomes: On completion of this course, students can	
CO1	Solve system of linear equations and find eigen values and eigen vectors of a matrix
CO2	Solve initial value problems by using Laplace transforms
CO3	Find the solution of algebraic/transcendental equations and also interpolate the functions
CO4	Evaluate numerical integration and to solve ordinary differential equations by using numerical methods
CO5	Find Fourier series of a periodic function and to determine the Fourier transform of a function

ENGINEERING PHYSICS **Semiconductor Physics & Semiconductor Optoelectronics**			
Subject Code	18ITPH2020	IA Marks	30

Number of Lecture Hours/Week	3(L) + 1(T)	Exam Marks	70
Total Number of Lecture Hours	50	Exam Hours	03
Credits – 04			

Unit -1	**Hours**
Electronic materials Free electron theory-Classical &Quantum theory, Density of states, Fermi level, Occupation probability, Bloch theorem, Kronig-Penny model (to introduce origin of band gap), E-k diagram and Effective mass. Types of electronic materials: metals, semiconductors, and insulators.	**10**
Unit -2	
Semiconductors Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier- concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Hall effect and its applications.	**10**
Unit – 3	
Light-semiconductor interaction Types of Semiconductor materials of interest for optoelectronic devices, band gap modification, Hetero structures, Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission, Joint density of states, Density of statesfor photons, Transition rates (Fermi's golden rule), Optical loss and gain, Photovoltaic effect.	**10**
Unit – 4	
Semiconductor light emitting diodes (LEDs) Direct and indirect band gap semiconductors, Injection Electro luminescence, LED: Device structure, materials, characteristics, Laser diode, Quantum-well, -wire, and -dot based lasers.	**10**
Unit – 5	
Photodetectors & Low-dimensional optoelectronic devices General properties of Photo detectors, Photo conductors, Types of semiconductor photo detectors -p-n junction, PIN, and Avalanche --- and their structure, materials, working principle, and characteristics, Noise limits on performance, Solar cells.	**10**

Text(T) / Reference(R) Books:	
T1	Solid State Physics, S O Pillai, New Age Publications
T2	Fundamentals of Photonics, B E A Saleh and M C Teich, John Wiley & Sons
R1	Engineering Physics, Ch Srinivas, Ch Seshubabu, Cengage learning publications
R2	Semiconductor Optoelectronic Devices, P Bhattacharya, Prentice Hall of India, 1997
R3	Semiconductor Optoelectronics, M R Shenoy, NPTEL Course
R4	Optoelectronic Materials and Devices, Monica Katiyar and Deepak Gupta, NPTEL Course

Course Outcomes: On completion of this course, students can	
CO1	Explain the conducting mechanism in metals
CO2	Estimate the concentration of charge carriers
CO3	Describe light-semiconductor interaction
CO4	Illustrate the working function of LEDs and diode lasers
CO5	Illustrate the working function ofphoto detectors
CO6	Illustrate the working function ofsolar cells

PROGRAMMING FOR PROBLEM SOLVING (Common for all programs)			
Subject Code	18CMCST2030	IA Marks	30

Number of Lecture Hours/Week	03	EA Marks	70
Total Number of Lecture Hours	50	Exam Hours	03
Credits - 03			

Unit-I: Introduction to computer systems and programming	**Hours**
History & Hardware Computer Hardware, Components, Types of Software, Memory Units. **Introduction to Problem solving** Algorithm, Characteristics of Algorithms, Basic operations of algorithms, Pseudocode, Flowchart, Types of languages, Relation between Data, Information,Input and Output. **Basics of C** History and Features of C, Importance of C, Procedural Language, Compiler versus Interpreter, Structure of C Program, Program development steps,programming errors.	**08**
Unit-II: C Expressions, evaluation and control statements	
Overview of C Character Set, C-Tokens, Data Types, Variables, Constants, Operators, Operator precedence and Associativity, converting mathematical expressions to C- expressions, evaluation of C-expressions, Input/output functions. **Conditional Branching** if statement, if...else statement, Nested if...else statement, if…else…if ladder, switch statement. **Unconditional Branching** goto **Control flow statements:** break, continue. **Looping Constructs:** do-while statement, while statement, for statement.	**12**
Unit-III: Arrays and Functions	
Arrays Introduction, 1-D Arrays, Character arrays and string representation, 2-D Arrays(Matrix), Multi-Dimensional Arrays. **Functions** Basics, necessity and advantages, Types of functions, Parameter passingmechanisms, Recursion, Storage Classes,Command Line Arguments, Conversion from Recursion to Iteration and vice-versa. **Strings** Working with strings, String Handling Functions (both library and user defined)	**10**

Unit-IV: Derived and User Defined Data types	
Pointers Understanding Pointers, Pointer expressions, Pointer and Arrays, Pointers andStrings, Pointers to Functions. **Dynamic Memory Allocation** Introduction to Dynamic Memory Allocation malloc, calloc, realloc, free. **Structures and Unions** Defining a Structure, typedef, Advantage of Structure, Nested structures, Arrays of Structures, Structures and Arrays, Structures and Functions, Structures and Pointers, Defining Unions, Union within union, Structure within union, Union within structure, self-referential structures, bitfields, enumerations.	**12**
Unit-V: Preprocessing and File Handling	
Preprocessing Directives Macro Substitution, File Inclusion, conditional compilation and other directives **File Management in C** Introduction to File Management, Modes and Operations on Files, Types of files,Error Handling During I/O Operations.	**08**

Text(T) / Reference(R) Books:	
T1	Computer Programing ANSI C, E Balagurusamy, McGraw Hill Education
T2	Programming in C, Reema Thareja, Second Edition, Oxford Higher Education
R1	Computer Basics and C Programming, V Raja Raman, Second Edition

Course Outcomes: On completion of this course, students can	
CO1	Formulate algorithms, translate them into programs and correct program errors
CO2	Choose right control structures suitable for the problem to be solved
CO3	Decompose reusable code in a program into functions (Iterative and recursive)
CO4	Use arrays, pointers, structures and unions appropriately
CO5	Explain Memory allocation strategies
CO6	Store and Retrieve data from permanent storage

ENGINEERING GRAPHICS

Subject Code	18CMMEL2040	IA Marks	30
Number of Lecture Hours/Week	1(L)+4(P)	Exam Marks	70
Total Number of Lecture Hours	50	Exam Hours	03

Credits – 03

Unit -1	**Hours**
Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections – Ellipse, Parabola, Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;	**10**
Unit -2	
Projections of Points and lines inclined to both planes; Projections of planes inclined to one plane	**08**
Unit – 3	
Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes	**10**
Unit – 4	
Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone	**10**
Unit – 5	
Isometric Projections Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions **Introduction to AUTOCAD** The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows	**12**

Text(T) / Reference(R) Books:	
T1	Engineering Drawing, NDBhatt, Chariot Publications
T2	Engineering Drawing + AutoCAD, K Venugopal, V. Prabhu Raja, New Age Publishers
R1	Engineering Drawing, Agarwal & Agarwal, Tata McGraw Hill Publishers
R2	Engineering Drawing, KLNarayana& P Kannaiah, SciTech Publishers
R3	Engineering Graphics for Degree, KC John, PHI Publishers
R4	Engineering Graphics, PI Varghese, McGrawHill Publishers

Course Outcomes: On completion of this course, students can

CO1	Construct Polygons using general methods, inscribe and describe polygons oncircles,draw curves (parabola, ellipse and hyperbola, cycloids, involutes) by general methods
CO2	Read, Interpret and Construct plain scales, diagonal scales and Vernier scales
CO3	Draw orthographic projections of points, lines, Planes & Solids inclined to onereference plane and apply these concepts to solve practical problems related to engineering
CO4	Draw sections and sectional views of Solids
CO5	Draw isometric view of lines, plane figures and simple solids, Convert given isometricviews into orthographic views, and apply these concepts to solve practical problems related to engineering
CO6	Draw objects using draw and modify toolbars of AutoCAD

ENGINEERING PHYSICS LABORATORY			
Subject Code	18ITPHL2050	IA Marks	15
Number of Practice Hours/Week	3(P)	Exam Marks	35

Total Number of Practice Hours	36	Exam Hours	03

Credits – 1.5

List of Experiments

Exercise 1 Study the atomic levels in Neon- Argon gases-Franck- Hertz experiment.

Exercise 2 Determine the resistivity of wire using four probe methods.

Exercise 3 Determine the Boltzmann constant using PN junction diode.

Exercise 4 Determine the Energy band gap of P-N junction diode.

Exercise 5 Determine the Hall coefficient-Hall effect.

Exercise 6 Study the spectral response of photo diode-Planck's constant.

Exercise 7 Draw the LED current-voltage characteristics.

Exercise 8 Draw the diode laser (LD) current-voltage characteristics.

Exercise 9 Draw the Photo diode current-voltage characteristics.

Exercise 10 Measure the current-voltage characteristics of a solar cell (Photovoltaic cell) at differentlight intensities.

Course Outcomes: On completion of this course, students can	
CO1	Understand the existence of the energy levels in gases
CO2	Study the resistivity variation with temperature in conductor
CO3	Determine the energy band gap of semiconductor diode
CO4	Understand the phenomenon of Hall Effect
CO5	Understand the interaction of the light with semiconductor
CO6	Study the characteristic curves of the LEDs, Laser diode & Solar cells

PROGRAMMING FOR PROBLEM SOLVING LAB

(Common for all branches)

Subject Code	18CMCSL2060	IA Marks	15
Number of Practice Hours/Week	4(P)	Exam Marks	35
Total Number of Practice Hours	48	Exam Hours	03

Credits - 02

List of Experiments Exercise 1 (Familiarization with programming environment)

Familiarization of CODE BLOCKS C++ Editor to edit, compile, execute, test anddebugging C programs.

Familiarization of RAPTOR Tool to draw flow charts and understand flow of control.

Acquittance with basic LINUX commands.

Exercise 2 (Simple computational problems using arithmetic expressions)

Write a C Program to display real number with 2 decimal places.

Write a C Program to convert Celsius to Fahrenheit and vice versa.

Write a C Program to calculate the area of triangle using the formulaarea = where $s = \frac{a+b+c}{2}$

Write a C program to find the largest of three numbers using ternary operator.

Write a C Program to swap two numbers without using a temporary variable.

Exercise 3 (Problems involving if-then-else structures)

Write a C Program to check whether a given number is even or odd using bitwiseoperator, shift operator and arithmetic operator.

Write a C program to find the roots of a quadratic equation.

Write a C Program to display grade based on 6 subject marks using if…else…if ladder.

Write a C program, which takes two integer operands and one operator form the user,performs the operation and then

prints the result using switch control statement. (Consider the operators +, -, *, /, %)

Exercise 4 (Iterative problems)

Write a C Program to count number of 0's and 1's in a binary representation of a givennumber.

Write a C program to generate all the prime numbers between two numbers suppliedby the user.

Write a C Program to print the multiplication table corresponding to number suppliedas input.

Exercise 5 (Iterative problems)

Write a C Program to Find Whether the Given Number is

) Armstrong Number ii) Palindrome Number

Write a C Program to print sum of digits of a given number

Exercise 6 (Series examples)

a) Write a C Program to calculate sum of following series

b) 1+2+3+…. n

b)1+1/2+1/3+……+1/n

c)$1+x+x^2+x^3……+x^n$

Exercise 7 (1D Array manipulation)

a) Write a C program to interchange the largest and smallest numbers in the array.

b) Write a C program to search an element in an array (linear search).

c) Write a C Program to print the following pattern using a character array

S

SA

SAS

SASI

Exercise 8 (Matrix problems, String operations)

a) Write a C program to add two matrices.

b) Write a C program to multiply two matrices if they are compatible or print an errormessage "incompatible matrix sizes" otherwise.

c) Write a C program to check given matrix is symmetric or not.

d) Implement the following string operations with and without library functions.

i) Copy ii) concatenate iii) length iv) compare

Exercise 9 (Simple functions)

a) Write a C Program demonstrating the following function types

i. With arguments and with return value.

ii. With arguments and without return value

iii. Without arguments and without return value.

iv. Without arguments and with return value.

b) Write a C Program illustrating call by reference

Exercise 10 (Recursive functions)

Write a C Program illustrating the following with Recursion without Recursion

a) Factorial b) GCD c) Power d) Fibonacci

Exercise 11(Pointers and structures)

a) Write a C program to find sum of n elements entered by user. To perform this program,allocate memory dynamically using malloc () function.

b) Write a C program to find sum of n elements entered by user. To perform this program,allocate memory dynamically using calloc () function.

Note: Understand the difference between the above two programs.

c) Write a C Program to read and print student details using structures.

Exercise 12 (File operations)

a) Write a C program to open a file and to print its contents on screen.

b) Write a C program to copy files

c) Write a C program merges two files onto a new file.

d) Write a C program to delete a file.

Course Outcomes: On completion of this course, students can	
CO1	Attain knowledge on using CODE BLOCKS and RAPTOR tools in solving problems
CO2	Examine and analyze alternative solutions to a problem
CO3	Design a solution to a problem using problem decomposition and step-wise refinement
CO4	Demonstrate conversion of iterative functions to recursive and vice-versa
CO5	Demonstrate usage of arrays, structures and unions
CO6	Demonstrate reading from and writing to files along with simple file operations

WORKSHOP/MANUFACTURING PRACTICE			
Subject Code	18CMMEL2070	IA Marks	15
Number of Practice Hours/Week	3(P)	Exam Marks	35

Total Number of Practice Hours	36	Exam Hours	03

Credits – 1.5

List of Experiments

Exercise 1 (lectures & Videos)

Manufacturing Methods: casting, forming, machining, Joining, Advanced methods

CNC machining, Additive manufacturing

Exercise 2 (lectures & Videos)

Fitting operations & power tools

Electrical & Electronics

Carpentry

Exercise 3(lectures & Videos)

Plastic molding, glass cutting

Metal casting

Welding (arc welding & gas welding), brazing

Exercise 4(Black smithy)

S-Hook

Square Rod to Round Rod

Exercise 4(Carpentry)

T-Lap Joint

Cross Lap Joint

Exercise 6(Foundry)

Mold for solid

Mold for split pattern

Exercise 7(Fitting)

Square fitting

V-fitting

Exercise 8(Welding)

Butt Joint

Lap Joint

Exercise 9(Machine Tools)

Turning

Knurling

Exercise 10(Plastic Molding)

Key Chain Molding

Course Outcomes: On completion of this course, students can	
CO1	Make use of basic carpentry joints to make furniture
CO2	Fabricate mechanical engineering assemblies using fitting joints
CO3	Produce various machine components by using foundry, black smithy, machining and plastic molding techniques

ENVIRONMENTAL SCIENCE			
Subject Code	18CMCHN2080	IA Marks	30
Number of Lecture Hours/Week	04	Exam Marks	70
Total Number of Lecture Hours	50	Exam Hours	03
Credits – 00			

Unit -1 (MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES)	**Hours**
Environment Definition, Introduction, Scope and Importance, Global environmentalchallenges, global warming & climate change, Acid rains, ozone layer depletion, Carbon credits, Sustainability, Stockholm & Rio Summit, Population growth & explosion, Role of Information Technology in Environment and human health. **Ecosystem** Concept, Structure and function, Producers, consumers and decomposers, Energyflow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure andfunction of the different ecosystems	**10**
Unit -2 (RESOURCES)	
Natural Resources Renewable and non-renewable resources, Natural resources and associatedproblems **Forest resources** Use and over exploitation, deforestation, Timber extraction, Mining, dams andother effects on forest and tribal people **Water resources** Use and over utilization of surface and ground water, Floods, drought, conflictsover water, dams – benefits and problems **Mineral resources** Use and exploitation, environmental effects of extracting and using mineralresources. **Food resources** World food problems, changes caused by agriculture and overgrazing, effects ofmodern agriculture, fertilizer-pesticide problems, water logging, salinity. **Energy resources** Growing energy needs, renewable and non-renewable energy sources use ofalternate energy sources. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.	**12**
Unit – 3 (BIODIVERSITY AND ITS CONSERVATION)	
Introduction, Definition, genetic, species and ecosystem diversity,	**06**

Biogeographicalclassification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aestheticand option values, Biodiversity at global, National and local levels. India as a mega-diversity nation, Hot-spots ofbiodiversity, Threats to biodiversity: habitat loss, Endangered andendemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.	
Unit – 4	
Environmental Pollution Definition, Cause, effects and control measures of :Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards **Solid waste Management** Causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Pollution case studies.	**12**
Unit – 5	
Social Issuesand the Environment Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people its problems and concerns. **Environment Protection Acts** Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involvedin enforcement of environmental legislation, Public awareness. **Field work** Visit to a local area to document environmental assets:River/forest/grassland/hill/mountain Visit to a local polluted site: Urban/Rural/industrial/AgriculturalStudy of common plants, insects, birds Study of simple ecosystems: pond, river, hill slopes, etc.	**10**

Text(T) / Reference(R) Books:	
T1	Environmental Studies, E Bharucha, University Publishing Company, New Delhi, 2003
T2	Environmental Science and Engineering, JG Henry and GW Heinke, 2nd edition, Prentice Hall of India, New Delhi, 2004
T3	Introduction to Environmental Engineering and Science, G M Masters, 2nd edition, Prentice Hall of India, New Delhi, 2004
R1	Environmental Studies, Deeshita Dave & P Udaya Bhaskar, Cengage Learning
R2	Environmental Studies, KVSGMurali Krishna, VGS Publishers, Vijayawada
R3	Environmental Studies, PNPaliniswamy, P Manikandan, A Geeta and K Manjula Rani, Pearson Education

Course Outcomes: On completion of this course, students can	
CO1	Explain importance of Environmental studies and the measures to be taken to overcome global environmental challenges
CO2	Describe the concept of ecosystem and its diversity
CO3	Describe knowledge on natural resources
CO4	Explain concept of biodiversity
CO5	Explain knowledge on environmental pollution
CO6	Debate knowledge on environmental legislation and global treaties

II -B.Tech EEE I- Semester Approved Course structure for the Academic Year 2018-2019

SN	Subject Code	Subject title	L	T	P	C	I	E	T
1	18CMMAT3010	Engineering Mathematics III	3	1		4			
2	18EEEET3020	Analog Electronics	3			3			
3	18EEEET3030	Electromagnetic fields	3	1		4			
4	18EEEET3040	Electrical Circuit Analysis	3	1		4			
5	18EEEET3050	Electrical Machines I	3			3			
6	18EEEEL3060	Analog Electronics Lab			3	1.5			
7	18EEEEL3070	Electrical Circuit Analysis Lab			3	1.5			
8	18EEEEL3080	Electrical Machines I Lab			3	1.5			
		Total	**15**	**3**	**9**	**22.5**			

II B.Tech EEE II Semester Approved Course structure for the Academic Year 2018-2019

SN	Subject Code	Subject title	L	T	P	C	I	E	T
1	18EEEET4010	Signals & Systems	3			3			
2	18CMMET4020	Engineering Mechanics	3	1		4			
3	18EEEET4030	Digital Electronics	3			3			
4	18EEEET4040	Control Systems	3			3			
5	18EEEET4050	Electrical Machines II	3			3			
6	18EEEEL4060	Digital Electronics Lab			3	1.5			
7	18EEEEL4070	Control Systems Lab			3	1.5			
8	18EEEEL4080	Electrical Machines II Lab			3	1.5			
		Total	**14**	**1**	**9**	**20.5**			

ENGINEERING MATHEMATICS III
(Proposed syllabus for the academic year 2019 -2020)
SEMESTER III
Common to all the branches

Subject Code	**18CMMAT3010**	**IA Marks**	**30**
Number of Lecture Hours/Week	**3L + 1T**	**Exam Marks**	**70**
Total Number of Lecture Hours	**60**	**Exam Hours**	**03**

Credits-04

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

1. To find the function of a complex variable
2. To evaluate complex integration and expand functions using Taylor &Maclaurin's series
3. To evaluate integrals using Residues
4. To find the statistical parameters for distributions
5. To test the hypothesis

Unit -1	
Function of a complex variable Introduction –continuity –differentiability, analyticity – properties – Cauchy – riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions – Milne – Thompson method.	**Hours – 10**
Unit ,2	
Integration and series expansions Complex integration: Line integral – Cauchy's integral theorem, Cauchy's in integral formula, generalized integral formula (all without proofs) Radius of convergence – expansion in Taylor's series, Maclaurin's series and Laurent series	**Hours – 12**
Unit – 3	
Singularities and Residue Theorem Zeros of an analytic function, Singularity, Isolated singularity, Removable singularity, Essential singularity, pole of order m, simple pole, Residues, Residue theorem, Calculation of residues, Residue at a pole of order m**,** Evaluation of real definite integrals: Integration around the unit circle**,** Integration around semi circle, Indenting the contours having poles on the real axis.	**Hours – 12**
Unit – 4	
Discrete Random variables and Distributions: Introduction,Random variables, Discrete Random variable,Distribution function, Expectation. Discrete distributions: Binomial, Poisson and Geometric distributions and their fitting to data. **Continuous Random variable and distributions:** Introduction,Continuous Random variable,Distribution function,Expectation,Continuous distribution: Uniform, Exponential and Normal distributions, Normal approximation to Binomial distribution	**Hours – 12**
Unit – 5	
Test of Significance: Introduction - Population and samples- Sampling distribution of means (σ-known) t-distribution- Sampling distribution of means(σ-unknown), chi-square	**Hours – 14**

and F- testHypothesis-Null and Alternative Hypothesis- Type I and Type II errors –Level of significance - One tail and two-tail tests- Tests concerning one mean and proportion, two means- Proportions and their differences - ANOVA for one – way and two – way classified data	

Course outcomes:

On completion of this course, students are able to

1. Find the function of a complex variable
2. Evaluate complex integration and expand functions using Taylor &Maclaurin's series
3. Evaluate integrals using Residues
4. Find the statistical parameters for Discrete Random variables and Distributions
5. Find the statistical parameters for Continuous Random variables and Distributions
6. Test the hypothesis

Question paper pattern:

Section A:

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This Section will have 10 questions.
2. Each full question carry 12 marks.
3. Each full question will have sub question covering all topics under a unit. The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. B.S. Grewal, **"Higher Engineering Mathematics"**, Khanna publishers, 44th edition, 2016.
2. Erwin Kreyszig, **"Advanced Engineering Mathematics**I, Wiley, 9th Edition, 2013.

Reference Books:

1. B.V. Ramana, **"Higher Engineering Mathematics"**, Tata McGraw-Hill, 2006
2. N.P.Bali and Manish Goyal, **"A text book of Engineering mathematics"**, Laxmi publications, 7th Edition.
3. H.K. Dass and Er. RajnishVerma, **"Higher Engineerig Mathematics"**, S.Chand publishing, 1st edition, 2011.
4. Dr. B.Rama Bhupal Reddy**, "Probability and Statistics for Engineers",** Research India Publications (DELHI), 2015.

COURSE OUTCOMES TO PROGRAM OUTCOMES MAPPING:

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

ANALOG ELECTRONICS
(Proposed syllabus for the academic year 2019 -2020)
SEMESTER III

Subject Code	**18EEEET3020**	**IA Marks**	**30**
Number of Lecture Hours/Week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits-03

COURSE OBJECTIVES:

This course will enable students:

1. To Understand the characteristics of Diode &Transistors
2. To Understand the working of various amplifier circuits
3. To Understand the characteristics of Practical Operational Amplifier
4. To Understand the Linear Applications of Operational Amplifier
5. To Understand the Non-Linear Applications of Operational Amplifier
6. To Understand the design nonlinear applications of op-amp.

Unit -1	
Diode & BJT circuits P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, Zener diodes, clamping and clipping circuits, Structure and I-V characteristics of a BJT; BJT as a switch. BJT as an amplifier: small-signal model, biasing circuits; common-emitter, common-base and common- collector amplifiers; Small signal equivalent circuits, high-frequency equivalent circuits.	**Hours – 10**
Unit -2	
MOSFET circuits MOSFET structure and I-V characteristics. MOSFET as a switch. MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; small signal equivalent circuits - gain, input and output impedances, trans- conductance, high frequency equivalent circuit.	**Hours –10**
Unit – 3	
Differential, multi-stage and operational amplifiers Differential amplifier; power amplifier; direct coupled multi-stage amplifier; internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain band width product)	**Hours –08**
Unit – 4	
Linear applications of op-amp Idealized analysis of op-amp circuits. Inverting and non-inverting amplifier, differential amplifier, current mirror circuit, instrumentation amplifier, integrator, active filter, P, PI and PID controllers and lead/lag compensator using an op-amp, voltage regulator, oscillators (Wein bridge and phase shift).Analog to Digital Conversion.	**Hours – 10**
Unit – 5	
Nonlinear applications of op-amp	**Hours – 07**

Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier, peak detector. Monoshot.	

COURSE OUTCOMES:

On completion of the course student will be:

1. Ability to Understand the characteristics of Diode &Transistors.
2. Ability to analyze amplifier circuits.
3. Ability to design and analyze amplifiercircuits MOSFET's.
4. Ability to Understand the functioning of OP-AMP.
5. Ability to design P, PI and PID controllers and lead/lag compensator using an op-amp.
6. Ability to design nonlinear applications of op-amp.

QUESTION PAPER PATTERN:

SECTION A:

1. This section contains ten one answer question carrying 1 mark each.
2. Two questions from each unit should present.

SECTION B:

1. This section will have 5 questions with internal choice.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under a unit.

TEXT BOOKS:

T1. Electronic Devices and Circuits – J. Millman, C.C. Halkias, Tata Mc-Graw Hill

T2. S. Sedra and K. C. Smith, "Microelectronic Circuits", New York, Oxford University Press,1998.

T3.J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 1992.

T4.J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education,1988.

T5. P.HorowitzandW.Hill,"TheArtofElectronics",Cambridge UniversityPress,1989.

T6. P. R. Gray, R. G. Meyer and S. Lewis, "Analysisand Design of Analog Integrated Circuits", John Wiley & Sons, 2001.

REFERENCE BOOKS:

R1.A Hand Book of Analog Electronics Circuit Design by Dennis L Feucht

R2.OP-AMPS & Linear integrated circuits by Ramakanth A Gayakwad (PHI)

R3.Linear integrated circuits by D Roy Chowdary,New age International

R4.OP-Amp's & Linear Integrated Circuit Concepts and Applications by Janet M.Fiore,Cenage learning

R5.Operational Amplifiers & Linear Integrated circuits by Robert F. Coughlin, Frederick F. Driscoll, Prentice-Hall

COURSE OUTCOMES TO PROGRAM OUTCOMES MAPPING:

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

ELECTRO MAGNETIC FIELDS (Proposedsyllabusfortheacademicyear2019-2020) SEMESTER III			
SubjectCode	**18EEEET3030**	**IAMarks**	**30**
NumberofLectureHours/Week	**3L+1T**	**ExamMarks**	**70**
TotalNumberofLectureHours	**40**	**ExamHours**	**03**
Credits-04			

COURSEOBJECTIVES:

This course will enable students to:

1. able tounderstandthebasiclawsofelectromagnetism
2. able to obtain the electric and magneticfieldsforsimpleconfigurationsunderstaticconditions
3. abletoanalyzeboundaryconditions
4. abletounderstandMaxwell'sequationindifferentformsanddifferentmedia
5. abletoanalyzetimevaryingelectricandmagneticfields

Unit1	
Review of Vector Calculus Vector algebra addition,subtraction,componentsofvectors,scalarandvectormultiplicati ons, triple products, three orthogonal coordinate systems(rectangular, cylindrical and spherical).Vectoroperatordel,gradient,divergenceandcurl;integraltheoremsofvectors. Conversionofavector from one coordinate system to another.	**Hours-10**
Unit—2	
StaticElectricField Coulomb'slaw,Electricfieldintensity,Electricalfieldduetopointcharges.Line,Surfacea ndVolumechargedistributions.Gausslawanditsapplications.AbsoluteElectricpotential ,Potentialdifference,Calculationofpotentialdifferencesfordifferentconfigurations.Ele ctricdipole,ElectrostaticEnergyandEnergydensity.	**Hours-06**
Unit–3	
Conductors,DielectricsandCapacitance Currentandcurrentdensity,OhmsLawinPointform,Continuityofcurrent,Boundarycond itionsofperfectdielectricmaterials.Permittivityofdielectricmaterials,Capacitance,Cap acitanceofatwowireline,Poisson'sequation,Laplace'sequation,SolutionofLaplaceand Poisson'sequation,ApplicationofLaplace'sandPoisson'sequations	**Hours-06**
Unit–4	
StaticMagneticFields BiotSavartLaw,AmpereLaw,Magneticfluxandmagneticfluxdensity,ScalarandVector Magneticpotentials.Steadymagneticfieldsproducedbycurrentcarryingconductors. Forceonamovingcharge,Forceonadifferentialcurrentelement,Forcebetweendifferenti alcurrentelements	**Hours-08**
Unit–5	
MagneticForces,MaterialsandInductance Natureofmagneticmaterials,Magnetizationandpermeability,Magneticboundarycondit ions,Magneticcircuits,inductancesandmutualinductances. **TimeVaryingFieldsandMaxwell'sEquations,ElectromagneticWaves** Faraday'slawforElectromagneticinduction,Displacementcurrent,PointformofMaxwe	**Hours-10**

ll'sequation,IntegralformofMaxwell'sequations,MotionalElectromotiveforces.Boun daryConditions..Poynting theorem,	

COURSEOUTCOMES:

Attheendofthecourse,studentswilldemonstratetheability

1. Tounderstandthebasiclawsofelectromagnetism.
2. Toobtaintheelectricandmagneticfieldsforsimpleconfigurationsunderstaticconditions.
3. Toanalyzeboundaryconditions
4. TounderstandMaxwell'sequationindifferentformsanddifferentmedia.
5. Toanalyzetimevaryingelectric fields
6. Toanalyzetime varying magnetic fields.

QUESTIONPAPERPATTERN:

SECTIONA:

1. Thissectioncontainstenoneanswerquestioncarrying1markeach.
2. Twoquestionsfromeachunitshouldpresent.

SECTIONB:

1. Thissectionwillhave5questionswithinternalchoice.
2. Eachfullquestioncarries12marks.
3. Eachfullquestionwillhavesubquestioncoveringalltopicsunderaunit.

TEXTBOOKS:

1. M.N.O.Sadiku,"ElementsofElectromagnetics",OxfordUniversityPublication,2014.

REFERENCEBOOKS:

1. A.Pramanik,"ElectromagnetismTheoryandapplications",PHILearningPvt.L td,NewDelhi,2009.
2. A.Pramanik,"ElectromagnetismProblemswithsolution",PrenticeHallIndia,2012.
3. G.W.Carter,"Theelectromagneticfieldinitsengineeringaspects",Longmans,1954.
4. W.J.Duffin,"ElectricityandMagnetism",McGrawHillPublication,1980.
5. W.J.Duffin,"AdvancedElectricityandMagnetism",McGrawHill,1968.
6. E.G.Cullwick,"TheFundamentalsofElectromagnetism",CambridgeUniversi tyPress,1966.
7. B. D. Popovic, "Introductory Engineering Electromagnetics", AddisonWesley EducationalPublishers,InternationalEdition,1971.
8. W.Hayt,"EngineeringElectromagnetics",McGrawHillEducation,2012.

COURSE-OUTCOMES-TO-PROGRAM-OUTCOMES-MAPPING:

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

ELECTRICAL CIRCUIT ANALYSIS
(Proposed syllabus for the academic year 2019-2020)
SEMESTER III

Subject Code	**18EEEET3040**	**IA Marks**	**30**
Number of Lecture Hours/Week	**3L+1T**	**Exam Marks**	**70**
Total Number of Lecture Hours	**60**	**Exam Hours**	**03**

Credits-04

COURSE OBJECTIVES:

This course will enable students :

1. To understand the applications of network theorems for analysis of electrical networks.
2. To study the transient& steady state behavior of electrical networks
3. To understand the behavior of RLC networks for sinusoidal excitations.
4. To understand the application of Laplace transforms for analysis of electrical circuits.
5. To understand the realization of electrical network function into electrical equivalent passive elements.
6. To Analyze two port circuitbehaviors

Unit -1	
Network Theorems: Circuit Analysis with dependent and independent urrent and voltage sources. Node and Mesh Analysis. Superposition theorem, Thevenin's theorem, Norton theorem,millimen's theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation theorem for AC Excitation. Concept of duality and dualnetworks.	**Hours-10**
Unit -2	
Solution of First and Second order networks: Solution of first and second order differential equations for Series and parallel R-L, R-C, R- L-C circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response.	**Hours-10**
Unit – 3	
Sinusoidal steady state analysis: Representationof sine function as rotating phasor, phasor diagrams, impedances and admittances, AC circuit analysis, effective or RMS values, average power and complex power. Three-phase circuits. Mutual coupled circuits, Dot Convention in coupled circuits, IdealTransformer.	**Hours-20**
Unit – 4	
Electrical Circuit Analysis Using Laplace Transforms: Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions. Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots), series and parallel resonances	**Hours-10**
Unit – 5	
Two Port Network and Network Functions: Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks.	**Hours-10**

COURSE OUTCOMES:

On completion of the course student will be able to:

1. Apply network theorems for the analysis of electricalcircuits.
2. Obtain the transient and steady-state response of electricalcircuits.
3. Analyze circuits in the sinusoidal steady-state (single-phase andthree-phase).
4. Obtain transfer functions to various Electrical networks using laplace transforms.
5. Analyze behavior of transfer functions with poles and zeroes.
6. Analyze two port circuitbehaviors.

QUESTION PAPER PATTERN:

SECTION A:

1. This section contains ten one answer question carrying 1 mark each.
2. Two questions from each unit should present.

SECTION B:

1. This section will have 5 questions with internal choice.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under a unit.

TEXT BOOKS:

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, Third edition 2006.
2. D. Roy Choudhury, " Networks and Systems", New Age InternationalPublications, 1998.
3. W. H. Haytand J. E. Kemmerly, " Engineering Circuit Analysis" , McGraw Hill Education,2013.

REFERENCE BOOKS:

1. C. K. Alexander and M. N. O. Sadiku, " Electric Circuits", McGraw Hill Education, 2004.
2. K. V. V. Murthy and M. S. Kamath, " BasicCircuit Analysis", Jaicoishers,1999.
3. Electrical circuit analysis by A.Sudhakar and Shyam Mohan S palli.

COURSE OUTCOMES TO PROGRAM OUTCOMES MAPPING:

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

ELECTRICAL MACHINES-I (Proposed syllabus for the academic year 2019-2020) SEMESTER III			
Subject Code	**18EEEET3050**	**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**
Credits-03			

Course Objectives:

This course will enable student to :

1. Understand the concepts of magnetic circuits.
2. Understand the operation of dc machines.
3. Understand the characteristics of different dc machine configurations.
4. Understand the operation of single phase transformer circuits.
5. Understand the operation of three phase transformer circuits.
6. Understand the control voltages with tap changing methods and to achieve three-phase to two-phase transformation

Unit-1	
Magnetic fields and magnetic circuits Review of magnetic circuits - MMF, flux, reluctance, inductance; review of Ampere Law and Biot-Savart Law; Visualization of magnetic fields produced by a bar magnet and a current carrying coil - through air and through a combination of iron and air; influence of highly permeable materials on the magnetic flux lines. B- H curve of magnetic materials; flux-linkage vs current characteristic of magnetic circuits; linear and nonlinear magnetic circuits; energy stored in the magnetic circuit; force as a partial derivative of stored energy with respect to position of a moving element; torque as a partial derivative of stored energy with respect to angular position of a rotating element.	**Hours-10**
Unit – 2	**Hours-09**
DC machines Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. Armature winding and commutation - Elementary armature coil and commutators, lap and wave windings, construction of commutators, linear commutation Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction.	
Unit – 3	**Hours-11**
DC machine - motoring and generation Armature circuit equation for motoring and generation, Types of field excitations - separately excited, shunt and series. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed. V-I characteristics and torque-speed characteristics of separately excited, shunt and series motors. Speed control through armature voltage. Losses, load testing and back-to-back testing of DC machines	

Unit – 4	**Hours-08**
Single Phase Transformers Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses, Parallel operation of single transformers, Autotransformers - construction, principle, applications and comparison with two winding transformer	
Unit – 5	**Hours-07**
Three Phase Transformers Three-phase transformer - construction, types of connection and their comparative features, Parallel operation of three-phase transformers, Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding transformers, Cooling of transformers.	

Course outcomes:

On completion of the course student will be able to:

1. Assimilate the concepts electromagnetic circuits.
2. Mitigate the ill-effects of armature reaction and improve commutation in dc machines.
3. Analyze the characteristics of various DC motors.
4. Analyze the characteristics of various DC Generators.
5. Analyze the performance and to pre determine efficiency, regulation and losses of a single phase transformer.
6. Analyze the change in control voltages with tap changing methods and to achieve three-phase to two-phase transformation.

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. E. Fitzgerald and C. Kingsley,"ElectricMachinery" , New York, McGraw Hill Education,2013.
2. P.S.Bimbhra,"Electrical Machinery",Khanna Publishers,2011.

Reference Books:

1. E. Clayton and N. N. Hancock, "Performance and design of DC machines" , CBS Publishers,2004.
2. M. G. Say, "Performance and design ofACmachines", CBS Publishers, 2002.
3. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education,2010.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

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

ANALOGELECTRONICSLAB
(Proposed-syllabus-for-the-academic-year-2019-2020)
SEMESTER III

SubjectCode	**18EEEEL3060**	**IAMarks**	**30**
NumberofPracticeHours/Week	**3P**	**ExamMarks**	**70**
TotalNumberofPracticeHours	**36**	**ExamHours**	**03**

Credits-1.5

COURSEOBJECTIVES:

Thiscoursewillenablestudentto:

1. ToUnderstandtheVIcharacteristicsofDiode&workingofvariousRectifier,clipping&Clamping circuits
2. ToUnderstandVIcharacteristicsofBJT&amplifiercircuits
3. ToUnderstandVIcharacteristicsofMOSFET&FrequencyResponseofCommonsourceamplifiercircuit
4. ToUnderstandtheLinearApplicationsofOperationalAmplifier
5. ToUnderstandtheNonLinearApplicationsofOperationalAmplifier

ListofExperiments(Anytwelveexperimentsmustbeconducted)

1. PlottheVIcharacteristicsof(a)Diode(b)ZenerDiode
2. Designandsetupthefollowingrectifierswithandwithoutfiltersandtodetermineripplefactorandrectifierefficiency:(a)Halfwaverectifier(b)FullWaveRectifier
3. Conductexperimenttotestdiodeclipping(single/doubleended)andclampingcircuits(positive/negative)
4. PlottheinputandoutputcharacteristicsofBJTinCommonEmitterConfiguration
5. RealizeBJTDarlingtonEmitterfollowerwithandwithoutbootstrappinganddeterminethegain, inputandoutputimpedances.
6. DesignBJTcommonemitteramplifierusingvoltagedividerbiaswithandwithoutfeedbackanddeterminethegainbandwidthproductfromitsfrequencyresponse.
7. PlotthetransferanddraincharacteristicsofaJFETandcalculateitsdrainresistance,mutualconductanceandamplificationfactor.
8. PlotthetransferanddraincharacteristicsofnchannelMOSFETandcalculateitsparameters,namely;drainresistance,mutualconductanceandamplificationfactor.
9. PlotthefrequencyresponseofCommonSourceJFET/MOSFETamplifierandobtainthebandwidth
10. DesignapracticalOpAmpintegrator&Differentiatortooperateaccuratelyatf=5kHz(andabove)andwiththemagnitudeofthegain=1fora5kHzsinewaveinput.Usestandardvaluesforresistorsandcapacitors.
11. ConductanexperimentonSeriesVoltageRegulatorusingZenerdiodeandOpAmpdeterminelineandloadregulationcharacteristics.
12. DeterminetheFrequencyresponseofPhaseshiftoscillatorusingOpAmp
13. Designandsetupasquarewave/Triangularwavewithamplitudeof+orVforafrequencyof1KHz.

COURSEOUTCOMES:

On completion of the course student will be able to:

1. AbilitytoUnderstandthecharacteristicsofDiode&ApplicationsofDiode(workingofrectifier,Clipping&Clampingcircuits
2. AbilitytoUnderstandthecharacteristicsofBJT&analyzethedifferentamplifiercircuits
3. AbilitytoUnderstandthecharacteristicsofMOSFET&analyzetheFrequencyResponseofCommonsourceamplifiercircuit
4. AbilitytoanalyzetheWorkingofPhaseshiftoscillators
5. AbilitytoanalyzetheworkingofOPAMPbasedcircuitslikeSquareWaveandTriangularwaveGenerators

COURSE-OUTCOMES-TO-PROGRAM-OUTCOMES-MAPPING:

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

ELECTRICAL CIRCUITS ANALYSIS LAB
(Proposed syllabus for the academic year 2019-2020)
SEMESTER III

Subject Code	**18EEEEL3070**	**1A-Marks**	**30**
Number of Practice Hours/Week	**3P**	**Exam Marks**	**70**
Total Number of Practice Hours	**36**	**Exam Hours**	**03**

Credits-1.5

COURSEOBJECTIVES:

Thiscoursewillenablestudentto:

1. Toverifyanddemonstratevarioustheorems.
2. Todetermine the transient analysis of single phase circuits
3. ToverifyanddetermineResonanceofanRLCcircuit.
4. Toverifyanddeterminetheparametersoftwoportnetworks.
5. Todetermineselfandmutualinductanceofamagneticcircuit.
6. Tomeasure three phase active and reactive power for polyphase circuits.

ListofExperiments(Anytenexperimentsmustbeconducted)

1. Verification of Kirchoff's laws.
2. VerificationofThevenin'sandNorton'sTheorems
3. VerificationofSuperpositiontheoremandMaximumPowerTransferTheorem
4. VerificationofCompensationTheorem
5. VerificationofReciprocity,Millmann'sTheorems
6. Transient Analysis of Series RL and RC circuit using PSPICE Software.
7. Measurementof3phasePowerbytwoWattmeterMethodforunbalancedloads
8. Measurementof3phasereactive power for star and delta connected load
9. DeterminationofSelf,MutualInductancesandCoefficientofcoupling
10. ZandYParameters
11. Transmissionandhybridparameters
12. Verification of nodal analysis using MATLAB software Tool.

COURSEOUTCOMES:

On completion of the course student will be able to:

1. Tobeabletoapplyvarioustheorems.
2. Tobeabletoanalyzethe transient response of single phase circuits
3. TobeabletofindresonanceforRLCCircuits.
4. Tobeabletodetermineparametersfortwoportnetworks.
5. Tobeabletodetermine the selfandmutualinductanceofamagneticcircuit.
6. Tobeablemeasureactive and reactive powerofPolyphaseCircuits.

COURSE-OUTCOMES-TO-PROGRAM-OUTCOMES-MAPPING:

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	2	2	1	1										
CO2	2	2	2	2	2										
CO3	2	2	2	2											
CO4	2	2	2												
CO5	2	2	2												
CO6	2	2	2												
Overall Course	**2**	**2**	**2**	**1**	**1**										

ELECTRICAL MACHINES LABI

(Proposed syllabus for the academic year 2019-2020)

SEMESTER III

Subject Code	**18EEEEL3080**	**IA Marks**	**25**
Number of Lecture Hours/week	**3P**	**Exam Marks**	**50**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits-1.5

Course Objectives:

This course will enable student to:

1. Gain knowledge on pre determination tests conducted on DC machines.
2. Gain knowledge on load tests conducted on DC machines.
3. Gain knowledge on various methods of controlling the speed of DC shunt motor.
4. Gain knowledge on separation of losses in DC shunt motor and single phase transformers.
5. Gain knowledge on pre determination tests conducted on single phase transformer.
6. Gain knowledge on operating two transformers in parallel and to achieve three phase to two phase transformation.

List of Experiments (Any ten experiments must be conducted)

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Brake test on DC shunt motor. Determination of performance curves.
3. Hopkinson's test on DC shunt machines. Predetermination of efficiency.
4. Swinburne's test and Predetermination of efficiencies as Generator and Motor.
5. Load test on DC compound generator. Determination of characteristics
6. Separation of losses in DC shunt motor
7. Load test on DC series generator. Determination of characteristics.
8. Brake test on DC compound motor. Determination of performance curves.
9. Load test on DC shunt generator. Determination of characteristics.
10. Sumpner's test on single phase transformer.
11. Scott connection of transformers
12. Parallel operation of Single phase Transformers
13. Separation of core losses of a single phase transformer

Course Outcomes:

On completion of the course student will be able to:

1. Pre determine the regulation, performance and efficiency on DC machines.
2. No load and Load the DC machine to obtain thecharacteristics, torque, output and efficiency.
3. Control the speed of DC shunt motor by using armature control and field control methods.
4. Separate the various losses present in DC shunt motor and single phase transformers.
5. Pre determine the regulation and efficiency for a single phase transformer.
6. Operate two transformers in parallel and to achieve three phase to two phase transformation.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1				3											
CO2				3											
CO3				3											
CO4				3											
CO5				3											
CO6				3											
Overall Course				3											

SIGNALSANDSYSTEMS
(Proposedsyllabusfortheacademicyear2019-2020)
SEMESTER IV

SubjectCode	**18EEEET4010**	**IAMarks**	**30**
NumberofLectureHours/Week	**2L+1T**	**ExamMarks**	**70**
TotalNumberofLectureHours	**45**	**ExamHours**	**03**

Credits-03

CourseObjectives:

Thiscoursewillenablestudentto:

1. Introducetheterminologyofsignalsandsystems
2. AnalyzebehaviorofcontinuousanddiscretetimeLTIsystems
3. IntroduceFouriertoolsthroughtheanalogybetweenvectorsandsignals.
4. Analyzethelinearsystemsintimeandfrequencydomainsoncontinuoustimesignalsandsystem sandstudyztransformasmathematicaltooltoanalyzediscretetimesignalsandsystems.
5. Introducetheconceptofsamplingandreconstructionofsignals

Unit1	
IntroductiontoSignalsandSystems: Classification of Signals and Systems. Basic operations on signals. Test signalsimpulse, step, ramp and sinusoid signals .Properties of signals. Energy and power signal. Transformation of independent variables.	**Hours-07**
Unit—2	
BehaviorofcontinuousanddiscretetimeLTIsystems: Impulseresponseandstepresponse,convolution,inputoutputbehaviorwithaperiodicconvergentinputs,cascadeinterconnections.CharacterizationofcausalityandstabilityofLTIsystems.Systemrepresentationthroughdifferentialequationsanddifferenceequations. PeriodicinputstoanLTIsystem,thenotionofafrequencyresponseanditsrelationtotheimpulseresponse.	**Hours-10**
Unit–3	
FourierseriesandFourierTransform: Fourierseriesrepresentationofperiodicsignals,WaveformSymmetries,CalculationofFourierCoefficients.FourierTransform,convolution/multiplicationandtheireffect inthefrequencydomain,magnitudeandphaseresponse,Fourierdomainduality.TheDiscreteTimeFourierTransform(DTFT)andtheDiscreteFourierTransform(DFT).Parseval'sTheorem.	**Hours-10**
Unit–4	
LaplaceandzTransforms: ReviewoftheLaplaceTransformforcontinuoustimesignalsandsystems,systemfunctions,polesandzerosofsystemfunctionsandsignals,Laplacedomainanalysis,solutiontodifferentialequationsandsystembehavior,InverseLaplaceTransform.ThezTransformfordiscretetimesignalsandsystems,systemfunctions,polesandzerosofsystemsandsequences, zdomainanalysis,InverseZTransform	**Hours-10**
Unit–5	
SamplingandReconstruction: TheSamplingTheoremanditsimplications.Spectraofsampledsignals.Reconstruction:idealinterpolator,zeroorderhold,firstorderhold.Aliasinganditseffects.Relationbetween continuousanddiscretetimesystems.	**Hours-08**

Courseoutcomes:

Oncompletionofthecoursestudentwillbeableto:

1. DistinguishthesignalsandsystemsandSystemproperties
2. AnalyzebehaviorofcontinuousanddiscretetimeLTIsystems
3. Analyzethecontinuoustimesignalsandcontinuoustimesystemsusing FourierseriesandFouriertransform
4. ApplyLaplacetransform toanalyzecontinues timesignalsandsystems
5. ApplyZtransformtoanalyzediscretetimesignalsandsystems.
6. Applysamplingtheoremtoconvertcontinuoustimesignalstodiscretetimesignalandreconstructback

QUESTIONPAPERPATTERN:

SECTIONA:

Thissectioncontainstenoneanswerquestioncarrying1markeach.
Twoquestionsfromeachunitshouldpresent.

SECTIONB:

Thissectionwillhave5questionswithinternalchoice.
Eachfullquestioncarries12marks.
Eachfullquestionwillhavesubquestioncoveringalltopicsunderaunit.

TEXTBOOKS:

1.A.V.Oppenheim,A.S.WillskyandS.H.Nawab,"Signalsandsystems",PrenticeHall India,1997.
2.J.G.ProakisandD.G.Manolakis,"DigitalSignalProcessing:Principles, Algorithms,andApplications",Pearson,2006.
3.H.P.Hsu,"Signalsandsystems",Schaum'sseries,McGrawHillEducation,2010.

REFERENCEBOOKS:

1.Signals&SystemsSimonHaykinandVanVeen,Wiley,2ndEdition.
2.PrinciplesofLinearSystemsandSignals–BPLathi,OxfordUniversityPress,2015
3.SignalsandSystems–KRajaRajeswari,BVisweswaraRao,PHI,2009
4.FundamentalsofSignalsandSystemsMichelJ.Robert,MGHInternationalEdition, 2008.

COURSE-OUTCOMES-TO-PROGRAM-OUTCOMES-MAPPING:

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	3	2													
CO2	3	2													
CO3	3	2		1											
CO4	3	2		1											
CO5	3	2		1											
CO6	3	2		1											
Overall Course	**3**	**2**		**1**											

ENGINEERING MECHANICS (Except CE) (Proposed syllabus for the academic year: 2019 -2020) SEMESTER IV			
Subject Code-	**18CMMET4020**	**IA Marks**	**30**
Number of Lecture Hours/Week	**3L+1T**	**Exam Marks**	**70**
Total Number of Lecture Hours	**44**	**Exam Hours**	**03**
Credits-03			

COURSE OBJECTIVES:

Thiscoursewillenablestudentto:

1. To develop an understanding of the principles of statics and the ability to analyze problems using static equilibrium equations.
2. To introduce the basic principles of mechanics applicable to rigid bodies in equilibrium.
3. To teach the basic principles of mechanics applicable to the motion of particles and rigid bodies.
4. To introduce with mathematical description of the plane motion of rigid bodies.
5. To develop the fundamentals of engineering mechanics and problem solving skills essential for mechanical engineering

Unit -1	
Introduction to Engg. Mechanics – Basic Concepts. **Systems of Forces:** Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.	**Hours-08**
Unit -2	
Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. LamisTheorm, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium, analysis of plane trusses.	**Hours-08**
Unit – 3	
Centroid and Centre of Gravity covering, Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; **Mass moment inertia** of circular plate, Cylinder, Cone, Sphere, Hook.	**Hours-10**
Unit – 4	
Review of particle dynamics- Rectilinear motion; Plane curvilinear motion (rectangular,path, and polar coordinates). 3-D curvilinear motion; Relative and constrained **Introduction to Kinetics of Rigid Bodies covering**, Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies;	**Hours-10**
Unit-5	

Work – Energy Method: Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.	**Hours-08**

COURSE OUTCOMES:

On completion of this course, students should be able to:

1. Able to Resolve the forces into components, moment of force and its applications
2. Construct free body diagrams and develop appropriate equilibrium equations.
3. Determine centroid and moment of inertia for composite areas.
4. Determine the kinematic relations of particles & rigid bodies.
5. Apply equations of motion to particle and rigid body.
6. Analyze motion of particles & rigid bodies using the principle of energy and momentum methods.

Question paper pattern:

Section A:

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

This Section will have 10 questions.

1. Each full question carries 12 marks.
2. Each full question will have sub question covering all topics under a unit.
3. The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. Engg. Mechanics - S.Timoshenko&D.H.Young., 4th Edn - , McGraw Hill publications.
2. Engineering Mechanics-Statics and Dynamics by A Nelson, Tata McGraw HillEducation Private Ltd, New Delhi, 2009.

Reference Books:

1. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11th Edn – Pearson Publ.
2. Engineering Mechanics, statics – J.L.Meriam, 6th Edn – Wiley India Pvt Ltd.
3. Engineering Mechanics, statics and dynamics – I.H.Shames, – Pearson Publ.
4. Mechanics For Engineers, statics - F.P.Beer&E.R.Johnston – 5th EdnMcGraw Hill Publ.
5. Mechanics For Engineers, dynamics - F.P.Beer&E.R.Johnston –5th EdnMcGraw Hill Publ.
6. Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best& W.G. McLean, 5th Edn – Schaum's outline series - McGraw Hill Publ.
7. Singer's Engineering Mechanics: Statics And Dynamics, K. Vijay Kumar Reddy, J. Suresh Kumar, Bs Publications
8. Engineering Mechanics, Fedinand . L. Singer, Harper – Collins.

COs VS POs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1**):**

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2											2		
CO2	2	2											2		
CO3	2	2											2		
CO4	3	2											1		
CO5	3	2											1		
CO6	**3**	**2**											**3**		
Overall Course	**3**	**2**											**3**		

DIGITALELECTRONICS (Proposedsyllabusfortheacademicyear2019-2020) SEMESTER IV			
SubjectCode	**18EEEET4030**	**IAMarks**	**30**
NumberofLectureHours/Week	**3L**	**ExamMarks**	**70**
TotalNumberofLectureHours	**60**	**ExamHours**	**03**
Credits–03			

COURSE-OBJECTIVES:

Thiscoursewillenablestudentto:

1. TounderstandtheworkingofLogicfamiliesandLogicgates
2. TounderstandtheworkingofCombinationalLogicCircuits
3. TounderstandtheworkingofSequentialLogicCircuits
4. TounderstandtheworkingofAD&DAConversion
5. TounderstandtheuseofPLDtoimplementthegivenlogic.
6. To understandworkingof Semiconductormemories

Unit-1	
Title: FundamentalsofDigitalSystemsandlogicfamilies Digitalsignals,digitalcircuits,AND,OR,NOT,NAND,NORandExclusiveOROperations,Booleanalgebra,examplesofICgates,numbersystemsbinary,signedbinary,octalhexadecimalnumber,binaryarithmetic,one'sandtwo'scomplementsarithmetic,codes,errordetectingandcorrectingcodes,characteristicsofdigitalICs,digitallogicfamilies,TTL,SchottkyTTLandCMOSlogic,interfacingCMOSandTTL,Tristatelogic.	**Hours-12**
Unit-2	
Title: CombinationalDigitalCircuits Standardrepresentationforlogicfunctions,Kmaprepresentation,simplificationoflogicfunctionsusingKmap,minimizationoflogicalfunctions.Don'tcareconditions,Multiplexer,DeMultiplexer/Decoders,Adders,Subtractors,BCDarithmetic,carrylookaheadadder,serialadder,ALU,elementaryALUdesign,popularMSIchips,digitalcomparator,paritychecker/generator,codeconverters,priorityencoders,decoders/driversfordisplaydevices,QMmethodoffunctionrealization.	**Hours-12**
Unit-3	
Title:Sequentialcircuitsandsystems A1bitmemory,thecircuitpropertiesofBistablelatch,theclockedSRflipflop,JKTandDtypeflipflops,applicationsofflipflops,shiftregisters,applicationsofshiftregisters,serialtoparallelconverter,paralleltoserialconverterringcounter,sequencegenerator,ripple(Asynchronous)counters,synchronouscounters,countersdesignusingflipflops,specialcounterIC's,asynchronoussequentialcounters,applicationsofcounters.	**Hours-12**
Unit–4	
Title: A/DandD/AConverters Digitaltoanalogconverters:weightedresistor/converter,R2RLadderD/Aconverte	**Hours-12**

r,specificationsforD/Aconverters,examplesofD/AconverterICs,sampleandhold circuit,analogtodigitalconverters:quantizationandencoding,parallelcomparator A/Dconverter,successiveapproximationA/Dconverter,countingA/Dconverter,d ualslopeA/Dconverter,A/Dconverterusingvoltagetofrequencyandvoltagetotime conversion,specificationsofA/Dconverters,exampleofA/DconverterICs	

Unit–5	
Title:SemiconductormemoriesandProgrammablelogicdevices Memoryorganizationandoperation,expanding memorysize,classificationandcharacteristicsofmemories,sequentialme mory,readonlymemory(ROM),readandwritememory(RAM),contentaddressabl ememory(CAM),chargedecoupleddevicememory(CCD),commonlyusedmemo rychips,ROMasaPLD,Programmablelogicarray,Programmablearraylogic,comp lexProgrammablelogicdevices(CPLDS),FieldProgrammableGateArray(FPGA).	**Hours-12**
COURSEOUTCOMES: Oncompletionofthecoursestudentwillbe: 1. Understandworkingoflogicfamiliesandlogicgates. 2. DesignandimplementCombinationallogiccircuits 3. DesignandimplementSequentiallogiccircuits. 4. UnderstandtheprocessofAnalogtoDigitalconversionandDigitalto Analogconversion. 5. BeabletousePLDstoimplementthegivenlogicalproblem. 6. Understandworkingof Semiconductormemories	
QUESTIONPAPERPATTERN: **SECTIONA:** 5. Thissectioncontainstenoneanswerquestioncarrying1markeach. 6. Twoquestionsfromeachunitshouldpresent. **SECTIONB:** 7. Thissectionwillhave5questionswithinternalchoice. 8. Eachfullquestioncarries12marks. 9. Eachfullquestionwillhavesubquestioncoveringalltopicsunderaunit.	
TEXTBOOKS: 1. R.P.Jain,"ModernDigitalElectronics",McGrawHillEducation,4th edition 2. M.M.Mano,"DigitallogicandComputerdesign",PearsonEducationIndia,2016. 3. A.Kumar,"FundamentalsofDigitalCircuits",PrenticeHallIndia,2016.	
REFERENCEBOOKS: 1. FundamentalsofLogicDesignbyCharlesHRothJr,JaicoPublisher 2. SwitchingTheoryandLogicDesignbyHillandPetersonMcGrawHillMHEdition 3. SwitchingTheoryandLogicDesignbyMVSubramanyam	

COURSE-OUTCOMES-TO-PROGRAM-OUTCOMES-MAPPING:

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	1	2	1											
CO2	1	1	2		2										
CO3	1	1	2	1											
CO4	1	1	2												
CO5	1	1	2		2										
CO6	1	1	2												
Overall Course	**2**	**2**	**3**	**1**	**2**										

CONTROLSYSTEMS (Proposedsyllabusfortheacademicyear2019-2020) SEMESTERIV			
SubjectCode	**18EEEET4040**	**IAMarks**	**30**
NumberofLectureHours/Week	**3L**	**ExamMarks**	**70**
TotalNumberofLectureHours	**48**	**ExamHours**	**03**
Credits-03			

CourseObjectives:

Thiscoursewillenablestudent:

1. Toderivemathematicalmodelsrelatedtovariousphysicalsystems.
2. Toanalyzethebehaviourofsecondordersystemsanddetermineerrorconstants
3. ToanalyzethestabilityofsystemsusingFrequencyresponsemethods
4. Todesignvariouscompensatorstoimprovetheperformanceofsystems
5. To AbletodeterminecontrollabilityandObservabilityandSTMofgivensystem.

Unit-1	
MATHEMATICALMODELINGOFCONTROLSYSTEMS Mathematicalmodelsof electrical and mechanical(translational and rotational) systems,ForceVoltage and ForceCurrent analogies.Transferfunctionmodelsoflineartimeinvariantsystems. FeedbackControl:OpenLoopandClosedloopsystems,ApplicationsBenefitsofFeedback.Blockdiagramalgebra.Signal Flow GraphMason's gain formula.	**Hours–08**
Unit-2	
TIMERESPONSEANALYSIS Standardtestsignals.Timeresponseoffirstandsecondordersystemsforstandardtestinputs.Applicationofinitialandfinalvaluetheorem.Classification of errors and error constants.Designspecificationsforsecondordersystemsbasedonthetimeresponse. Concept of Stability.RouthHurwitCriteria.RelativeStabilityanalysis. RootLocustechnique.ConstructionofRootloci.	**Hours–12**
Unit-3	
FREQUENCYRESPONSEANALYSIS Frequency domain specifications.Relationshipbetweentimeandfrequencyresponse,Polarplots,Bodeplots.Nyquiststabilitycriterion.RelativestabilityusingNyquistcriterion.	**Hours–12**
Unit-4	
CONTROL SYSTEM DESIGN Introduction to P,PI,PID controllers,Lag , Lead, LagLead compensator design (Bode Plot), Addition of poles and addition zeros on stability.	**Hours–08**
Unit-5	
STATEVARIABLEANALYSIS Conceptsofstatevariables.Statespacemodel.Canonical formsofStateMatrix.Solutionofstateequations,State transition matrix .EigenvaluesandStabilityAnalysis.Conceptofcontrollabilityandobservability.	**Hours–08**

Courseoutcomes:

Oncompletionofthecoursestudentwillbe:

1. AbletoderivetransferfunctionofdifferentphysicalSystems
2. Abletoanalyzethebehaviourofsecondordersystemwithtimedomainspecifications
3. AbletocomputeStabilityofLTIsystemusingBodePlotNyquistplot
4. AbletocomputeStabilityofLTIsystemusingNyquistplot
5. Abletoanalyzethethedifferentcontrollers
6. AbletodeterminecontrollabilityandObservabilityandSTMofgivensystem.

Questionpaperpattern:

SectionA:

1.Thissectioncontainstenoneortwolineanswerquestioncarrying1markeach.

2.Twoquestionsfromeachunitshouldpresent.

SectionB:

1.Thissectionwillhave10questions.

2.Eachfullquestioncarries12marks.

3.Eachfullquestionwillhavesubquestioncoveringalltopicsunderunit.

Thestudentwillhavetoanswer5fullquestionsselectingonefullquestionfromeachunit.

TextBooks:

1. B.C.Kuo,"AutomaticControlSystem",PrenticeHall,1995.
2. K.Ogata,"ModernControlEngineering",PrenticeHall,1991.
3. I.J.NagrathandM.Gopal,"ControlSystemsEngineering",NewAgeInternational,2009 .

ReferenceBooks:

R1.ControlSystemsbyN.K.Sinha,NewAgeInternational(P)LimitedPublishers,3rdEdition,1998.

R2. Controlsystems–byA.Nagoorkani,CBSpublications

R3. Problems&solutionsincontrolsystems–byA.K.Jairath

COURSE-OUTCOMES-TO-PROGRAME-OUTCOMES-MAPPING:

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	3	2			1										3
CO2	3	2	2												3
CO3	2		2	2											2
CO4	2	1	2	2											2
CO5	3	3	3		3										3
CO6	3		3		3										3
Overall Course	**3**	**2**	**2**	**1**	**2**										**3**

ELECTRICAL MACHINES II (Proposed syllabus for the academic year 2019-2020) SEMESTER IV			
Subject Code	**18EEEET4050**	**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**
Credits -3			

Course Objectives:

This course will enable student to :

1. Explain the structure of AC machines and analyse the windings with pulsating and rotating magnetic fields.
2. Understand the operation of three phase induction
3. Analyse the performance of three phase induction motor.
4. Explain the performance of single phase induction and ac series motors.
5. Explain the operation of synchronous machines and their performance.
6. Explain the role of synchronous generators operation when connected to an infinite bus or when operating in parallel.

Unit 1	
Fundamentals of AC machine windings Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single turn coil active portion and overhang; full pitch coils, concentrated winding, distributed winding, winding axis, 3D visualization of the above winding types, Air gap MMF distribution with fixed current through winding concentrated and distributed, Sinusoidally distributed winding, winding distribution factor	**Hours-07**
Unit 2	**Hours-06**
Pulsating and revolving magnetic fields Constant magnetic field, pulsating magnetic field alternating current in windings with spatial displacement, Magnetic field produced by a single winding fixed current and alternating current. Pulsating fields produced by spatially displaced windings, Windings spatially shifted by 90 degrees, Addition of pulsating magnetic fields, Three windings spatially shifted by 120 degrees (carrying three phase balanced currents), revolving magnetic field.	
Unit 3	**Hours-09**
Induction Machines Construction, Types (squirrel cage and slip ring), Torque Slip Characteristics, Starting and Maximum Torque. Equivalent circuit. Phasor Diagram, Losses and Efficiency. Effect ofparameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Methods of starting, braking and speed control for induction motors.Generator operation. Self excitation. Doubly Fed Induction Machines.	

Unit 4	
Single phase induction motors Constructional features, double revolving field theory, equivalent circuit, determination of parameters. Split phase starting methods and applications.	**Hours-08**
Unit 5	
Synchronous machines Constructional features, cylindrical rotor synchronous machine generated EMF, equivalent circuit and phasor diagram, armature reaction, synchronous impedance, voltage regulation. Operating characteristics of synchronous machines, V curves. Salient pole machine two reaction theory, analysis of phasor diagram, power angle characteristics. Parallel operation of alternators synchronization and load division.	**Hours-15**

Course outcomes:

On completion of the course student will be able to:

1. Illustrate the structure of AC machines and identify the various types of windings.
2. Analyse the operation of three phase induction
3. Analyse the performance of three phase induction motor.
4. Analyse the performance of single phase induction and ac series motors.
5. Analyse the operation of synchronous machines for both salient and non salient pole construction and their performance.
6. Analyse the synchronization of alternators and estimate the synchronizing power, active and reactive power division.

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. E. Fitzgerald and C. Kingsley, "Electric Machinery" , McGraw Hill Education,2013.
2. M. G. Say, " Performance and design ofACmachines", CBS Publishers, 2002.
3. P.S.Bimbhra,"Electrical Machinery",Khanna Publishers,2011.

Reference Books:

1. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education,2010.
2. S. Langsdorf, " Alternating current machines", McGraw Hill Education,1984.
3. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2007.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	3													
CO2	3	1													
CO3	2	3													
CO4	1	3													
CO5	2	3													
CO6	3	1													
Overall Course	**2**	**3**													

DIGITALELECTRONICSLAB
(Proposedsyllabusfortheacademicyear2019-2020)
SEMESTER IV

SubjectCode	**18EEEEL4060**	**1AMarks**	**30**
NumberofPracticeHours/Week	**3P**	**ExamMarks**	**70**
TotalNumberofPracticeHours	**36**	**ExamHours**	**03**

Credits-1.5

COURSEOBJECTIVES:

Thiscoursewillenablestudents:

1. TounderstandDeMorgan'sTheoremSOP,POSForms.
2. TounderstandFull/ParallelAdders,SubtractorsandMagnitudeComparators,Multiplexerusinggates,
3. TounderstandDeMultiplexersandDecoders,FlipFlops,ShiftRegistersandCounters
4. TounderstandA-DandD-AConverters.
5. Tounderstandthe SemiConductorMemories

ListofExperiments(Anytwelveexperimentsmustbeconducted)

1. DesignandimplementationofAddersandSubtractorsusinglogicgates.
2. Designandimplementationofcodeconvertersusinglogicgates(i)BCDtoexcess3codeandviceversa(ii)Binarytograyandviceversa
3. Designandimplementationof4bitbinaryAdder/subtractorandBCDadderusingIC7483
4. Designandimplementationof2BitMagnitudeComparatorusinglogicgates8BitMagnitudeComparatorusingIC7485
5. Designandimplementationof16bitodd/evenparitycheckergeneratorusingIC74180.
6. 6.DesignandimplementationofMultiplexerandDemultiplexerusinglogicgatesandstudyofIC74150andIC74154
7. Designandimplementationofencoderanddecoderusinglogicgatesandstudyof IC7445andIC74147
8. Constructionandverificationof4bitripplecounterandMod10/Mod12Ripplecounters
9. Designandimplementationof3bitsynchronousup/downcounter
10. ImplementationofSISO,SIPO,PISOandPIPOshiftregistersusingflipflops.
11. TodesignandbuildDACusingOpAmp.
12. TodesignandbuildADCusingOpAmp
13. RealizetheRingCounterandJohnsonCounterusingIC7476

COURSEOUTCOMES:

Oncompletionofthecoursestudentwillbe:

1. DemonstratethetruthtableofvariousExpressionsandCombinationalCircuitsusinglogicgates.
2. Design,testandevaluatevariousCombinationalCircuitssuchasAdders,Subtractors,Comparators,MultiplexersandDemultiplexers.
3. ConstructFlipflops,CountersandShiftRegisters.
4. Construct A-D Converters using OpAmp.
5. Construct D-A Converters using OpAmp.
6. ConstructdifferenttypesofMemories

COURSE-OUTCOMES-TO-PROGRAM-OUTCOMES-MAPPING:

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	2	1						1						
CO2	1	2	3	1	1				1						
CO3	1	1	2		1				1						
CO4	1	1	2	2	1				1						
CO5	2	1	1	1											
CO6	1	1	3	2	1				2						
Overall Course	**2**	**2**	**3**	**2**	**1**				**2**						

CONTROLSYSTEMSLAB
(Proposedsyllabusfortheacademicyear2019-2020)
SEMESTERIV

SubjectCode	**18EEEEL4070**	**IAMarks**	**25**
NumberofLectureHours/week	**3P**	**ExamMarks**	**50**
TotalNumberofLectureHours	**32**	**ExamHours**	**03**
Credits1.5			

CourseObjectives:

Thiscoursewillenablestudents:

1. TostrengthentheknowledgeofFeedbackcontrol
2. Toinculcatethecontrollerdesignconcepts
3. TointroducetheconceptofMathematicalModeling

ListofExperiments(Anytenexperimentsmustbeconducted)

1. TimeresponseofSecondordersystem and determination of time domain specifications
2. CharacteristicsofACservomotor.
3. CharacteristicsofDCservomotor.
4. Transfer function of DC Motor and DC Generator
5. EffectofP,PD,PI,PIDControlleronasecondordersystems
6. Lagandleadcompensation–Magnitudeandphaseplot.
7. TemperaturecontrollerusingPID Controller.
8. Stability analysis (RootLocus,Bode plot ,Nyquist plot) of linear time in variant system.
9. Find the delay time and rise time of PID Controlled DC motor using MATLAB
10. Design the compensators with given gain margine and phase margine.
11. State space model for classical transfer function.

Course(Lab)outcomes:

Oncompletionofthecoursestudentwillbe:

1. AbletoderivetransferfunctionofdifferentphysicalSystems
2. Abletoanalyzethebehaviourofsecondordersystemwithtimedomainspecifications
3. AbletocomputeStabilityofLTIsystemusingBodePlotNyquistplot
4. AbletocomputeStabilityofLTIsystemusingNyquistplot
5. Abletoanalyzethethedifferentcontrollers
6. AbletodeterminecontrollabilityandObservability ofgivensystem

COURSEOUTCOMESTOPROGRAMEOUTCOMESMAPPING:

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	2	2												2
CO2	2		2		2										2
CO3	3		3		3										3
CO4	3		3		3										3
CO5	2		2												2
CO6	2				2										2
Lab	**2**	**1**	**2**		**1**										**2**

ELECTRICAL MACHINES LAB II
(Proposed syllabus for the academic year 20192020)
SEMESTER IV

Subject Code	**18EEEEL4080**	**IA Marks**	**25**
Number of Lecture Hours/week	**3P**	**Exam Marks**	**50**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**
Credits1.5			

Course Objectives:

This course will enable student to :

1. Obtain efficiency by conducting direct and indirect tests on three phase induction motor.
2. Obtain regulation of alternator by E.M.F, M.M.F, Z.P.F methods and also performance curves.
3. Obtain V and Inverter V Curves of a three phase synchronous motor.
4. Determine X_d and $X_q$of a salient pole synchronous machine.
5. Control the speed of the single phase induction motor and to obtain equivalent circuit.
6. Improve the power factor of single phase induction motor and to obtain its performance.

List of Experiments (Any ten experiments must be conducted)

1. Brake test on three phase Induction Motor
2. No–load & Blocked rotor tests on three phase Induction motor
3. Regulation of a three –phase alternator by synchronous impedance &m.m.f. Methods
4. Regulation of three–phase alternator by Potier triangle method
5. V and Inverted V curves of a three phase synchronous motor.
6. Determination of X_d and $X_q$of a salient pole synchronous machine
7. Equivalent circuit of single phase induction motor
8. Speed control of induction motor by V/f method.
9. Determination of efficiency of three phase alternator by loading with three phase induction motor.
10. Power factor improvement of single phase induction motor by using capacitors and load test on single phase induction motor.
11. Measurement of sequence impedance of a three–phase alternator.
12. Break test on split phase induction motor.

Course outcomes:

On completion of the course student will be able to:

1. Obtain efficiency by conducting direct and indirect tests on three phase induction motor.
2. Obtain regulation of alternator by E.M.F, M.M.F, Z.P.F methods and also performance curves.
3. Obtain the V and Inverter V Curves of a three phase synchronous motor.
4. Determine X_d and $X_q$of a salient pole synchronous machine.
5. Control the speed of the single phase induction motor and to obtain equivalent circuit.
6. Improve the power factor of single phase induction motor and to obtain its performance.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	0	2	2	2											
CO2	0	2	2	2											
CO3	2		2	2											
CO4	2	2	2												
CO5	2	1	2	2											
CO6	2		2	2											
Lab	**1**	**1**	**2**	**2**											

III-B.Tech EEE I- Semester Approved Course structure for the Academic Year 2018-2019

SN	Subject Code	Subject title	L	T	P	C	I	E	T
1	18EEEET5010	Microprocessors	3			3			
2	18EEEET5020	Power Systems – I (Apparatus and Modeling)	3			3			
3	18CMMST5030	Management Science	3			3			
4	18EEEET5040	Power Electronics	3			3			
5	18EEXXO5051	Open Elective – 1	3			3			
6	18EEEEL5060	Microprocessors Lab			3	1.5			
7	18EEEEL5070	Power Systems-I Lab			3	1.5			
8	18EEEEL5080	Power Electronics Lab			3	1.5			
		Total	**15**		**9**	**19.5**			

III B.Tech EEE II Semester Approved Course structure for the Academic Year 2018-2019

SN	Subject Code	Subject title	L	T	P	C	I	E	T
1	18CMBIT6010	Biology for Engineers	3			3			
2	18CMEGT6020	Personality Development & Professional Communication	2			2			
3	18EEEET6030	Power Systems – II (Operation and Control)	3			3			
4	18EEEET6040	Electrical Measurements & Instrumentation	3			3			
5	18CMMST6050	Engineering Economics and Financial management	3			3			
6	18EEEEP606X	Program Elective - 1	3			3			
7	18EEEEL6070	Power Systems – II Lab			3	1.5			
8	18EEEEL6080	Measurements and Instrumentation Lab			3	1.5			
9	18EEEEC6090	Term Paper with Seminar				2			
		Total	**16**		**6**	**21**			

Program Elective – 1

18EEEEP6061	Line Commutated and Active Rectifiers
18EEEEP6062	HVDC Transmission Systems
18EEEEP6063	Control Systems Design

MICROPROCESSORS

(Proposed Syllabus for the academic year-2018-2019)

SEMESTER-V

SubjectCode	**18EEEET5020**	**IA Marks**	**30**
NumberofLectureHours/Week	**3L**	**Exam Marks**	**70**
TotalNumberofLectureHours	**45**	**Exam Hours**	**03**

Credits -3

Course Objectives:

1. Understand the fundamentals of 8086 microprocessor
2. Have a good insight of 8051 micro controller
3. Learn instruction set and programming of 8051 microcontroller
4. Understand the knowledge of memory and I/O interfacing
5. Know the basics of interfacing 8051 microcontroller

Unit—1	
Fundamentals of Microprocessors & Microcontrollers Fundamentals of 8086 Microprocessor Architecture, Internal block diagram, Instruction Set and Addressing modes, Difference between Microprocessor and Microcontroller, Comparison of 8-bit, 16-bit and 32-bit microcontrollers.Definition of embedded system and its characteristics, Role of microcontrollers in embedded Systems.	**Hours-09**
Unit – 2	**Hours-08**
The 8051 Architecture Internal Block Diagram, CPU, ALU, address, data and control bus, Working registers, SFRs, Clock and RESET circuits, Stack and Stack Pointer, Program Counter, I/O ports, Memory Structures, Data and Program Memory, Timing diagrams and Execution Cycles	
Unit – 3	**Hours-08**
Instruction set and Programming Addressing modes: Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing, Bit inherent addressing, bit direct addressing. 8051 Instruction set, Instruction timings. Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. Assembly language programs, C-language programs. Assemblers and compilers. Programming and debugging tools.	
Unit – 4	**Hours-08**
Memory and I/O interfacing Memory and I/O expansion buses, control signals, memory wait states. Interfacing of peripheral devices such as General Purpose I/O, ADC, DAC, timers, counters, memory devices	
Unit – 5	**Hours-13**
External Communication Interface & Applications Synchronous and Asynchronous Communication. RS232, SPI, I^2C. Introduction and interfacing to protocols like Blue-tooth and Zig-bee.LED, LCD and keyboard interfacing. Stepper motor interfacing, DC Motor interfacing, sensor interfacing. Introduction to Arduino, PIC 18, Raspberry pi micro controllers.	

Course outcomes:

On completion of the course student will be able to:

1. Understand the fundamentals of 8086 microprocessor
2. Have a good insight of 8051 micro controller
3. Learn instruction set and programming of 8051 microcontroller
4. Understand the knowledge of memory and I/O interfacing
5. Know the basics of interfacing 8051 microcontroller

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. M.A.Mazidi, J. G. Mazidi and R. D. McKinlay, "The8051Microcontroller and Embedded Systems: Using Assembly and C",Pearson Education, 2007.
2. K. J. Ayala, " 8051 Microcontroller" , Delmar Cengage Learning,2004.
3. R. Kamal, "Embedded System", McGraw Hill Education,2009.
   R. S. Gaonkar, ", Microprocessor Architecture: Programming and Applications with the 8085", Penram International Publishing, 1996

Reference Books:

1. D. A. Patterson and J. H. Hennessy, "Computer Organization and Design: The Hardware/Software interface", Morgan Kaufman Publishers, 2013.
2. D. V. Hall, " Microprocessors & Interfacing" , McGraw Hill Higher Education, 1991

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2													
CO2	0	1													
CO3	1	2													
CO4	1	2													
CO5	0	1													
Overall Course	**1**	**2**													

POWER SYSTEMS – I
(Apparatus and Modeling)
(Proposed syllabus for the academic year 2019-2020)
SEMESTER V

Subject Code	**18EEEET5020**	**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits – 03

Course Objectives:

This course will enable student to :

1. Understand the concepts of powersystems.
2. Understand the various power systemcomponents.
3. Evaluate fault currents for different types offaults.
4. Understand the generation of over-voltages and insulationcoordination.
5. Understand basic protectionschemes.
6. Understand concepts of HVDC power transmission and renewable energygeneration.

Unit-1	
Basic Concepts Evolution of Power Systems and Present-Day Scenario. Structure of a power system: Bulk Power Grids and Micro-grids. Generation from Conventional and Renewable Energy Sources. Transmission and Distribution Systems: Line diagrams, transmission and distribution voltage levels and topologies (meshed and radial systems). Synchronous Grids and Asynchronous (DC) interconnections.	**Hours- 08**
Unit – 2	**Hours-08**
Power System Components – I Overhead Transmission Lines: Electrical and Magnetic Fields around conductors, Parameters of lines. Capacitance and Inductance calculations for simple configurations Corona. Sinusoidal Steady state representation of Lines: Short, medium and long lines, Power Transfer, voltage profile and Reactive Power. Characteristics of transmission lines, Surge Impedance Loading. Series and Shunt Compensation of transmission lines, Insulators: types of insulators, characteristics, voltage distribution calculations, grading of insulators	
Unit – 3	**Hours-08**
Power System Components – II Cables: Classification, insulation resistance, insulation materials, dielectric stress, capacitance of single core and three core, Grading of a cables. Synchronous Machines: Steady-state performance characteristics. Operation when connected to infinite bus. Real and Reactive Power Capability Curve of generators. Typical waveform under balanced terminal short circuit conditions – steady state, transient and sub-transient equivalent circuits. Loads: Types, Voltage and Frequency Dependence of Loads. Per-unit System and per-unit calculations.	
Unit – 4	**Hours-08**
Over voltages and Insulation Requirements Generation of Over-voltages: Lightning and Switching Surges. Protection against Over-voltages, Insulation Coordination.Propagation of Surges. Voltages produced by traveling surges. Termination of line with open circuit end and short circuit end, Bewley Diagrams, Impulse voltages.	

Unit – 5	
Introduction to DC Transmission and Renewable Energy Systems DC Transmission Systems: Line-Commutated Converters (LCC) and Voltage Source Converters (VSC). Comparison of ac and dc transmission. Solar PV systems: I-V and P-V characteristics of PV panels, power electronic interface of PV to the grid. Wind Energy Systems: Power curve of wind turbine. Fixed and variable speed turbines. Permanent Magnetic Synchronous Generators and Induction Generators.	**Hours-13**

Course outcomes:

On completion of the course student will be able to:

1. Understand the concepts of powersystems.
2. Understand the various power systemcomponents.
3. Evaluate fault currents for different types offaults.
4. Understand the generation of over-voltages and insulationcoordination.
5. Understand basic protectionschemes.
6. Understand concepts of HVDC power transmission and renewable energygeneration

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. J. Grainger and W. D. Stevenson, "Power System Analysis" , McGraw Hill Education, 1994.
2. O. I. Elgerd, " Electric Energy Systems Theory" , McGraw Hill Education, 1995.
3. A. R. Bergen and V. Vittal, " Power System Analysis", Pearson Education Inc., 1999.

Reference Books:

1. D. P. Kothari and I. J. Nagrath, " Modern Power System Analysis" , McGraw Hill Education, 2003.
2. B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, " Electric Power Systems", Wiley, 2012.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs / Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	2											3		
CO2	1	3											2		
CO3	1	3											2		
CO4	1	2											3		
CO5	1	2											3		
CO6	1	3											2		
Overall Course	**1**	**3**											**3**		

MANAGEMENTSCIENCE
(Proposed syllabus for the academic year 2019-2020)
SEMESTER V

Subject Code	**18CMMST5030**	**IA Marks**	**30**
Number of Lecture Hours/Week	**4+1**	**Exam Marks**	**70**
Total Number of Lecture Hours	**69**	**Exam Hours**	**03**

Credits-03

Course objectives:

1. To understand the concept of Management its nature importance, Management theories, concept of decision making and organization principles and structures.
2. To understand the concept of production management in the organization. Work study, SQC, inventory management and its techniques.
3. To understand the concept of HRM and its functions, Marketing Management, Strategic management its components.
4. To understand the concept of project management PERT, CPM and Project Crashing.
5. To understand the concepts of recent trends in management

Unit -I: Introduction to Management	**Teaching Hours**
Concept –nature and importance of Management – Functions of Management – Evaluation of Management thought- Theories of Motivation – Decision making process-Designing organization structure- Principles of organization - Types of organization structure.	**Hours-14**
Unit -II: Operations Management	
Principles and Types of Management – Work study- Statistical Quality Control- Control charts (P-chart, R-chart, and C chart). Simple problems- Material Management: Need for Inventory control- EOQ, ABC analysis (simple problems) and Types of ABC analysis (HML, SDE, VED, and FSNanalysis).	**Hours-13**
Unit-III: Functional Management&Strategic Management	
Functional Management: Concept of HRM, HRD and PMIR- Functions of HRM - Marketing Management- Functions of Marketing, Marketing strategiesbasedonproductLifeCycle,Channelsofdistributions. **Strategic Management**: Vision, Mission, Goals, Strategy – Elements of Corporate Planning Process – Environmental Scanning – SWOT analysis- Steps in Strategy Formulation and Implementation, Generic Strategy alternatives	**Hours-16**
Unit –IV: Project Management: **(PERT/CPM)**	
Development of Network – Difference between PERT and CPM Identifying Critical Path- Probability- Project Crashing (SimpleProblems)	**Hours-12**
Unit-V: Contemporary Management Practices	
Basic concepts of MIS, MRP, Justin- Time (JIT) system, Total Quality Management (TQM), Six sigma , Supply ChainManagement, Enterprise Resource Planning (ERP), Business Process outsourcing (BPO), Business process Re-engineering and Bench Marking, Balanced ScoreCard..	**Hours-14**

Course outcomes:

1. Students are able to understand the concept and functions of Management, and Theories of Motivation, Styles of Leadership.
2. Students are able to understand the Statistical Quality Control Techniques, Methods of inspection, the concept of Inventory Management and Control.
3. Students are understand the functional areas of organization i.e., Marketing Management, Human Resource Management, and Strategic Management
4. Students are able to understand Project Management Techniques.
5. Students are able to Understand the various contemporary issues in Management Practices like TQM and BPO etc.

Question paper pattern:

Section A:

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This Section will have 10 questions.
2. Each full question carry 12 marks.
3. Each full question will have sub question covering all topics under a unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. 1. Dr. P. Vijaya Kumar& Dr. N. Appa Rao, '*ManagementScience'* Cengage, Delhi,2012.
2. Dr. A. R. Aryasri, *Management Science'* TMH2011.

Reference Books:

1. Koontz &Weihrich: 'Essentials of Management' TMH 2011
2. Seth &Rastogi: Global Management Systems, Cengage Learning, Delhi, 2011.
3. Robbins: Organizational Behaviors, Pearson Publications, 2011
4. KanishkaBedi: Production & Operational Management, Oxford Publications, 2011.
5. Manjunath: Management Science, Pearson Publications, 2013.
6. BiswajitPatnaik: Human Resource Management, PHI, 2011.
7. Hitt and Vijaya Kumar: Strategic Management, Cengage Learning.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs / Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	1													
CO2	2	1													
CO3	2	1													
CO4	2	1													
CO5	2	1													
CO6	2	1													
Overall Course	**2**	**1**													

POWER ELECTRONICS
(Proposed syllabus for the academic year 2019-2020)
SEMESTER-V

Subject Code	**18EEEET5040**	**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits – 03

Course Objectives:

This course will enable student to :

1. Study the characteristics of various power semiconductor devices and to design their firing circuits.
2. To understand the operation of single phase full–wave converters and analyze harmonics in the input current
3. Analyze the operation of three phase full–wave converters.
4. To understand the operation of different types of DC-DC converters and analyze the operation of AC-AC regulators.
5. To understand the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation

Unit-1	
Power Switching Devices Silicon controlled rectifiers (SCR's) –Characteristics of power MOSFET and power IGBT– Basic theory of operation of SCR–Static characteristics–Turn on and turn off methods–Dynamic characteristics of SCR– Snubber circuit design– Basic requirements of gating circuits for SCR, IGBT and MOSFET.	**Hours – 10**
Unit – 2	**Hours – 16**
1-Φ Phase controlled Rectifiers 1-phase half wave controlled rectifiers – R load and RL load with and without freewheeling diode –1-phase full wave controlled rectifiers – center tapped configuration and bridge configuration- R load and RL load with and without freewheeling diode – continuous and discontinuous conduction – 1-phase semi controlled rectifier-R and RL load – Harmonic analysis for input current waveform in a system with a large load inductance –Calculation of input power factor, effect of source inductance.	
Unit – 3	**Hours – 12**
3-Φ Phase controlled Rectifiers 3-phase Half wave and Full wave uncontrolled rectifier – 3-phase half wave controlled rectifier with R and RL load – 3-phase fully controlled rectifier with R and RL load – 3-phase semi controlled rectifier with R and RL load.	
Unit – 4	**Hours – 16**
DC-DC Converters Analysis of Buck, boost and buck, buck-boost converters in Continuous Conduction Mode (CCM) and Discontinuous Conduction Modes (DCM) – Output voltage equations using volt-sec balance in CCM & DCM – output voltage ripple & inductor current ripple for CCM only – Principle operation of forward and fly back converters in CCM. **AC-AC Regulators** Static V-I characteristics of TRIAC and modes of operation – 1-phase AC-AC regulator with R and RL load – For continuous and discontinuous conduction- 3-Phase AC-AC regulator with R load, Cyclo converters	

Unit – 5	
Single phase &Three phase Inverters 1- phase Half bridge and Full bridge inverters with R and RL loads – 3-phase square wave inverters – 120^0conduction and 180^0conduction modes of operation – PWM inverters – Quasi-square wave pulse width modulation – Sinusoidal pulse width modulation – Prevention of shoot through fault in Voltage Source Inverter (VSI) – Current Source Inverter (CSI)	**Hours – 12**

Course outcomes:

On completion of the course student will be able to:

1. Analyze the static and dynamic characteristics of SCRs and Design firing circuits for SCR.
2. Explain the operation of single phase full–wave converters and analyze harmonics in the input current.
3. Explain the operation of three phase full–wave converters.
4. Analyze the operation of different types of DC-DC converters and AC-AC regulators.
5. Explain the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998.
2. Power Electronics: Essentials & Applications by L.Umanand, Wiley, Pvt. Limited, India, 2009.

Reference Books:

1. R. W. Erickson and D. Maksimovic, "Fundamentals of Power Electronics", Springer Science & Business Media, 2007.
2. Elements of Power Electronics–Philip T. Krein, oxford.
3. Power Electronics – by P.S. Bhimbra, Khanna Publishers.
4. Power Electronics: converters, applications & design -by Nedmohan, Tore M.Undeland, Robbins by Wiley India Pvt. Ltd.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs / Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	1	2												3	
CO2	1	2												3	
CO3	1	3												2	
CO4	1	2												3	
CO5	1	3												2	
CO6	1	2												3	
Overall Course	**1**	**3**												**3**	

MICROPROCESSOR LABORATORY
(Proposed syllabus for the academic year 2019 -2020)
SEMESTER-V

Subject Code	**18EEECP5060**	**1A Marks**	**30**
Number of Practice Hours/Week	**03**	**Exam Marks**	**70**
Total Number of Practice Hours	**36**	**Exam Hours**	**03**

Credits – 1.5

COURSE OBJECTIVES:

1. Study the Architecture of 8,16,32 bit Microprocessors.
2. Learn the Programming skills of Microprocessor & Microcontroller.
3. Learn the design aspects of I/O and Memory Interfacing circuits.
4. Study the Architecture of 8051 microcontroller
5. Learn the design aspects of 8051 for different applications.

List of Experiments (Any Ten experiments must be conducted)

PART-A Microprocessor 8086

1. Arithmetic operation – Multi byte addition and subtraction, multiplication and Division
2. Arithmetic operation - Signed and Unsigned arithmetic operation, ASCII - arithmetic operation.
3. Logic operations- Shift and Rotate- Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
4. By using string operation and instruction prefix: Move block, Reverse string, Sorting,

PART-B Microcontroller 8051

5. Reading and writing on a parallel port using 8051.
6. Timer in different modes using 8051.
7. Serial communication implementation using 8051
8. Understanding three memory areas of 00-FF using 8051 external interrupts.
9. 8 bit Analog to Digital Converter using 8051
10. 8 bit Digital to Analog Converter using 8051
11. Introduction to Arduino
12. Introduction to Raspberry pi
13. Introduction to PIC 18 micro controller

COURSE OUTCOMES:

1. To be able to write programs on 8086 Microprocessor .
2. To be able to write programs for different applications using 8086 & 8051.
3. Design and implement programs on 8051 Micro controller.
4. To be able to interface Micro Controller with other electronic devices
5. To Understand the concepts related to I/O and memory interfacing

COURSE-OUTCOMES-TO-PROGRAM-OUTCOMES-MAPPING:

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

POWER SYSTEMS LAB 1
(Proposed-syllabus-for-the-academic-year-2019-2020)
SEMESTER-V

Subject-Code-	**18EEEEL5070**	**1A-Marks**	**30**
Number-of-Practice--Hours/Week	**3P**	**Exam-Marks**	**70**
Total-Number-of-Practice-Hours	**36**	**Exam-Hours**	**03**

Credits- 1.5

COURSE-OBJECTIVES:

1. To Study the concepts of power systems.
2. To Study the various power systemcomponents.
3. To Study and Evaluate fault currents for different types offaults.
4. To Study the generation of over-voltages and insulationcoordination.
5. To Study basic protectionschemes.
6. To Study concepts of HVDC power transmission and renewable energygeneration.

List-of-Experiments-(Any-ten-experiments-must-be-conducted)

1. Transmission line parameter calculations (inductance , capacitance)
2. ABCD parameter
3. Study of different types of insulator
4. Determination of leakage current of pin insulator
5. Voltage distribution across the string insulator
6. Characteristics of transmission line with open & short circuit termination
7. Determination of breakdown strength of solid insulating material
8. Power angle characteristics of a salient pole synchronous machine.
9. Determination of breakdown strength of transformer oil
10. Computation of P-V and Q-V profiles in simple power systems
11. Measurement of earth resistance by earth tester
12. Synchronization of the alternator with infinite bus bar

COURSE-OUTCOMES:

1. Understand the concepts of powersystems.
2. Understand the various power systemcomponents.
3. Evaluate fault currents for different types offaults.
4. Understand the generation of over-voltages and insulationcoordination.
5. Understand basic protectionschemes.
6. Understand concepts of HVDC power transmission and renewable energy generation

COURSE-OUTCOMES-TO-PROGRAM-OUTCOMES-MAPPING:

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

POWER ELECTRONICS-LAB -(Proposed-syllabus-for-the-academic-year-2019-2020)			
Subject-Code-	**18EEEEL5080**	**1A-Marks**	**30**
Number-of-Practice--Hours/Week	**3P**	**Exam-Marks**	**70**
Total-Number-of-Practice-Hours	**36**	**Exam-Hours**	**03**
Credits-1.5			

LAB-OBJECTIVES:

1. To study the characteristics of various power electronic devices and analyze firing circuits and commutation circuits of SCR.
2. To analyze the performance of single–phase and three–phase full–wave bridge converters with both resistive and inductive loads.
3. To understand the operation of AC voltage regulator with resistive and inductive loads.
4. To understand the working of Buck converter, Boost converter and inverters.

List-of-Experiments-(Any-ten-experiments-must-be-conducted)

1. Study of Characteristics of Thyristor, MOSFET & IGBT.
2. Design and development of a firing circuit for Thyristor.
3. Design and development of gate drive circuits for IGBT.
4. Single Phase Half controlled converter with R and RL load
5. Single Phase fully controlled bridge converter with R and RL loads
6. Single Phase AC Voltage Regulator with R and RL Loads
7. Three Phase AC-AC voltage regulator with R-load.
8. Three Phase fully controlled converter with RL–load.
9. Design and verification of voltages gain of Boost converter in Continuous ConductionMode (CCM) and Discontinuous Conduction Mode(DCM).
10. Design and verification of voltages ripple in buck converter in CCM operation.
11. Single phase PWM inverter with sine triangle PWM technique.
12. Single Phase square wave bridge inverter with R and RL Loads

LAB-OUTCOMES:

Students will be able to:

1. Study the characteristics of various power electronic devices and design the gate drive circuits of SCR, IGBT and MOSFET.
2. Analyze the performance of single phase and three phase full wave bridge converters with both resistive and inductive loads.
3. Analyze the operation of single phase and three phase AC voltage regulator with resistive and inductive loads.
4. Design and control the voltage ripple of Buck converter and Boost converter in CCM and DCM
5. Analyze the operation of single phase square wave and PWM inverters.

COURSE-OUTCOMES-TO-PROGRAM-OUTCOMES-MAPPING:

COs / Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	1										
CO2	2	2	2	2	2										
CO3	2	2	2	2	0										
CO4	2	2	2												
CO5	2	2	2												
CO6	2	2	2												
Overall Course	**2**	**2**	**2**	**1**	**1**										

POWER SYSTEMS – II
(Operation and Control)
Proposed syllabus for the academic year 2019-2020
SEMESTER-VI

Subject Code	**18EEEET6030**	**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits – 03

Course Objectives:

This course will enable student to :

1. Use numerical methods to analyse a power system in steady state.
2. Understand stability constraints in a synchronousgrid.
3. Understand methods to control the voltage, frequency and powerflow.
4. Understand the monitoring and control of a powersystem.
5. Understand the basics of power systemeconomics.

Unit-1	
Power Flow Formation of Y–bus and Z- bus matrix. Necessity of power flow studies, Static Real and Reactive power flow equations at a node. Application of numerical methods for solution of non- linear algebraic equations – Gauss Seidel, Newton- Raphson, Decoupled and fast decoupled methods for the solution of the power flow equations and its comparisons.	**Hours – 10**
Unit – 2	**Hours –10**
Fault Analysis Symmetrical Fault analysis - Short circuit MVA Calculations, Unsymmetrical faults on power system (LG-LL-LLG and LLL)	
Unit – 3	**Hours – 09**
Stability Swing Equations of a synchronous machine connected to an infinite bus. Power angle curve - Synchronizing Power Coefficient. Methods of stability analysis - Euler, Runge-Kutta and Equal Area Criterion. Loss of synchronism in a single machine infinite bus system, sudden increase in mechanical input power, sudden loss of line and three--phase fault. Series compensation of Transmission lines for stability improvement.	
Unit – 4	**Hours – 08**
Operation and Control An overview of power system operation and control, Turbines and Speed-Governors, Frequency dependence of loads, Droop Control and Power Sharing. Automatic Generation and absorption of reactive power by various components of a Power System. Excitation System Control in synchronous generators, Methods of voltage control - Automatic Voltage Regulation.	
Unit – 5	**Hours – 9**
Power System Economics and Management Power System load variation- System load characteristics, load curves - daily, weekly and annual, load-duration curve, load factor, diversity factor. Reserve requirements: Installed reserves, spinning reserves, cold reserves, hot reserves. Load forecasting, techniques of	

forecasting.Economic dispatch – Numerical problem lambda-iteration method, Generation Control and integration of economic dispatch control with LFC. unit commitment numerical problems solutions Priority-list methods, forward dynamic programming approach and λ-iteration method.	

Course outcomes:

On completion of the course student will be able to:

1. Use numerical methods to analyse a power system in steady state.
2. Understand stability constraints in a synchronousgrid.
3. Understand methods to control the voltage, frequency and powerflow.
4. Understand the monitoring and control of a powersystem.
5. Understand the basics of power systemeconomics.

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. J. Grainger and W. D. Stevenson, "Power System Analysis" , McGraw Hill Education, 1994.
2. O.I.Elgerd,"ElectricEnergySystemsTheory",McGrawHillEducation,1995.
3. A.R.BergenandV.Vittal,"PowerSystemAnalysis",PearsonEducationInc.,1999.

Reference Books:

1. D. P. Kothari and I. J. Nagrath, " Modern Power System Analysis" , McGraw Hill Education, 2003.
2. B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, "Electric Power Systems", Wiley,2012.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs / Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	2	2	1	1										
CO2	2	2	2	2	2										
CO3	2	2	2	2	0										
CO4	2	2	2												
CO5	2	2	2												
CO6	2	2	2												
Overall Course	**2**	**2**	**2**	**1**	**1**										

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION
Proposed syllabus for the academic year 2019-2020
SEMESTER-VI

Subject Code	**18EEEET6040**	**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits – 03

Course Objectives:

This course will enable student :

1. To study the principle of operation and working of different types of instruments. Measurement of voltage and current.
2. To study the working principle of operation of different types of instruments for measurement of power and energy.
3. To understand the principle of operation and working of dc and ac potentiometers.
4. To understand the principle of operation and working of various types of bridges for measurement of parameters –resistance, inductance, capacitance and frequency.
5. To study the principle of operation and working of various types of magnetic measuring instruments.
6. To study the applications of CRO for measurement of frequency, phase difference and hysteresis loop using Lissajouspatterns.

Unit-1

Measuring Instruments:
Classification –Deflecting,control and damping torques–Ammeters and Voltmeters –PMMC, moving iron type, dynamometer and electrostatic instruments – Expression for the deflecting torque and control torque–Errors and compensations– Extension of range using shunts and series resistance –CT and PT: Ratio and phase angle errors

Hours – 08

Unit – 2

Measurement of Power and Energy:
Single phase and three phase dynamometer wattmeter –LPF and UPF – Expression for deflecting and control torques– Type of P.F. Meters – Single phase and three phase dynamometer and moving iron type Single phase induction type energy meter –Driving and braking.torques – errors and compensations –Testing by phantom loading using R.S.S. meter– Three phase energy meter – Tri vector meter – Maximum demand meters

Potentiometers
Principle and operation of D.C. Crompton's potentiometer – Standardization – Measurement of unknown resistance – Current – Voltage – AC Potentiometers: polar and coordinate types –Standardization – Applications.

Hours – 12

Unit – 3

Measurements of R, L & C Elements:
Method of measuring low, medium and high resistance – Sensitivity of Wheat stone's bridge – Carey Foster's bridge– Kelvin's double bridge for measuring low resistance– Loss of charge method for measurement of high resistance – Megger Measurement of earth resistance – Measurement of inductance – Quality Factor – Maxwell's bridge–Hay's bridge – Anderson's bridge–Measurement of capacitance and loss angle – Desautybridge – Schering Bridge

Hours – 08

Unit – 4	**Hours – 08**
Transducers Definition of transducers – Classification of transducers – Advantages of Electrical transducers – Characteristics and choice of transducers – Principle operation of resistor,inductor, LVDT and capacitor transducers – LVDT Applications – Strain gauge and its principle of operation – Guage factor – Thermistors – Thermocouples – Synchros – Piezoelectric transducers – Photo diodes, Hall sensors.	
Unit – 5	**Hours – 13**
Magnetic Measurements and Digital Meters : Ballistic galvanometer – Equation of motion – Flux meter – Constructional details– Determination of B–H Loop methods of reversals six point method – AC testing – Iron loss of bar samples– Core loss measurements by bridges and potentiometers.Digital Voltmeter–Successive approximation – Measurement of phase difference – Frequency – Hysteresis loop using lissajious patterns in CRO – Ramp and integrating type–Digital frequency meter–Digital multimeter– Digital Tachometer.	

Course outcomes:

On completion of the course student will be able to:

1. An ability to **analyze** PMMC and mi meters and instrument transformers.
2. An ability to calculate load consumption using energy meter
3. An ability to determine unknown physicalparameters
4. An ability to analyze performance of transducers
5. An ability to apply the use of different digital meters.

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C.Widdis, fifth Edition, Wheeler Publishing.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.
3. Electrical and Electronic Measurements and instrumentation by R.K.Rajput, S.Chand.

Reference Books:

1. Electrical & Electronic Measurement & Instruments by A.K.SawhneyDhanpatRai& Co. Publications.
2. Electrical Measurements – by Buckingham and Price, Prentice – Hall
3. Electrical Measurements by Forest K. Harris. John Wiley and Sons
4. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P) Limited, Publishers.
5. Electrical and Electronic Measurements –by G.K.Banerjee, PHI Learning Private Ltd., New Delhi–2012.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs / Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	2													
CO2	2	2													
CO3	2	2													
CO4	2	2													
CO5	2	2													
CO6	2	2													
Overall Course	**2**	**2**													

ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT
(Proposed-syllabus-for-the-academic-year-2019-2020)
SEMESTER-VI

Subject Code	18CMMST6050	**IA Marks**	30
Number of Lecture Hours/Week	4+1	**Exam Marks**	70
Total Number of Lecture Hours	69	**Exam Hours**	03

Credits - 03

Course objectives:

1. To understand the concept and nature of Managerial Economics and Concept of Demand and Demand forecasting.
2. To understand the concept of Production function, Input Output relationship, Cost Concepts and Concept of Cost-Volume-Profit Analysis.
3. To understand the Market structures, significance of various pricing methods and different forms of Business organization and the concepts of Business Cycles.
4. To understand the different Accounting Systems preparation of Financial Statements and uses of different tools for performance evaluation
5. To understand the concept of Capital, Capitalization, Capital Budgeting and to know the techniques used to evaluate Capital Budgeting proposals by using different methods.

Unit -I: Introduction to Managerial Economics and demand Analysis	**Teaching Hours**
Definition of Managerial Economics and Scope-Managerial Economics and its relation with other subjects-Concepts of Demand-Types-Determents-Law of Demand its Exception-Elasticity of Demand-Types and Measurement- Demand forecasting and its Methods.	**16 Hours**
Unit -II: Production and Cost Analysis	
Production function-Isoquants and Isocost-Law of Variable proportions-Cobb-Douglas Production function-Economics of Sale-Cost Concepts-Opportunity Cost-Fixed vs Variable Costs-Explicit Costs vs Implicit Costs- Cost Volume Profit analysis- Determination of Break-Even Point (Simple Problems).	**14 Hours**
Unit-III: Introduction To Markets, Pricing Policies & forms Organizations and Business Cycles	
Market Structures: Perfect Competition, Monopoly and Monopolistic and Oligopoly – Features – Price,Output Determination – Methods of Pricing: Market Skimming Pricing, And Internet Pricing: Flat Rate Pricing. Features and Evaluation of Sole Trader – Partnership – Joint Stock Company – State/Public Enterprises and their forms – Business Cycles – Meaning and Features – Phases of Business Cycle	**13 Hours**
Unit –IV: Introduction to Accounting & Financing Analysis	
Introduction to Double Entry Systems – Preparation of Financial Statements- Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow cash flow statements (Simple Problems)	**12 Hours**
Unit-V: Capital and Capital Budgeting	
Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Need for Capital Budgeting-Techniques of Capital Budgeting-Traditional and Modern Methods.	**14 Hours**

Course outcomes:

1. Students are equipped with the knowledge of managerial economics and estimating demand for a product.
2. Students understand Production and Cost concepts, estimating Cost Break even Analysis.
3. Students are equipped with the knowledge on Markets and Pricing methods along with Business Cycles.
4. Students are able to understand Accounting Concepts and Prepare Financial Statements-Analysis
5. Students are able to analyse various investment project proposals with the help of Capital Budgeting techniques.

Question paper pattern:

Section A:

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This Section will have 10 questions.
2. Each full question carry 12 marks.
3. Each full question will have sub question covering all topics under a unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. Dr. A. R. Aryasri – Managerial Economics and Financial Analysis, TMH 2011.
2. B. Kuberadu Managerial Economics and Financial Analysis, 1/e, HPH, 2013
3. Dr. P. Vijaya Kumar & Dr. N. Apparao Management Science Cengage, Delhi, 2012.
4. Dr. A. R. Arya Sri, Management Science, TNH, 2011

Reference Books:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, PHI, 4th Ed.
3. Koontz and weihrich: Essentials of management, TMH 2011
4. Seth&Rastogi: Global management systems, cengage learning,delhi,2011
5. V. Maheswari: Managerial Economics, Sultan Chand.
6. Dr. B. Kuberudu and Dr. T. V. Ramana: Managerial Economics & Financial Analysis, Himalaya Publishing House 2011.
7. VanithaAgarwal : Managerial Economics, Pearson Publications 2011.
8. Sanjay Dhameja: Financial Accounting for Managers, Pearson.
9. Maheswari : Financial Accounting, Vikas Publications.
10. S. A. Siddiqui& A. S. Siddiqui: Managerial Economics and Financial Analysis, New Age International Publishers, 2012.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs / Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	2	2	1	1								0		
CO2	2	2	2	2	2								1		
CO3	2	2	2	2											
CO4	2	2	2												
CO5	2	2	2										1		
CO6	2	2	2												
Overall Course	**2**	**2**	**2**	**1**	**1**								**1**		

LINE COMMUTATED AND ACTIVE RECTIFIERS

Proposed syllabus for the academic year 2019-2020

SEMESTER-VI

Subject Code		**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits – 03

Course Objectives:

This course will enable student to :

1. Analyze the control rectifier circuits
2. Understand the operation of line commutated rectifiers and multipulse converters
3. Understand the operation of boost converters
4. Understand the operation of fly back converters

Unit-1	
Thyristor rectifiers with passive filtering Half-wave thyristor rectifier with RL and RC loads; 1-phase thyristor rectifier with L and LC filter; 3-phase thyristor rectifier with L and LC filter; continuous and discontinuous conduction, input current waveshape	**Hours – 08**
Unit – 2	**Hours – 08**
Multi-Pulse converter Review of transformer phase shifting, generation of 6-phase ac voltage from 3-phase ac, 6- pulse converter and 12-pulse converters with inductive loads, steady state analysis, commutation overlap, notches during commutation.	
Unit – 3	**Hours – 08**
Single-phase ac-dc single-switch boost converter Review of dc-dc boost converter, power circuit of single-switch ac-dc converter, steady state analysis, unity power factor operation, closed-loop control structure.	
Unit – 4	**Hours – 08**
Ac-dc bidirectional boost converter Review of 1-phase inverter and 3-phase inverter, power circuits of 1-phase and 3-phase ac-dc boost converter, steady state analysis, operation at leading, lagging and unity power factors. Rectification and regenerating modes. Phasor diagrams, closed-loop control structure.	
Unit – 5	**Hours – 13**
Isolated single-phase ac-dc flyback converter Dc-DC fly back converter, output voltage as a function of duty ratio and transformer turns ratio. Power circuit of ac-dc flyback converter, steady state analysis, unity power factor operation, closed loop control structure.	

Course outcomes:

On completion of the course student will be able to:

1. Analyze the control rectifier circuits
2. Understand the operation of line commutated rectifiers and multipulse converters
3. Understand the operation of boost converters
4. Understand the operation of fly back converters

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. G. De, "Principles of Thyristorised Converters", Oxford & IBH Publishing Co, 1988.
2. J.G. Kassakian, M. F. Schlecht and G. C. Verghese, "Principles of Power Electronics", Addison- Wesley, 1991.
3. L. Umanand, " Power Electronics: Essentials and Applications", Wiley India,2009.
4. Abraham I.Press man, "Switching Power Supply Design"

Reference Books:

1. N. Mohan and T. M. Undeland, " Power Electronics: Converters, Applications and Design", John Wiley & Sons, 2007.
2. R. W. Erickson and D. Maksimovic, "Fundamentals of Power Electronics", Springer Science & Business Media, 2001.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs / Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	2	2	1	1								0		
CO2	2	2	2	2	2								1		
CO3	2	2	2	2											
CO4	2	2	2												
Overall Course	**2**	**2**	**2**	**1**	**1**								**1**		

HVDC TRANSMISSION SYSTEM

Proposed syllabus for the academic year 2019-2020

SEMESTER-VI

Subject Code		IA Marks	30
Number of Lecture Hours/week	3L	Exam Marks	70
Total Number of Lecture Hours	45	Exam Hours	03

Credits – 03

Course Objectives:

This course will enable student to :

5. Understand differences among AC and DC transmission system
6. Identify the importance of HVDC in power transmission network.
7. Analyze the 6 pulse and 12 pulse converter performance.
8. Understand the control strategies for HVDC network.

Unit-1	
DC Transmission Technology Comparison of AC and dc Transmission (Economics, Technical Performance and Reliability).Application of DC Transmission.Types of HVDC Systems. Components of aHVDC system. Line Commutated Converter and Voltage Source Converter based systems.	**Hours –08**
Unit – 2	**Hours – 08**
Analysis of Line Commutated and Voltage Source Converters Line Commutated Converters (LCCs): Six pulse converter, Analysis neglecting commutation overlap,harmonics, Twelve Pulse Converters. Inverter Operation.Effect of Commutation Overlap.Expressions for average dc voltage, AC current and reactive power absorbed by the converters.Effect of Commutation Failure, Misfire and Current Extinction in LCC links. Voltage Source Converters (VSCs): Two and Three-level VSCs. PWM schemes: Selective Harmonic Elimination, Sinusoidal Pulse Width Modulation. Analysis of a six pulse converter. Equations in the rotating frame. Real and Reactive power control using a VSC.	
Unit – 3	**Hours –12**
Control of HVDC Converters: Principles of Link Control in a LCC HVDC system. Control Hierarchy, Firing Angle Controls– Phase-Locked Loop, Current and Extinction Angle Control, Starting and Stopping of a Link. Higher level Controllers Power control, Frequency Control, Stability Controllers.Reactive Power Control. Principles of Link Control in a VSC HVDC system: Power flow and DC Voltage Control. Reactive Power Control/AC voltage regulation. **Components of HVDC systems:** Smoothing Reactors, Reactive Power Sources and Filters in LCC HVDC systems DC line: Corona Effects.Insulators, Transient Over-voltages. DC line faults in LCC systems. DC line faults in VSC systems. DC breakers. Mono polar operation. ground electrodes.	
Unit – 4	**Hours –04**
Stability Enhancement using HVDC Control Basic Concepts: Power System Angular, Voltage and Frequency Stability. Power	

Modulation: basic principles – synchronous and asynchronous links. Voltage Stability Problem in AC/DC systems.	
Unit – 5	**Hours –05**
MTDC Links Multi-Terminal and Multi-Infeed Systems.Series and Parallel MTDC systems using LCCs. MTDC systems using VSCs. Modern Trends in HVDCTechnology.Introduction to Modular Multi-level Converters.	

Course outcomes:

On completion of the course student will be able to:

1. Realize the importance of HVDC transmission.
2. Analyze the harmonics effect in converter performance
3. Apply different control strategies to converters.
4. Take the steps to improve stability.

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. K. R. Padiyar, " HVDC Power Transmission Systems", New Age International Publishers,2011.
2. J. Arrillaga, "HighVoltage Direct Current Transmission", Peter Peregrinus Ltd., 1983.

Reference Books:

1. E. W. Kimbark, " Direct Current Transmission", Vol.1, Wiley-Interscience,1971

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs / Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	1	2											3		
CO2	1	2											3		
CO3	1	3											0		
CO4	1	0											2		
CO5	1	3											0		
CO6	1	2											0		
Overall Course	**1**	**3**											**2**		

CONTROL SYSTEM DESIGN
Proposed syllabus for the academic year 2019-2020
SEMESTER-VI

Subject Code		**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits – 03

Course Objectives:

This course will enable student to :

1. Know the concepts of various designing fundamentals.
2. Understand the basic design in both time and frequency domain
3. Know the concepts of PID controllers
4. Enhance the knowledge of design using state space
5. Understand the basic concepts of nonlinearities and their performance
6. Know the concepts of singular points and performance of system

Unit-1	
Design Specifications Introduction to design problem and philosophy. Introduction to time domain and frequency domain design specification and its physical relevance. Effect of gain on transient and steady state response. Effect of addition of pole on system performance. Effect of addition of zero on system response.	**Hours – 08**
Unit – 2	**Hours – 08**
Design of Classical Control System in the time domain and Frequency domain Introduction to compensator. Design of Feedback and Feed forward compensators Feedback compensation. Realization of compensators. Compensator design in frequency domain to improve steady state and transient response. Feedback and Feed forward compensator design using bode diagram.	
Unit – 3	**Hours – 6**
Design of PID controllers Design of P, PI, PD and PID controllers in time domain and frequency domain for first, second and third order systems. Control loop with auxiliary feedback – Feed forward control.	
Unit – 4	**Hours – 04**
Control System Design in state space Review of state space representation. Concept of controllability & observability, effect of pole zero cancellation on the controllability & observability of the system, pole placement design through state feedback. Ackerman's Formula for feedback gain design. Design of Observer. Full order, Reduced order observer. Separation Principle.	
Unit – 5	**Hours – 08**
Design of control for Non Linear Systems Introduction, Methods of solving Non-linear systems of equations. Pseudo-composition, weight function procedure, Technique for extending scalar methods to the multidimensional case in a nontrivial way	

Course outcomes:

On completion of the course student will be able to:

1. Elaborate the concepts of various designing fundamentals.
2. Know the basic design in both time and frequency domain
3. Understand the concepts of PID controllers
4. Enhance the knowledge of design using state space
5. Enumerate the basic concepts of nonlinearities and their performance
6. Understand the concepts of singular points and performance of system

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. N.Nise,"ControlsystemEngineering", JohnWiley,2000.
2. I.J.NagrathandM.Gopal,"Controlsystemengineering",Wiley,2000.
3. M.Gopal,"DigitalControlEngineering",WileyEastern,1988.
4. K.Ogata,"ModernControlEngineering",PrenticeHall,2010.

Reference Books:

1. B. C. Kuo, " AutomaticControl system", Prentice Hall,1995.
2. J. J. D'Azzo and C. H. Houpis, " Linearcontrol system analysis anddesign (conventional and modern)" , McGraw Hill,1995.
3. R. T. Stefani and G. H. Hostetter, "Design of feedback Control Systems", Saunders College Pub,1994.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs / Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	2													3
CO2	1	2													3
CO3	1	3													
CO4	1														2
CO5	1	3													
CO6	1	2													
Overall Course	**1**	**3**													**2**

POWER SYSTEMS LAB II
(Proposed-syllabus-for-the-academic-year-2019-2020)
SEMESTER-VI

Subject-Code-	**18EEEEL6070**	**1A-Marks**	**30**
Number-of-Practice--Hours/Week	**3P**	**Exam-Marks**	**70**
Total-Number-of-Practice-Hours	**36**	**Exam-Hours**	**03**

Credits- 1.5

COURSE-OBJECTIVES:

1. Use numerical methods to analyse a power system in steady state.
2. Understand stability constraints in a synchronousgrid.
3. Understand methods to control the voltage, frequency and powerflow.
4. Understand the monitoring and control of a powersystem.
5. Understand the basics of power systemeconomics.

List-of-Experiments-(Any-ten-experiments-must-be-conducted)

1. Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
2. Load Flow Analysis- I : Solution of load flow and related problems using Gauss-Seidel Method
3. Load Flow Analysis II: Solution of load flow and related problems using Newton Raphson.
4. Load Flow Analysis - II: Solution of load flow and related problems using decoupled and fast decoupted.
5. Fault Analysis of Symmetrical and unsymmetrical faults
6. Simulation of Swing Equations of a synchronous machine connected a single infinite bus
7. Analysis of application of Equal Area Criterion in stability studies
8. Transient and Small Signal Stability Analysis: Single-Machine Infinite Bus System
9. Transient Stability Analysis of Multi machine Power Systems
10. Load – Frequency Dynamics of Single- Area and Two-Area Power Systems
12. System load variation and load characteristics - load curves and load-duration curve.
13. Economic dispatch using lambda-iteration method
14. Unit commitment: Priority-list schemes and dynamic programming

CURSE-OUTCOMES:

1. Use numerical methods to analyse a power system in steady state.
2. Understand stability constraints in a synchronousgrid.
3. Understand methods to control the voltage, frequency and powerflow.
4. Understand the monitoring and control of a powersystem.
5. Understand the basics of power systemeconomics.

COURSE-OUTCOMES-TO-PROGRAM-OUTCOMES-MAPPING:

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

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB
(Proposed-syllabus-for-the-academic-year-2019-2020)
SEMESTER-VI

Subject-Code-	**18EEEEL6080**	**1A-Marks**	**30**
Number-of-Practice--Hours/Week	**3P**	**Exam-Marks**	**70**
Total-Number-of-Practice-Hours	**36**	**Exam-Hours**	**03**

Credits-1.5

COURSE-OBJECTIVES:

1.To-analyze -various-measuring instruments.
2.To-determine R,LC by using suitable bridge
3.To-analyze performance of CT and PT
4.To- determine non electrical parameters.
5.To-determine—temperature of given object by using suitable method
6.To-measure- displacement using LVDT

List-of-Experiments-(Any-ten-experiments-must-be-conducted)

1. Calibration and Testing of single phase energy Meter
2. Calibration LPF wattmeter by using Phantom loading
3. Calibration of dynamometer wattmeter using phantom loading
4. Crompton D.C. Potentiometer- Calibration of PMMC voltmeter and Ammeter
5. Kelvin's double Bridge- Measurement of resistance- Determination of Tolerance.
6. Capacitance Measurement using Schering Bridge.
7. Inductance Measurement using Anderson bridge
8. C.T. testing using mutual Inductor – Measurement of %ratio error and phase angle of given C.T.by Null method
9. Measurement of displacement using LVDT
10. Measurement of displacement using strain gauge based displacement transducer.
11. Measurement of temperature by RTD.
12. Measurement of temperature by thermocouple

COURSE-OUTCOMES:

1. To-be-able-to-apply-various-Measuring instruments.
2. To-be-able-to-analyze-the Performance of Measuring instruments
3. To-be-able to apply suitable bridge to determine unknown quantity.
4. To-be-able-to-determine-Physical Parameters.
5. To-be-able-to-determine Temperature by using suitable method
6. To-be-able-analyze the performance of CT

COURSE-OUTCOMES-TO-PROGRAM-OUTCOMES-MAPPING:

COs / Pos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	2	2	1	1										
CO2	2	2	2	2	2										
CO3	2	2	2	2	0										
CO4	2	2	2	0	0										
CO5	2	2	2	0	0										
CO6	2	2	2	0	0										
Overall Course	**2**	**2**	**2**	**1**	**1**										

III –B.Tech EEE I- Semester Approved Course structure for the Academic Year 2018-2019

SN	Subject Code	Subject title	L	T	P	C	I	E	T
1	18EEEET7010	Power System Protection	3			3			
2	18EEEEP702X	Program Elective -2	3			3			
3	18EEEEP703X	Program Elective -3	3			3			
4	18EEEEO7042	Open Elective-2	3			3			
5	18EEEEO7053	Open Elective-3	3			3			
6	18EEEEL7060	Electronics Design Lab			3	1.5			
7	18EEEER7070	Project Phase-I			8	4			
8	18EEEEC7080	Industry Internship (During summer vacation)				2			
		Total	**15**		**11**	**22.5**			

Program Elective – 2

18EEEEP7021	Electrical Drives
18EEEEP7022	Smart Grid
18EEEEP7023	Optimization Techniques

Program Elective – 3

18EEEEP7031	Electrical and Hybrid Vehicles
18EEEEP7032	Power System Dynamics and Stability
18EEEEP7033	Digital signal Processing

IV B.Tech EEE II Semester Approved Course structure for the Academic Year 2018-2019

SN	Subject Code	Subject title	L	T	P	C	I	E	T
1	18EEEEP801X	Program Elective -4	3			3			
2	18EEEEP802X	Program Elective -5	3			3			
3	18EEEEO8034	Open Elective-4	3			3			
4	18EEEER8040	Project Phase-II			14	7			
		Total	**9**		**14**	**16**			

Program Elective – 4

18EEEEP8011	Advanced Electric Drives
18EEEEP8012	Electrical Energy Conservation And Auditing
18EEEEP8013	Intelligent Control & Its Applications

Program Elective – 5

18EEEEP8021	FACTS
18EEEEP8022	Power Quality
18EEEEP8023	Digital Control Systems

POWER SYSTEM PROTECTION
(Proposed syllabus for the academic year 2019-2020)
SEMESTER-VII

Subject Code	**18EEEET7010**	**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits-03

Course Objectives:

This course will enable student to :

1. Understand the different components of a protectionsystem.
2. Evaluate fault current due to different types of fault in anetwork.
3. Understand the protection schemes for different power systemcomponents.
4. Understand the basic principles of digitalprotection.
5. Understand system protection schemes.
6. Understand the Wide-Area Measurement Systems for improving protection systems.

Unit-1	
Introduction and Components of a Protection System Principles of Power System Protection, Relays, Instrument transformers, Circuit Breakers	**Hours –08**
Unit – 2	**Hours – 08**
Faults and Over-Current Protection Review of Fault Analysis, Sequence Networks. Introduction to overcurrent Protection and overcurrent relay co-ordination.	
Unit – 3	**Hours –10**
Equipment Protection Schemes and Digital Protection Directional, Distance, Differential protection.Transformer and Generator protection. Bus bar Protection, Bus Bar arrangement schemes. Computer-aided protection, Fourier analysis and estimation of Phasors from DFT. Sampling, aliasing issues.	
Unit – 4	**Hours –08**
Modeling and Simulation of Protection Schemes CT/PT modeling and standards, Simulation of transients using Electro-Magnetic Transients (EMT) programs. Relay Testing	
Unit – 5	**Hours – 13**
System Protection Effect of Power Swings on Distance Relaying.System Protection Schemes. Under-frequency, under-voltage and df/dt relays, Out-of-step protection, Synchro- phasors, Phasor Measurement Units and Wide-Area Measurement Systems (WAMS). Application of WAMS for improving protection systems.	

Course outcomes:

On completion of the course student will be able to:

1. Analyze the different components of a protectionsystem.
2. Evaluate the fault current due to different types of fault in anetwork.
3. Analyzetheprotection schemes for different power systemcomponents.
4. Explainthebasic principles of digitalprotection.
5. Evaluate the system protection schemes.
6. Analyze the Wide-Area Measurement Systems for improving protection systems.

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. J. L. Blackburn, " Protective Relaying: Principles and Applications" , Marcel Dekker, New York,1987.
2. Y. G.Paithankar and S. R. Bhide, " Fundamentals of power system protection" , Prentice Hall, India,2010.
3. A. G. Phadke and J. S. Thorp, " Computer Relaying for Power Systems", John Wiley & Sons,1988.

Reference Books:

1. G. Phadke and J. S. Thorp, "Synchronized Phasor Measurements and their Applications" , Springer,2008.
2. D. Reimert, " Protective Relaying for Power Generation Systems", Taylor and Francis, 2006.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	2	3			0										
CO2	2	3			0										
CO3	1	3			1										
CO4	0	1			3										
CO5	2	3			0										
CO6	0	1			0										
Overall Course	**2**	**3**			**1**										

ELECTRIC DRIVES
(Proposed syllabus for the academic year 2019-2020)
SEMESTER-VII

Subject Code	**18EEEEP7021**	**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits-03

Course Objectives:

This course will enable student to :

1. To analyze the operation of three phase converter controlled dc motors and four quadrant operation of dc motors using dual converters.
2. To discuss the converter control of dc motors in various quadrants.
3. To understand the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters.
4. To learn the principles of static rotor resistance control and various slip power recovery schemes.
5. To understand the speed control mechanism of synchronous motors

Unit-1	
Fundamentals of Electric Drives Electric drive, Fundamental torque equation, Load torque components ,Nature and classification of load torques ,Steady state stability , Load equalization, Four quadrant operation of drive (hoist control) ,Braking methods**:** Dynamic, Plugging, Regenerative methods.	**Hours –08**
Unit – 2	**Hours – 08**
Controlled Converter Fed DC Motor Drives 1,phase half and fully controlled converter fed separately and self,excited DC motor drive, Output voltage and current waveforms, Speed,torque expressions , Speed,torquecharacteristics, Principle of operation of dual converters and dual converter fed DC motor drives, Numerical problems.	
Unit – 3	**Hours –10**
DC–DC Converters Fed DC Motor Drives Single quadrant, Two quadrant and four quadrant DC,DC converter fed separately excited and self, excited DC motors, Continuous current operation, Output voltage and current waveforms, Speed, torque expressions, Speed, torque characteristics, Four quadrant operation, Closed loop operation (qualitative treatment only).	
Unit – 4	**Hours –13**
3-phase Induction motor Drives Stator side control of 3,phase Induction motor Drive: Stator voltage control using 3,phase AC voltage regulators, Waveforms, Speed torque characteristics, Variable Voltage Variable Frequency control of induction motor by PWM voltage source inverter, Closed loop v/f control of induction motor drives (qualitative treatment only). Rotor side control of 3,phase Induction motor Drive: Static rotor resistance control, Slip power recovery schemes, Static Scherbius drive, Static Kramer drive, Performance and speed torque characteristics , Advantages – Applications.	

Unit – 5	
Control of Synchronous Motor Drives Separate control & self, control of synchronous motors, Operation of self, controlled synchronous motors by VSI, Closed Loop control operation of synchronous motor drives (qualitative treatment only).Variable frequency control, Pulse width modulation.	**Hours – 08**

Course outcomes:

On completion of the course student will be able to:

1. Explain the fundamentals of electric drive and different electric braking methods.
2. Analyze the operation of three phase converter fed dc motors and four quadrant operations of dc motors using dual converters.
3. Describe the converter control of dc motors in various quadrants of operation
4. Know the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters.
5. Explain the speed control mechanism of synchronous motors

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. Fundamentals of Electric Drives – by G K DubeyNarosa Publications
2. Power Semiconductor Drives, by S.B.Dewan, G.R.Slemon, A.Straughen, Wiley, India Edition.

Reference Books:

1. Electric Motors and Drives Fundamentals, Types and Apllications, by Austin Hughes and Bill Drury, Newnes.
2. Thyristor Control of Electric drives – VedamSubramanyam Tata McGraw Hill Publications.
3. Power Electronic Circuits, Devices and applications by M.H.Rashid, PHI
4. Power Electronics handbook by Muhammad H.Rashid, Elsevier.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	2	3			1										
CO2	2	3			1										
CO3	1	3			1										
CO4	0	1			3										
CO5	2	3			3										
Overall Course	**2**	**3**			**2**										

SMARTGRID (Proposed syllabus for the academic year 2019-2020) SEMESTER-VII			
Subject Code	**18EEEEP7022**	**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**
Credits-03			

Course Objectives:

This course will enable student to :

1. Understand concept of smart grid and its advantages over conventionalgrid.
2. Know smart meteringtechniques.
3. Learn wide area measurementtechniques.
4. Understanding the problems associated with integration of distributed generation & its solution through smart grid.

Unit-1	
Introduction to Smart Grid Evolution of ElectricGrid, Concept of Smart Grid, Definitions, Need of SmartGrid, Concept of Robust &Self-Healing Grid, Present development & International policies in SmartGrid.	**Hours – 08**
Unit – 2	**Hours – 08**
Smart Grid Applications-I Introduction to Smart Meters, Real Time Prizing, SmartAppliances, Automatic Meter Reading(AMR), Outage Management System(OMS),Plug in Hybrid ElectricVehicles(PHEV),Vehicle to Grid, SmartSensors, Home & Building Automation, Smart Substations, Substation Automation, FeederAutomation	
Unit – 3	**Hours – 08**
Smart Grid Applications-II Geographic Information System(GIS), Intelligent Electronic Devices (IED) & their application for monitoring & protection, Smart storage like Battery, SMES, PumpedHydro, Compressed Air EnergyStorage, Wide Area Measurement System (WAMS), Phase Measurement Unit (PMU).	
Unit – 4	**Hours – 10**
Micro Grid Technology Concept of micro-grid, need & applications ofmicro-grid, Formation of micro-grid, Issues ofinterconnection, Protection & control ofmicro-grid, Plastic & Organic solar cells, Thin film solarcells, Variable speed wind generators, fuel-cells,micro-turbines, Captive power plants, Integration of renewable energysources.	
Unit – 5	**Hours – 10**
Regulations and Market Models for Smart Grid Net Metering, Building to Grid B2G, Vehicle to Grid V2G, Solar to Grid, Micro gridDemand Response, Tariff Design, Time of the day pricing (TOD), Time of use pricing (TOU), Consumer privacy and data protection, consumer engagement etc. Cost benefit analysis of smart grid projects.	

Course outcomes:

On completion of the course student will be able to:

1. Appreciate the difference between smart grid & conventional grid.
2. Apply smart metering concepts to industrial and commercial installations.
3. Formulate solutions in the areas of smart substations, distributed generation and wide area measurements.
4. Come up with smart grid solutions using modern communication technologies.

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. Ali Keyhani, "Design of smart power grid renewable energy systems", WileyIEEE,2011.
2. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press,2009.
3. JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, "Smart Grid: Technology and Applications", Wiley2012.

Reference Books:

1. Stuart Borlas'e, "Smart Grid:Infrastructure, Technology and solutions "CRCPress.
2. A.G.Phadke , "Synchronized Phasor Measurement and theirApplications",Springer.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	1	3	0												
CO2	2	3	0												
CO3	0	3	1												
CO4	1	2	0												
CO5	0	3	0												
CO6	0	3	0												
Overall Course	**2**	**3**	**1**												

OPTIMIZATION TECHNIQUES
(Proposed syllabus for the academic year 2019-2020)
SEMESTER-VII

Subject Code	**18EEEEP7023**	**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits -03

Course Objectives:

This course will enable student to :

1. To define an objective function and constraint functions in terms of design variables, and then state the optimization problem.
2. To state single variable and multi variable optimization problems, without and with constraints.
3. To explain linear programming technique to an optimization problem, define slack and surplus variables, by using Simplex method.
4. To study and explain nonlinear programming techniques, unconstrained or constrained, and define exterior and interior penalty functions for optimization problems.
5. To introduce evolutionary programming techniques.

Unit-1	
Introduction and Classical Optimization Techniques: Statement of an Optimization problem, design vector, design constraints, constraint surface, objective function, objective function surfaces, classification of Optimization problems.	**Hours – 08**
Unit – 2	**Hours – 08**
Classical Optimization Techniques Single variable Optimization, multi variable Optimization without constraints, necessary and sufficient conditions for minimum/maximum, multivariable Optimization with equality constraints.Solution by method of Lagrange multipliers, multivariable Optimization with inequality constraints, Kuhn, Tucker conditions.	
Unit – 3	**Hours – 08**
Linear Programming Standard form of a linear programming problem , geometry of linear programming problems, definitions and theorems, solution of a system of linear simultaneous equations, pivotal reduction of a general system of equations, motivation to the simplex method, simplex algorithm, Duality in Linear Programming, Dual Simplex method.	
Unit – 4	**Hours – 08**
Nonlinear Programming: Unconstrained cases,One, dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method, Univariate method, Powell's method and steepest descent method. **Constrained cases,** Characteristics of a constrained problem, Classification, Basic approach of Penalty Function method; Basic approaches of Interior and Exterior penalty function methods.Introduction to convex Programming Problem.	
Unit – 5	**Hours – 13**
Introduction to Evolutionary Methods: Evolutionary programming methods, Introduction to Genetic Algorithms (GA)–	

Control parameters, Number of generation, population size, selection, reproduction, crossover and mutation, Operator selection criteria , Simple mapping of objective function to fitness function, constraints, Genetic algorithm steps, Stopping criteria –Simple examples.	

Course outcomes:

On completion of the course student will be able to:

1. State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.
2. Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution.
3. Formulate a mathematical model and apply linear programming technique by using Simplex method. Also extend the concept of dual Simplex method for optimal solutions.
4. Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions.
5. Able to apply Genetic algorithms for simple electrical problems.

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. "Engineering optimization: Theory and practice"-by S. S.Rao, New Age International (P) Limited, 3rd edition, 1998.
2. 2. Soft Computing with Matlab Programming by N.P.Padhy&S.P.Simson, Oxford University Press – 2015

Reference Books:

1. "Optimization methods in operations Research and Systems Analysis" by K.V.Mital and C.Mohan, New Age International (P) Limited, Publishers, 3rd edition, 1996.
2. Genetic Algorithms in search, optimization, and Machine Learning by David E.Goldberg,ISBN:978-81-7758-829-3, Pearsonby Dorling Kindersley (India) Pvt. Ltd.
3. "Operations Research: An Introduction" by H.A.Taha, PHI pvt. Ltd., 6th edition.
4. Linear Programming by G.Hadley.

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COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	3	0												
CO2	2	3	0												
CO3	0	3	1												
CO4	1	2	0												
CO5	0	3	0												
Overall Course	**2**	**3**	**1**												

ELECTRIC AND HYBRID ELECTRIC VEHICLES
(Proposed syllabus for the academic year 2019-2020)
SEMESTER-VII

Subject Code	**18EEEEP7031**	**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits-03

Course Objectives:

This course will enable student to :

1. Understand working of different configurations of electric and hybrid electric vehicles,
2. Understand hybrid vehicle configuration and its components, performance analysis.
3. Understand of electric vehicle drive systems.
4. Understand the properties of energy storage systems.
5. Understand different Energy management strategies

Unit-1	
Introduction Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance. 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.	**Hours – 08**
Unit – 2	**Hours – 08**
Electric Trains 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. 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, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.	
Unit – 3	**Hours – 12**
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.	
Unit – 4	**Hours – 04**
Energy Storage 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, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. 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, Communications, supporting subsystems	
Unit – 5	**Hours – 05**
Energy Management Strategies 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, implementation issues of energy management strategies. Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).	

Course outcomes:

On completion of the course student will be able to:

1. Understand working of different configurations of electric and hybrid electric vehicles,
2. Understand hybrid vehicle configuration and its components, performance analysis.
3. Understand of electric vehicle drive systems.
4. Understand the properties of energy storage systems.
5. Understand different Energy management strategies

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. C. Mi, M. A. Masrur and D. W. Gao, " Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, " Hybrid Electric Vehicles: Energy Management Strategies" , Springer, 2015.

Reference Books:

1. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.
2. T. Denton, "Electric and Hybrid Vehicles", Routledge, 2016.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	3	0												
CO2	2	3	0												
CO3	0	3	1												
CO4	1	2	0												
CO5	0	3	0												
Overall Course	**2**	**3**	**1**												

POWER SYSTEM DYNAMICS AND STABILITY
(Proposed syllabus for the academic year 2019-2020)
SEMESTER-VII

Subject Code	**18EEEEP7032**	**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits – 03

Course Objectives:

This course will enable student to :

1. Understand the problem of power system stability and its impact on thesystem.
2. Analyse linear dynamical systems and use of numerical integrationmethods.
3. Model different power system components for the study ofstability.
4. Understand the methods to improvestability.

Unit-1	
Introduction to Power System Operations Basics of system dynamics , numerical techniques, importance of power system stability in the operation and control, design distinction between transient and dynamic stability, complexity of stability problem in larges system, stability of interconnected systems **Analysis of Linear Dynamical System and Numerical Methods** Analysis of dynamical System, Concept of Equilibrium, System response to Small and Large Disturbance, linear model of the unregulated synchronous machine and its modes of oscillation, effect of excitation on dynamic stability, Analysis using Numerical solutions, stabilizing signals- dynamic performance measure, small signal performance measures, Integration Techniques	**Hours -08**
Unit – 2	
Modeling of Synchronous Machines and Associated Controllers Modeling of synchronous machine: flux linkage equations, Park's transformation ,equivalent circuit, current space model, flux linkage state space model, D-Q Transformation. Model with Standard Parameters. Steady State Analysis of Synchronous Machine. Short Circuit Transient Analysis, Voltage-reactive power characteristics. Synchronization to an Infinite Bus, Capability curves.	**Hours -08**
Unit – 3	
Modeling of other Power System Components Modeling of Transmission Lines and Loads. Transmission Line Physical Characteristics. Transmission Line Modeling. Load Models - induction machine model. Frequency and Voltage Dependence of Loads.	**Hours-12**
Unit – 4	
Stability Analysis Angular stability analysis in Single Machine Infinite Bus System. Angular Stability in multi- machine systems, Intra-plant, Local and Inter-area modes. Frequency Stability: Centre of Inertia Motion. Load Sharing: Interaction with speed governors ,Voltage Stability, Torsional Oscillations.	**Hours -08**
Unit – 5	
Enhancing System Stability Principle behind transient stability enhancement methods: high-speed fault clearing, reduction of transmission system reactance, regulated shunt compensation, dynamic braking, reactor switching, independent pole-operation of circuit-breakers, single-pole switching, high-speed excitation systems; NGH	**Hours -05**

damper scheme Power System Stabilizers	

Course outcomes:

On completion of the course student will be able to:

1. Understand the problem of power system stability and its impact on thesystem.
2. Analyse linear dynamical systems and use of numerical integrationmethods.
3. Model different power system components for the study ofstability.
4. Understand the methods to improvestability.

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. K.R. Padiyar, " Power System Dynamics, Stability and Control", B. S. Publications, 2002.
2. P.Kundur,"PowerSystemStabilityandControl",McGrawHill,1995.

Reference Books:

1. P.Sauerand M.A.Pai,"PowerSystemDynamicsand Stability",Prentice Hall,1997.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	1	3												2	
CO2	1	3												2	
CO3	1	2												2	
CO4	1	3												2	
CO5	1	2												2	
Overall Course	**1**	**3**												**2**	

DIGITAL SIGNAL PROCESSING
(Proposed syllabus for the academic year 2019-2020)
SEMESTER-VII

Subject Code	**18EEEEP7033**	**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits- 03

Course Objectives:

This course will enable student to :

1. Represent signals mathematically in continuous and discrete-time, and in the frequency domain.
2. Analyze discrete-time systems usingz-transform.
3. Understand the Discrete-Fourier Transform (DFT) and the FFTalgorithms.
4. Design digital filters for variousapplications.
5. Apply digital signal processing for the analysis of real-lifesignals.

Unit-1	
Discrete-time signals and systems Discrete time signals and systems: Sequences; representation of signals on orthogonal basis; Representation of discrete systems using difference equations, Sampling and reconstruction of signals, aliasing; Sampling theorem and Nyquist rate.	**Hours – 08**
Unit – 2	**Hours – 08**
Z-transform z-Transform, Region of Convergence, Analysis of Linear Shift Invariant systems using z- transform, Properties of z-transform for causal signals, Interpretation of stability in z-domain, Inverse z-transforms.	
Unit – 3	**Hours – 09**
Discrete Fourier Transform Frequency Domain Analysis, Discrete Fourier Transform (DFT), Properties of DFT, Convolution of signals, Fast Fourier Transform Algorithm, Parseval's Identity, Implementation of Discrete Time Systems.	
Unit – 4	**Hours – 12**
Design of Digital filters Design of FIR Digital filters: Window method, Park-McClellan's method. Design of IIR Digital Filters: Butterworth, Chebyshev and Elliptic Approximations;Low-pass, Band-pass, Band- stop and High-pass filters. Effect of finite register length in FIR filter design. Parametric and non-parametric spectral estimation. Introduction to multi-rate signal processing.	
Unit – 5	**Hours – 08**
Applications of Digital Signal Processing Correlation Functions and Power Spectra, Stationary Processes, Optimal filtering using ARMA Model, Linear Mean-Square Estimation, Wiener Filter.	

Course outcomes:

On completion of the course student will be able to:

1. To apply DFT for the analysis of digital signals & systems
2. To design FIR filters
3. To design IIR filters
4. To design optimal filtering using ARMA model
5. To have a deep understanding on basics of digital signal processing which can be applied to transmission systems

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. S. K. Mitra, "DigitalSignal Processing: A computer based approach", McGraw Hill, 2011.
2. A.V. Oppenheim and R. W. Schafer, "Discrete Time Signal Processing", Prentice Hall,1989.
3. J. G. Proakis and D.G. Manolakis, " Digital Signal Processing: Principles, Algorithms And Applications", Prentice Hall,1997.
4. L. R.Rabiner and B. Gold, "Theory and Application of Digital Signal Processing" , Prentice Hall, 1992.

Reference Books:

1. J.R. Johnson,"IntroductiontoDigitalSignalProcessing",PrenticeHall,1992.
2. D. J. DeFatta, J. G. Lucas andW. S. Hodgkiss, " Digital Signal Processing" , John Wiley & Sons, 1988

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	3	0											0	0
CO2	2	3	0											0	0
CO3	0	3	1											0	0
CO4	1	3	0											0	0
CO5	0	3	0											0	0
Overall Course	2	3	1											1	1

ELECTRONICS DESIGN LABORATORY (Proposed-syllabus-for-the-academic-year-2019-2020) SEMESTER-VII			
Subject Code	**18EEEEL7060**	**1A-Marks**	**30**
Number of Lecture Hours/week	**3P**	**Exam-Marks**	**70**
Total Number of Lecture Hours	**36**	**Exam-Hours**	**03**
Credits-1.5			

COURSE-OBJECTIVES:

At the end of the course, students will demonstrate the ability to

1. Understand the practical issues related to practical implementation of applications using electroniccircuits.
2. Choose appropriate components, software and hardwareplatforms.
3. Design a Printed Circuit Board, get it made and populate/solder it withcomponents.
4. Work as a team with other students to implement anapplication

List-of-Experiments-(Any-ten-experiments-must-be-conducted)

Basic concepts on measurements; Noise in electronic systems; Sensors and signal conditioning circuits; Introduction to electronic instrumentation and PC based data acquisition; Electronic system design, Analog system design, Interfacing of analog and digital systems, Embedded systems, Electronic system design employing microcontrollers, CPLDs, and FPGAs, PCB design and layout; System assembly considerations. Group projects involving electronic hardware (Analog, Digital, mixed signal) leading to implementation of anapplication.

COURSE-OUTCOMES:

1. Understand the practical issues related to practical implementation of applications using electroniccircuits.
2. Choose appropriate components, software and hardwareplatforms.
3. Design a Printed Circuit Board, get it made and populate/solder it withcomponents.

Work as a team with other students to implement anapplication

TEXT/REFERENCE BOOKS:

1. A. S. Sedra and K. C. Smith, "Microelectronic circuits", Oxford University Press, 2007.
2. P.Horowitz and W.Hill,"The ArtofElectronics",CambridgeUniversityPress,1997.
3. H.W.Ott, "Noise Reduction Techniques in Electronic Systems", Wiley,1989.
4. W.C. Boss hart, "Printed Circuit Boards: Design and Technology", Tata McGraw Hill, 1983.
5. G.L. Ginsberg, "Printed Circuit Design" , McGraw Hill,1991.

COURSE-OUTCOMES-TO-PROGRAM-OUTCOMES-MAPPING:

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	3	0											0	0
CO2	2	3	0											0	0
CO3	0	3	1											0	0
CO4	1	3	0											0	0
Overall Course	2	3	1											1	1

ADVANCED ELECTRIC DRIVES
(Proposed syllabus for the academic year 2019-2020)
SEMESTER-VII

Subject Code	**18EEEEP8011**	**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits – 03

Course Objectives:

This course will be able student to understand :

1. Understand the operation of power electronic converters and their controlstrategies.
2. Understand the vector control strategies for ac motordrives
3. Understand the implementation of the control strategies using digital signal processors.

Unit-1	
Power Converters for AC drives PWM control of inverter, selected harmonic elimination, space vector modulation, current control of VSI, three level inverter, Different topologies, SVM for 3 level inverter, Diode rectifier with boost chopper, PWM converter as line side rectifier, current fed inverters with self-commutated devices. Control of CSI, H bridge as a 4-Q drive.	**Hours – 10**
Unit – 2	**Hours – 10**
Induction motor drives Different transformations and reference frame theory, modeling of induction machines, voltage fed inverter control-v/f control, vector control, direct torque and flux control(DTC).	
Unit – 3	**Hours – 06**
Synchronous motor drives Modeling of synchronous machines, open loop v/f control, vector control, direct torque control, CSI fed synchronous motor drives.	
Unit – 4	**Hours – 06**
Permanent magnet motor drives Introduction to various PM motors, BLDC and PMSM drive configuration, comparison, block diagrams, Speed and torque control in BLDC and PMSM.	
Unit – 5	**Hours – 12**
Switched reluctance motor drives Evolution of switched reluctance motors, various topologies for SRM drives, comparison, Closed loop speed and torque control of SRM. **DSP based motion control** Use of DSPs in motion control, various DSPs available, realization of some basic blocks in DSP for implementation of DSP based motion control.	

Course outcomes:

On completion of the course student will be able to:

1. Understand the operation of power electronic converters and their controlstrategies.
2. Understand the vector control strategies for ac motordrives
3. Understand the implementation of the control strategies using digital signal processors

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. B.K.Bose,"ModernPowerElectronicsandACDrives",PearsonEducation,Asia,2003.
2. P. C. Krause, O. Wasynczuk and S. D. Sudhoff, " Analysisof Electric Machinery and Drive Systems", John Wiley & Sons,2013.

Reference Books:

1. H.A.TaliyatandS.G.Campbell,"DSPbasedElectromechanicalMotionControl", CRC press,2003.
2. R. Krishnan, " Permanent Magnet Synchronous and Brushless DC motor Drives" , CRC Press,2009.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	1	3	0											0	0
CO2	2	3	0											0	0
CO3	0	3	1											0	0
Overall Course	2	3	1											1	1

ELECTRICAL ENERGY CONSERVATION AND AUDITING
(Proposed syllabus for the academic year 2019-2020)
SEMESTER-VII

Subject Code	**18EEEEP8012**	**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits-03

Course Objectives:

This course will be able student to understand :

1. To understand energy efficiency, scope, conservation and technologies.
2. To design energy efficient lighting systems.
3. To estimate/calculate power factor of systems and propose suitable compensation techniques.
4. To understand energy conservation in HVAC systems.
5. To calculate life cycle costing analysis and return on investment on energy efficient technologies.

Unit-1	
Basic Principles of Energy Audit and management Energy audit – Definitions – Concept – Types of audit – Energy index – Cost index – Pie charts –Sankey diagrams – Load profiles – Energy conservation schemes and energy saving potential – Numerical problems – Principles of energy management – Initiating, planning, controlling, promoting, monitoring, reporting – Energy manager – Qualities and functions – Language – Questionnaire – Check list for top management.	**Hours – 08**
Unit – 2	**Hours – 12**
Lighting Modification of existing systems – Replacement of existing systems – Priorities**:** Definition of terms and units – Luminous efficiency – Polar curve – Calculation of illumination level – Illumination of inclined surface to beam – Luminance or brightness – Types of lamps – Types of lighting – Electric lighting fittings (luminaries) – Flood lighting – White light LED and conducting Polymers – Energy conservation measures.	
Unit – 3	**Hours – 12**
Power Factor and energy instruments Power factor – Methods of improvement – Location of capacitors – Power factor with non linear loads – Effect of harmonics on Power factor – Numerical problems. Energy Instruments – Watt–hour meter – Data loggers – Thermocouples – Pyrometers – Lux meters – Tong testers – Power analyzer.	
Unit – 4	**Hours – 08**
Space Heating and Ventilation Ventilation -Air-Conditioning (HVAC) and Water Heating**:** Introduction, Heating of buildings -Transfer of Heat–Space heating methods -Ventilation and air–conditioning- Insulation-Cooling load -Electric water heating systems-Energy conservation methods.	
Unit – 5	**Hours – 8**
Computation of Economic Aspects and Financial Analysis Understanding energy cost, Economics Analysis – Depreciation Methods – Time value of money – Rate of return – Present worth method – Replacement analysis – Life cycle costing analysis – Energy efficient motors (basic concepts) – Economics of energy efficient motors and systems. Need of investment, appraisal and criteria, Calculation of simple payback period–Return on investment – Net present value – Internal rate of return – numerical examples Applications of life cycle costing analysis – Return on investment –Numerical examples.	

Course outcomes:

On completion of the course student will be able to:

1. To understand energy efficiency, scope, conservation and technologies.
2. To design energy efficient lighting systems.
3. To estimate/calculate power factor of systems and propose suitable compensation techniques.
4. To understand energy conservation in HVAC systems.
5. To calculate life cycle costing analysis and return on investment on energy efficient technologies.

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. Hand Book of Energy Audit by Sonal Desai- Tata McGraw hill
2. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd–2nd edition, 1995

Reference Books:

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications. 2012
2. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.
3. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.
4. Energy management hand book by W.C.Turner, John wiley and sons.
5. Energy management and conservation –k v Sharma and pvenkataseshaiah-I K International Publishing House pvt.ltd,2011.
6. http://www.energymanagertraining.com/download/Gazette_of_IndiaPartIISecI- 37_25-08-2010.pdf

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	1	3	0											0	0
CO2	2	3	0											0	0
CO3	0	3	1											0	0
CO4	1	3	0											0	0
CO5	0	3	0											0	0
CO6	0	3	0											3	2
Overall Course	**2**	**3**	**1**											**1**	**1**

INTELLIGENT CONTROL AND APPLICATIONS

(Proposed syllabus for the academic year 2019-2020)

SEMESTER-VII

Subject Code	18EEEEP8013	**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits – 03

Course Objectives:

This course will enable student to :

1. Understand the basic intelligent controller concept
2. Understand concepts of feed forward neural networks and learning and understanding of feedback neural networks.
3. Understand and analyze the concept of genetic algorithm.
4. Understand the knowledge of fuzzy logic control.
5. Apply the knowledge of fuzzy logic control, genetic algorithm and neural network to the real problems.

Unit-1	
INTRODUCTION TO INTELLIGENT CONTROL: Introduction and motivation. Approaches to intelligent control. Architecture for intelligent control. Symbolic reasoning system, rule-based systems, the AI approach. Knowledge representation. Expert systems.	**Hours – 08**
Unit – 2	**Hours – 12**
ARTIFICIAL NEURAL NETWORKS Concept of Artificial Neural Networks, its basic mathematical model, McCulloch-Pitts neuron model, simple perceptron, Adaline and Madaline, Feed-forward Multilayer Perceptron. Learning and Training the neural network. Introduction,derivation,algorithm,flowchart,limitation-Error Back propagation, Hopefield, Radial bases function	
Unit – 3	**Hours – 08**
GENETIC ALGORITHM Basic concept of Genetic algorithm and detail algorithmic steps, adjustment of free parameters. Solution of typical control problems using genetic algorithm. Concept on some other search techniques like tabu search and ant-colony search techniques for solving optimization problems	
Unit – 4	**Hours – 08**
FUZZY LOGIC SYSTEM Introduction to crisp sets and fuzzy sets, basic fuzzy set operation and approximate reasoning. Introduction to fuzzy logic modeling and control. Fuzzification, inferencing and defuzzification. Fuzzy knowledge and rule bases. Fuzzy modeling and control schemes for nonlinear systems. Fuzzy logic control for nonlinear time-delay system. Implementation of fuzzy logic controller.	
Unit – 5	**Hours – 10**
APPLICATIONS Industrial applications to GeniticAlgorithm,Neural Network and Fuzzy Logic Control- case studies	

Course outcomes:

On completion of the course student will be :

1. able to identify knowledge representations applied to artificial intelligence techniques
2. able to model artificial neuron and identify its use in Perceptron models and back propagation algorithm to multilayer feed forward networks
3. able to develop rule based and decision making with the use of classical and fuzzy logic systems
4. able to analyze concept of genetic algorithm.
5. able to analyze various applications of neural and fuzzy logic systems in electrical Engineering

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. Simon Haykins, Neural Networks: A comprehensive Foundation, Pearson Edition, 2003.
2. T.J. Ross, Fuzzy logic with Fuzzy Applications, McGraw Hill Inc, 1997.
3. David E Goldberg, Genetic Algorithms. Wesley Publishing Company,1989
4. John Yen and Reza Langari, Fuzzy logic Intelligence, Control, and Information, PearsonEducation, Indian Edition, 2003.
5. Neural Network, Fuzzy Logic and Genetic Algorithm : Synthesis and Applications S. Rajasekaran and G. A. VijayalakshmiPai (Prentice Hall India, 2010)

Reference Books:

1. M.T. Hagan, H. B. Demuth and M. Beale, Neural Network Design, Indian reprint, 2008.
2. Fredric M. Ham and IvicaKostanic, Principles of Neuro computing for science andEngineering, McGraw Hill, 2001.
3. N. K. Bose and P. Liang, Neural Network Fundamentals with Graphs, Algorithms, andApplications, Mc, Graw Hill, Inc. 1996.
4. Yung C. Shin and ChengyingXu, Intelligent System, Modeling, Optimization and Control,CRC Press, 2009.
5. N. K. Sinha and Madan M Gupta, Soft computing & Intelligent Systems, Theory &Applications, Indian Edition, Elsevier, 2007.
6. WitoldPedrycz, Fuzzy Control and Fuzzy Systems, Overseas Press, Indian Edition, 2008.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1				3										
CO2	2				3										
CO3			1		3										
CO4	1				3										
CO5					3										
Overall Course	2		1		3									1	1

FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS
(Proposed syllabus for the academic year 2019-2020)
SEMESTER-VII

Subject Code	**18EEEEP8021**	**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits -03

Course Objectives:

This course will enable student to :

1. To learn the basics of power flow control in transmission lines using FACTS controllers
2. To explain operation and control of voltage source converter.
3. To understand compensation methods to improve stability and reduce power oscillations of a power system.
4. To learn the method of shunt compensation using static VAR compensators.
5. To learn the methods of compensation using series compensators
6. To explain operation of Unified Power Flow Controller (UPFC).

Unit-1	
Introduction to FACTS Power flow in an AC System – Loading capability limits – Dynamic stability considerations – Importance of controllable parameters – Basic types of FACTS controllers – Benefits from FACTS controllers – Requirements and characteristics of high power devices – Voltage and current rating – Losses and speed of switching – Parameter trade–off devices.	**Hours – 08**
Unit – 2 **Voltage source and Current source converters** Concept of voltage source converter(VSC) – Single phase bridge converter – Square–wave voltage harmonics for a single–phase bridge converter – Three– phase full wave bridge converter– Three–phase current source converter – Comparison of current source converter with voltage source converter.	**Hours – 08**
Unit – 3 **Shunt Compensators–1** Objectives of shunt compensation – Mid–point voltage regulation for line segmentation – End of line voltage support to prevent voltage instability – Improvement of transient stability – Power oscillation damping.	**Hours – 08**
Unit – 4 **Shunt Compensators–2** Thyristor Switched Capacitor(TSC)–Thyristor Switched Capacitor – Thyristor Switched Reactor (TSC–TCR). Static VAR compensator(SVC) and Static Compensator(STATCOM): The regulation and slope transfer function and dynamic performance – Transient stability enhancement and power oscillation damping– Operating point control and summary of compensation control.	**Hours – 08**
Unit – 5 **Series Compensators** Static series compensators: Concept of series capacitive compensation – Improvement of transient stability – Power oscillation damping – Functional requirements. GTO thyristor controlled Series Capacitor (GSC) – Thyristor Switched Series Capacitor (TSSC) and Thyristor Controlled Series Capacitor (TCSC).	**Hours – 13**

Combined Controllers Schematic and basic operating principles of Unified Power Flow Controller (UPFC).– Application on transmission lines.

Course outcomes:

On completion of the course student will be able to:

1. Understandpower flow control in transmission lines using FACTS controllers.
2. Explain operation and control of voltage source converter.
3. Analyze compensation methods to improve stability and reduce power oscillations in the transmission lines.
4. Explain the method of shunt compensation using static VAR compensators.
5. Understand the methods of compensations using series compensators.
6. Explain operation of Unified Power Flow Controller (UPFC).

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. "Understanding FACTS" N.G.Hingorani and L.Guygi, IEEE Press.Indian Edition is available:—Standard Publications, 2001.

Reference Books:

1. "Flexible ac transmission system (FACTS)" Edited by Yong Hue Song and Allan T Johns, Institution of Electrical Engineers, London.
2. Thyristor-based FACTS Controllers for Electrical Transmission Systems, by R.MohanMathur and Rajiv k.Varma, Wiley

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	3	0											0	0
CO2	2	3	0											0	0
CO3	0	3	1											0	0
CO4	1	3	0											0	0
CO5	0	3	0											0	0
CO6	0	3	0											3	2
Overall Course	2	3	1											1	1

POWER QUALITY
(Proposed syllabus for the academic year 2019-2020)
SEMESTER-VII

Subject Code	18EEEEP8022	**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits – 03

Course Objectives:

This course will enable student to :

1. To learn different types of power quality phenomena.
2. To identify sources for voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.
3. To describe power quality terms and study power quality standards.
4. To learn the principle of voltage regulation and power factor improvement methods.
5. To explain the relationship between distributed generation and power quality.
6. To understand the power quality monitoring concepts and the usage of measuring instruments.

Unit-1	
Introduction Overview of power quality – Concern about the power quality – General classes of power quality and voltage quality problems – Transients – Long–duration voltage variations – Short–duration voltage variations – Voltage unbalance – Waveform distortion – Voltage fluctuation – Power frequency variations.	**Hours -09**
Unit – 2	**Hours - 10**
Voltage imperfections in power systems Power quality terms – Voltage sags – Voltage swells and interruptions – Sources of voltage sag, swell and interruptions – Nonlinear loads – IEEE and IEC standards. Source of transient over voltages – Principles of over voltage protection – Devices for over voltage protection – Utility capacitor switching transients.	
Unit – 3	**Hours -10**
Voltage Regulation and power factor improvement: Principles of regulating the voltage – Device for voltage regulation – Utility voltage regulator application – Capacitor for voltage regulation – End–user capacitor application – Regulating utility voltage with distributed resources – Flicker – Power factor penalty – Static VAR compensations for power factor improvement.	
Unit – 4	**Hours -09**
Harmonic distortion and solutions Voltagedistortion vs. Current distortion – Harmonics vs. Transients – Harmonic indices – Sources of harmonics – Effect of harmonic distortion – Impact of capacitors, transformers, motors and meters – Point of common coupling – Passive and active filtering	
Unit – 5	**Hours -08**
Compenastion Compensation for power quality enhancement-Series,Shunt and Combained.	

Course outcomes:

On completion of the course student will be able to:

1. Differentiate between different types of power quality problems.
2. Explain the sources of voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.
3. Analyze power quality terms and power quality standards.
4. Explain the principle of voltage regulation and power factor improvement methods.
5. Demonstrate the relationship between distributed generation and power quality.
6. Explain the power quality monitoring concepts and the usage of measuring instruments.

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. Electrical Power Systems Quality, Dugan R C, McGranaghan M F, Santoso S, and Beaty H W, Second Edition, McGraw–Hill, 2012, 3rd edition.
2. Electric power quality problems –M.H.J.Bollen IEEE series-Wiley India publications,2011.

Reference Books:

1. Power Quality Primer, Kennedy B W, First Edition, McGraw–Hill, 2000.
2. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M HJ, First Edition, IEEE Press; 2000.
3. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.
4. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad Reinhold, New York.
5. Power Quality c.shankaran, CRC Press, 2001
6. Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor & Francis)
7. Power Quality in Power systems and Electrical Machines–EwaldF.fuchs, Mohammad A.S. Masoum–Elsevier.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
CO1	1	3	0											0	0
CO2	2	3	0											0	0
CO3	0	3	1											0	0
CO4	1	3	0											0	0
CO5	0	3	0											0	0
CO6	0	3	0											3	2
Overall Course	**2**	**3**	**1**											**1**	**1**

DIGITAL CONTROL SYSTEMS
(Proposed syllabus for the academic year 2019-2020)
SEMESTER-VII

Subject Code	**18EEEEP8023**	**IA Marks**	**30**
Number of Lecture Hours/week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam Hours**	**03**

Credits – 03

Course Objectives:

This course will enable student to :

1. Obtain discrete representation of LTIsystems.
2. Analyze stability of open loop and closed loop discrete-timesystems.
3. Design and analyse digitalcontrollers.
4. Design state feedback and output feedbackcontrollers.
5. Analyze the concepts of feed back control
6. Understand the basic concepts of fast output sampling

Unit-1	
Discrete Representation of Continuous Systems Basics of Digital Control Systems. Discrete representation of continuous systems. Sample and hold circuit. Mathematical Modelling of sample and hold circuit. Effects of Sampling and Quantization. Choice of sampling frequency. ZOH equivalent.	**Hours – 08**
Unit – 2	**Hours – 08**
Discrete System Analysis Z-Transform and Inverse Z Transform for analyzing discrete time systems. Pulse Transfer function. Pulse transfer function of closed loop systems. Mapping from s-plane to z plane. Solution of Discrete time systems. Time response of discrete time system.	
Unit – 3	**Hours – 12**
Stability of Discrete Time System Stability analysis by Jury test. Stability analysis using bilinear transformation. Design of digital control system with dead beat response. Practical issues with dead beat response design. **State Space Approach for discrete time systems** State space models of discrete systems, State space analysis. Controllability, reach-ability, Reconstructibility and observability analysis. Effect of pole zero cancellation on the controllability & observability.	
Unit – 4	**Hours – 04**
Design of Digital Control System Design of Discrete PID Controller, Design of discrete state feedback controller. Design of Discrete Observer,full order and reduced order for LTI System.	
Unit – 5	**Hours – 05**
Discrete output feedback control Design of discrete output feedback control. Fast output sampling (FOS) and periodic output feedback controller design for discrete time systems.	

Course outcomes:

On completion of the course student will be able to:

1. Obtain discrete representation of LTIsystems.
2. Analyze stability of open loop and closed loop discrete-timesystems.
3. Design and analyse digitalcontrollers.
4. Design state feedback and output feedbackcontrollers.
5. Analyze the concepts of feed back control
6. Understand the basic concepts of fast output sampling

Question paper pattern:

Section A :

1. This section contains ten one or two line answer question carrying 1 mark each.
2. Two questions from each unit should present.

Section B:

1. This section will have 10 questions.
2. Each full question carries 12 marks.
3. Each full question will have sub question covering all topics under unit.

The student will have to answer 5 full questions selecting one full question from each unit.

Text Books:

1. K.Ogata,"DigitalControlEngineering",Prentice Hall,EnglewoodCliffs,1995.
2. B.C.Kuo,"DigitalControlSystem",Holt,RinehartandWinston,1980.

Reference Books:

1. G. F. Franklin, J. D. Powell and M. L. Workman, " Digital Control of Dynamic Systems", Addison-Wesley,1998.
2. M.Gopal,"DigitalControlEngineering",WileyEastern,1988.

COURSE OUTCOMES TO PROGRAME OUTCOMES MAPPING:

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	1	3													2
CO2	0	2													3
CO3	1	2													2
CO4	1	3													2
CO5	1	2													2
CO6	1	3													2
Overall Course	**1**	**3**													2