Structure for Second Year B. Tech. (Electrical) from Academic Year 2019 - 20

Choice Based Credit System

Semester- I

Sr. No	Code	Subject	Contact Period (Hrs.)			Credits	Continuous Evaluation in terms of Marks						
			L	T	P		Class Test I	Class test II	TA	ESE	TW	Practical & Viva-voce	Total
1	MA2001	Engineering Mathematics-III	4	-	-	4	15	15	10	60	-	-	100
2	HS2001	Environmental Studies	4	-	-	4	15	15	10	60	-	-	100
3	EE2001	Electromagnetic Field	3	-	-	3	15	15	10	60	-	-	100
4	EE2002	Network Analysis	3	-	-	3	15	15	10	60	-	-	100
5	EE2003	Analog Electronics	3	-	-	3	15	15	10	60	-	-	100
6	EE2004	Computer Programming	2	-		2	15	15	10	60	-	-	100
7	EE2005	Lab- Network Analysis	-	-	2	1	-	-	-	-	25	25	50
8	EE2006	Lab- Analog Electronics	-	-	2	1	-	-	-	-	25	25	50
9	EE2007	Lab- Computer Programming	-	-	2	1	-	-	-	-	25	25	50
		A] Total of Semester I	19	-	6	22	90	90	60	360	75	75	750

Semester- II

Sr. No	Code	Subject	Contact Period (Hrs.)			Credits	Continuous Evaluation in terms of Marks						
			L	T	P		Class Test I	Class test II	TA	ESE	TW	Practical & Viva-voce	Total
1		Select any one subject from HSS list from institute website	3	-	-	3	15	15	10	60	-	-	100
2	EE2008	Electrical Machines-I	3	1	-	4	15	15	10	60	-	-	100
3	EE2009	Electrical Measurement & Instrumentation	3	-	-	3	15	15	10	60	-	-	100
4	EE2010	Power System I	3	1	-	4	15	15	10	60	-	-	100
5	EE2011	Linear integrated circuits and Applications	3	-	-	3	15	15	10	60	-	-	100
6	EE2015 to EE2020	Select any one course from list ES courses	2	-	-	2	15	15	10	60	-	-	100
7		Select any one course from list mandatory courses	3	-	-	0	-	-	-	-	-	-	-
8	EE2012	Lab- Electrical Machines-I	-	-	2	1	-	-	-	-	25	25	50
9	EE2013	Lab- Electrical Measurement & Instrumentation	-	-	2	1	-	-	-	-	25	25	50
10	EE2014	Lab- Linear Integrated Circuits and Applications	-	-	2	1	-	-	-	-	25	25	50
11	#	Internship/Industrial Training											
		B] Total of Semester II	20	2	6	22	90	90	60	360	75	75	750
		Total of Semesters (A+B)	39	2	12	44	180	180	120	720	150	150	1500

L = Lecturer, T = Tutorial, P = Practical, TA = Teacher Assessment, ESE = End Semester Examination

External Examiner may be appointed from the same university

 # Internship/Industrial Training: The student has to undergo internship/industrial training of minimum one month after fourth and/or sixth semester with minimum of two weeks in one attempt. The student has to give presentation on the same in subsequent semester.

Students shall select any one course from Engineering Science course list given below

Course Code	Name of subject	Course Code	Name of subject	Course Code	Name of subject
EE2015	Material Science	EE2017	Solid Mechanics	EE2019	Engineering Materials
EE2016	Basic Thermodynamics	EE2018	Fluid Mechanics	EE2020	Numerical computational Techniques

MA 2001: Engineering Mathematics-III	
Teaching Scheme **Lectures : 4 Hrs/Week** **Total Credits : 04**	**Examination Scheme** **Class Test-I : 15 Marks** **Class Test-II : 15 Marks** **Teachers Assessment : 10Marks** **End Semester Exam : 60 Marks**

Course description:

Engineering Mathematics-III (MA 2001) is a compulsory course to all second year engineering students of the institute in the Semester –III and is a continuation of previous year courses viz. Engineering Mathematics-I (MA1001) and Engineering Mathematics-II (MA1002). This course intends to provide engineering students a coherent and balanced account of major mathematical techniques and tools.

Course Objective:

This course intends to provide an overview of analytical and numerical techniques to solve ordinary and partial differential equations, which we apply to solve many engineering problems of mechanical, civil electrical Engineering.

Course Outcomes:

After completing the course, students will be able to:

CO1	Determine the solution of second and higher order linear differential equation and apply knowledge of LDE to solve the problems in Engineering
CO2	Classify, formulate and solve the first order and second order linear, non-linear partial differential equations and apply the knowledge of partial differential equations to solve the problems in Engineering
CO3	Find approximate solution of ordinary differential equations of first order and find the convergence and stability of the approximate solutions

Detailed syllabus:

Unit-I	**Linear Differential Equations (LDE):** Linear Differential Equations **(LDE)** with constant coefficients, Differential equations reducible to LDE with constant coefficients, Simultaneous LDE with constant coefficients	**08 Hrs**
Unit-II	**Applications of Linear Differential Equations (LDE):** L-C-R Circuit, Coupled Electrical Circuits, Bending of beams, Spring-Mass system	**08 Hrs**
Unit-III	**Partial Differential Equations (PDE):** First order linear/ nonlinear Partial Differential Equation Formation **(PDE)**, Lagrange's equation, Linear Partial Differential Equations **(PDE)** of second and higher order with constant coefficients, Linear non-homogeneous PDE.	**08 Hrs**
Unit-IV	**Applications of Partial Differential Equations:** Solutions of one-dimensional wave equation, one-dimensional heat equation, Steady state solution of two-dimensional heat equation, Fourier series solutions in Cartesian coordinates.	**08 Hrs**
Unit-V	**The approximation for the solution of first order Ordinary Differential Equations:** Taylor series method, Euler's method, Euler's modified Method, Runge-Kutta Fourth order Method, Milne's Predictor-Corrector Method, Solution of system of ordinary differential equations by Runge-Kutta methods.	**08 Hrs**

Text and Reference Books

1. A Text Book of engineering Mathematics (Vol.1 &2) by P.N.Wartikar&J.N.Wartikar, Pune VidhyarthiGrihaPrakashan, Pune.
2. Advanced Engineering Mathematics by Erwin Kreyszig, Willey Eastern Ltd. Mumbai.
3. Engineering Mathematics-A Tutorial Approach by Ravish R Singh, Mukul Bhatt.
4. Higher Engineering Mathematics by B. S. Grewal, Khanna publication, New Delhi.
5. Advanced Engineering Mathematics by H. K. Dass, S. Chand and Sons.
6. Calculus by G. B. Thomas and R. L. Finney, Addison- Wesley, 1996
7. Elements of Partial Differential Equations by I.N. Sneddon

Mapping of Course outcome with Program Outcomes (Electrical Engineering):

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PO13	PO14	PO15
CO1	3		2										2	2	2
CO2	3		2										2	2	2
CO3	3		2										2	2	2

Teaching Strategies:

The teaching strategy planned through the lectures, and team based home works. Exercises assigned weekly to stimulate the students to actively use and revise the learned concepts, which also help the students to express their way of solving the problems fluently in written form. Most critical concepts and mistakes emphasized

Teacher's Assessment: Teacher's assessment of 10 marks based on the following.

1) Home assignments
2) Surprise tests with multiple choice questions

EE2001:Electromagnetic Fields	
Teaching Scheme Lectures : 3 Hrs/Week Tutorial : NIL Total Credits : 3	Examination Scheme Class Test I : 15Marks Class Test II : 15Marks Teachers' Assessment : 10 Marks End -Semester Exam : 60 Marks

Pre-requisites:

GE 142- Engineering Physics GE 151-Engineering Mathematics-II

Course description: -

This course examines electric and magnetic quasistatic forms of Maxwell's equations applied to dielectric, conduction and magnetization boundary value problems. Topics covered include: electromagnetic forces, force densities, , including magnetization and polarization, equations of moon, and energy conservation, propagation and stability of electromechanical waves and charge transport phenomena

Course objectives: -

The objectives of the course are to learn

1. Have an ability to determine and describe static and dynamic electric and magnetic fields for technologically important structures: the coil, charge distributions, the dipole, the coaxial cable, dielectric and conducting spheres.
2. Understand the coupling between electric and magnetic fields through Maxwell's equations.
3. Knowledge of, physical interpretation, and ability to apply Maxwell's equations
4. Determine field waves, potential waves, and energy and charge conservation conditions.

Course Outcome:

After completing the course students will able to,

CO1	Apply vector calculus to understand the behavior of static electric fields in standard configurations.
CO2	Apply vector calculus to understand the behavior of static magnetic fields in dielectrics.
CO3	Apply the Maxwell's equation to dielectric, conduction.
CO4	Evaluate displacement current and motion of particles and conductors in time varying fields.
CO5	Describe and analyze electromagnetic wave propagation in free-space ,dielectric.

Detailed Syllabus:

UNIT-I	**Static Electric Field**: Coulombs law, Electric field intensity due to different charge distribution, Electric flux density, Gauss' law, Divergence and Divergence theorem, Maxwell's first equation Potential and potential difference, Potential field of system of charges, Potential gradient, Dipole, The energy density in electric field.
UNIT-II	**Static Electric Field in Dielectrics**: Continuity of current, Conductor properties and boundary conditions Nature of dielectrics, Boundary conditions for perfect dielectric material polarization and its effect in dielectric.
UNIT-III	**Steady Magnetic Field:** BiotSavart law, Ampere's circuital law Curl, Stokes' theorem, Magnetic flux and magnetic flux density, Nature of magnetic material, Magnetic field and magnetization, Boundary conditions in magnetic field
UNIT-IV	**Time Varying Field:** Faraday's law, displacement current, Maxwell'sequations in

	point form and integral form
UNIT-V	**Uniform Plane Wave**: Wave propagation in free space, in dielectrics, Pointing vector and power consideration, Wave propagation in good conductor: Skin effect Reflection of uniform plane waves at normal incidence, Standing wave ratio.

Text Books:

1. William H. Hayt, Jr& John A. Buck," Engineering Electromagnetics," 7th edition, Tata McGraw:Hill.
2. D. Kraus," Electromagnetic" 5th Edition, McGraw Hill Book Company.
3. Matthew N.O.Sadiku&S.V.Kulkarni, " Principles of Electromagnetics" 6th Edition
   Oxford University Press

Reference Books:

1. S P Ghosh,"Electromagnetic Field Theory" 1st Edition, Mcgraw Hill Education
2. S.P. Seth,"Elements of Electromagnetic Fields" DhanpatRai& Co. Ltd. Educational & Technical Publishers, 2001.
3.G. S. N. Raju," Electromagnetic Field Theory and Transmission Lines "1st Edition, Pearson India

Mapping of Course outcome with program outcomes :

Corse outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15
CO1	3	2	1				1	1	1				2	3	2
CO2	3	2					1	1	1				2	3	2
CO3	3	3											2	3	2
CO4	3	3	1						1				2	3	2
CO5	3	2	1			2	1	1	1				2	3	2

1-LOW 2- MEDIUM 3- HIGH

Teaching Strategies:

The teaching strategy is planed through the lectures, tutorials and team based home works. Exercises are assigned weekly to stimulate the students to actively use and revise the learned concepts which also help the students to express their way of solving the problems fluently in written form. Most critical concepts and mistakes are emphasized.

Teacher's Assessment: Teacher's Assessment of 10 marks is based on one of the /or combination of the few of the following.

1) Home Assignments
2) Develop working models
3) Surprise written Test with multiple choice question

EE2002: Network Analysis	
Teaching Scheme	**Examination Scheme**
Lectures : 3 Hrs/Week	Test I : 15Marks
Tutorial : NIL	Test II : 15 Marks
Total Credits : 3	Teachers Assessment : 10Marks
	End Semester Exam : 60 Marks

Course description: This is the course in Electrical Engineering which introduces the basic concepts to solve DC and AC electrical network ,steady state and transient solution of electrical network to the students.

Prerequisites:
EE 143 - Basics of Electrical Engineering.
GE 141 - Engineering Mathematics-I

Course Objectives:
The objectives of the course are to
1. Provide the student with compression understanding of the basic law of electric circuit & theories.
2. To make the students capable of analyzing any given electrical network.
3. To learn about the use of mathematics, needs of Laplace Transform & differential equations for analysis network.
4.To make the students learn how to synthesize an electrical network from a given impedance/admittance function.

Course Outcomes :
After completing the course, students will able to:

CO1	Solve Circuits using Tree, Node, Branch ,Cut set ,Tie Set Methods.
CO2	Analyze the circuit using different network theorems.
CO3	Analyze the circuit for steady state and transient response.
CO4	Analyze and evaluate transient response, Steady state response, network functions in time and frequency domain
CO5	Express given Electrical Circuit in terms of A,B,C,D and Z,Y Parameter model and solve the circuits.

Detailed Syllabus:

Unit 1	Basic Concepts: Electrical parameters, Voltage and current sources, Classification of electrical elements, Topology of networks, Network equations on loop and node basis, Dot convention for coupled circuits, Concept of duality and dual networks.
Unit 2	Network Theorems: Node, Mesh, Super mesh& Super node analysis, Superposition, The venin's and Norton, Reciprocity, Substitution theorems, Maximum power theorem applied to networks with all types of sources. Fourier method of waveform analysis: Application of Fourier series expansion for periodic and non- sinusoidal waveforms.
Unit 3	Solution of Network Equations: Steady state and transient solution, Forced and free response, Time constants, Physical and

	mathematical analysis of circuit transients, Initial and final conditions in elements and in networks.
Unit 4	Laplace Transform Method: Solution of differential equations and network equations using Laplace transform method inverse Laplace transform, Transformed networks with initial conditions analysis of electrical circuits with applications of step, impulse and ramp functions, shifted and singular functions, The convolution integral Laplace transform of various periodic and non-periodic waveforms.
Unit 5	Two Port Networks: Z,Y and transmission parameters H parameters, Interrelations between these parameters, Transfer function, Concepts of poles and zeros, Transform impedance, Transform admittance, Concept of complex frequency, Driving point and transfer impedance and admittances.

Text Books: 1. William H. Hayt Jr., Jack E. Kemmerly, Steven M. Durbin, Engineering Circuit Analysis, Tata McGraw:Hill,6thedition. 2. M.E. Van Valkenburg, Network Analysis, Prentice Hall,2nd edition. 3. Boylestad Robert L. Charles E., Introduction to Circuit Analysis, Merril Publishing Company. 4. John R. OMalley, Circuit Analysis, Prentice Hall.
Reference Books: 1. SmarajitGhosh, Network Theory: Analysis And Synthesis 1st Edition , Phi Learning Pvt. Ltd 2. C. L. Wadhwa, Electrical Circuit Analysis: Including Passive Network Synthesis 2nd Edition , NEW AGE INTERNATIONAL PUBLISHERS LTD.-NEW DELHI 3. M. Musa, Matthew N. O. Sadiku, Charles K. Alexander, Applied Circuit Analysis 1st Edition ,Mcgraw Hill Education

Mapping of Course outcome with Program Outcomes

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	P O7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15
CO1	3	2	1										3	3	3
CO2	3	1	1										3	3	3
CO3	3	2	1										3	3	3
CO4	3	1	1			1	1	1					3	3	3
CO5	3	2											3	3	3

1 -Low 2 – Medium 3 – High

Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following ,

1. Assignments based on Numerical from exercise (unsolved problems from Text books).
2. Objective type test.
3. Solving networks problems by MATLAB. solution

EE2003:Analog Electronics			
Teaching Scheme		**Examination Scheme**	
Lectures	: 3 Hrs/Week	Test I	: 15 Marks
Tutorial	:NIL	Test II	: 15 Marks
Total Credits	: 3	Teachers Assessment	: 10 Marks
		End Semester Exam	: 60 Marks

Pre-requisites:

Knowledge of basics of Engineering Physics and Electrical Engineering

Course description: -

Analog Electronics (EE2003) is a one-semester course compulsory to all second year engineering students of the department.

Course objectives:

The objectives of the course are:

1. design variousfilters
2. provide the basic concepts of CB, CE and CC types of transistor , load lines, hparameter
3. provide fundamental knowledge of feedback and various feedback amplifiers
4. provide fundamentals of operation of various power amplifiers and oscillators
5. provide basics concepts of diode circuits i.e. clippers andclampers,

Unit wise Course Outcomes expected:

After completion of this course students will be able to:

CO1. Analyze the operation of various rectifiers, filters
CO2. design the circuits involving BJT transistor amplifier and verify performance, develop h parameter model of CE transistor amplifier; calculate performance parameters; describe the concepts of load lines and biasing techniques *etc*.
CO3. describe the types of feedback, various feedback amplifiers and solve numerical based on various feedback topologies
CO4. describe operation of various power amplifiers and oscillators
CO5. describe operation of clippers and clampers and multivibrators

Detailed Syllabus:

UNIT-I	**Review of Semiconductor Devices, DC Power Supply:** Rectification, Half wave, Full wave, Bridge, Expression for ripple factor, Efficiency, Diode Ratings, **Filters:** Capacitor, Inductor, LC Filters, Simple Voltage regulator, Series regulators, IC regulators
UNIT-II	**Small Signal Amplifiers:** CC, CB, CE configurations, CE Amplifiers, Biasing techniques, Stabilization of operating point, h parameters, Concept of load lines, Loading effect at the input and output, Bootstrapping, methods of coupling, DC coupled amplifier, RC coupled amplifier, Transformer coupled amplifier, Analysis of RC coupled amplifier, -3dB bandwidth

UNIT-III	**FET and Feedback Amplifiers:** FET as voltage variable resistor, Comparison with BJT, Multistage amplifier, Negative and positive feedback, Types of feedback amplifiers, Voltage series/shunt, Current series/shunt amplifiers
UNIT-IV	**Power Amplifiers Classification:** Class: A, Class: B, Class: AB, Class: C **Oscillators:** Bark Hausen‟s criteria, RC, Phase shift, LC, Hartley, Colpitts Oscillators
UNIT-V	**Pulse Circuits:** Pulse characteristics, wave shaping using RC circuits, Clipping, Clamping, Transistor as a switch, **Multivibrators:**Astable, Monostable &Bistable

Text Books:

1. Millman and Halkias, „Electronic Devices and Circuits‟, McGrawHill
2. Allan Mottorshed, Electronic Devices and Circuits‟, Tata McGrawHill
3. Boylestad and Neshelsky, Electronic Devices and Circuits„, Tata McGrawHill

Reference Books:

1. Millman and Halkias, Integrated Electronics, McGraw Hill
2. Schilling and Belove, Electronic Devices and Circuits, McGrawHill.

Mapping of Course outcome with program outcomes (Electrical Engineering)

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15
CO1	3	1	1					1	1						3
CO2	3	1	1					1	1						3
CO3	3	1	1					1	1						3
CO4	3	1	1					1	1						3
CO5	3	1	1					1	1						3

1-LOW 2-MEDIUM 3-HIGH

Teaching Strategies:

The teaching strategy is planed through the lectures, tutorials and team based home Assignments.

Exercises are assigned weekly to revise the learned concepts.

Teacher's Assessment: Teachers' Assessment of 10 marks is based on one of the /or combination of the few of the following

1) Quizzes
2) Home Assignments
3) MCQ
4) Attendance of the student
5) Surprise tests
6) Working models based on the curriculum

EE 2004: Computer Programming			
Teaching Scheme		**Examination Scheme**	
Lectures	: 2 Hrs/Week	Class Test I	: 15Marks
Tutorial	: 0Hr/Week	Class Test II	: 15 Marks
Total Credits	: 2	Teachers' Assessment	: 10 Marks
		End -Semester Exam	: 60 Marks

Course Description: - This is a one-semester course compulsory to all second year engineering students of the electrical engineering department.

Unit wise Course Outcomes Expected:

After completion of this course students will be able to

CO1. Develop programme in c using basic functions
CO2. Develop programme in C using arrays
CO3. Develop program using structures
CO4. Devlop program in C using pointers
CO5. Develop programme on simple search and sort algorithms

Detailed Syllabus:

UNIT-I	**Introduction** Introduction to computer organization; Evolution of Operating Systems; Machine languages, Assembly Languages and High Level Languages; Key Software and Hardware Trends, Procedural & Object Oriented Programming Methodologies; Program Development in C, Structured Programming - Algorithm, Pseudo-code; The C Standard Library, Data types in C, Arithmetic operators, Control Structures – If-else, While, for, do-while, Switch, break and continue statements; Formatted input-output for printing Integers, floating point numbers, characters and strings; Simple C Programming examples;
UNIT-II	**Designing Structured Programs in** Top Down Design and Stepwiserefinement; Program Modules in C, Math Library Functions, Function Definition, Prototypes; Header files, Parameter passing in C, Call by Value and Call by Reference; Standard functions, Recursive functions, Preprocessor commands, Example C programs; Scope, Storage classes; ***Arrays*** Declaring arrays in C, Passing arrays to functions, Array applications, Two dimensional arrays, Multidimensional arrays, C program examples
UNIT-III	**Pointers in** Pointer variable declaration and Initialization. Pointer operators, Pointer expressions and Arithmetic, Relationship between pointers and arrays; **Strings** Including Concepts, String Conversion functions, C Strings, String Manipulation Functions and String Handling Library;

UNIT-IV	**Derived types** Structures – Declaration, definition and initialization of structures, accessing structures, structures in functions, self referential structures, unions; **DataStructures** Including Introduction to Data Structures, Stacks, Queues, Trees, representation using arrays, Insertion and deletion operations;
UNIT-V	**Dynamic Memory Allocation** Linked List Implementation, Insertion, Deletion and Searching operations on linear list; *Searching and Sorting* – Sorting- selection sort, bubble sort, insertion sort, quick sort, merge sort, Searching-linear and binary search methods;

Text and Reference Books:

1. Dietel&Dietel (2000), *C – How to Program,* Pearson Education 51
2. Ellis Horowitz, SartajSahni, Susan Anderson (1993), *Fundamentals of Data Structures in C,* Prentice Hall of India
3. B.W. Kernighan and Dennis M.Ritchie (1988), *The C Programming Language*, Pearson Education
4. J.R. Hanly and E.B. Koffman (2007), *Problem Solving and Program Design in C,* Pearson Education
5. A.M. Tanenbaum, Y. Langsam& M.J. Augenstein(2005),*Data Structures using C,* Pearson Education

Mapping of Course outcome with program outcomes :

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15
CO1	3		3										2	2	2
CO2	3		3										2	2	2
CO3	3		3										2	2	2
CO4	3		3										2	2	2
CO5	3		3										2	2	2

1-LOW 2- MEDIUM 3-HIGH

Sample Assessment Table:

Assessment Tool	K1+K3	K1+K3	K1+K3	K1+K3	K1+k3
Unit wise Course outcomes	C01	C02	C03	CO4	CO5
Class Test 20 Marks	05	10	05	05	05
Teachers Assessment 20 Marks				05	05
ESE Assessment 60 Marks	12	12	12	12	12

Teaching Strategies:

The teaching strategy is planed through the lectures, tutorials and team based home works, NPTEL videos

Teacher's Assessment:

Teacher's Assessment of 10 marks is based on assignment

EE2005: Lab Network Analysis	
Teaching Scheme	**Examination Scheme**
Lectures : 2Hrs/Week	Term Work : 25Marks
Tutorial : NIL	Practical/Oral : 25Marks
Total Credits : 01	

Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1	Apply various basic laws and theorems of electrical circuit
CO2	Understand effects of Initial and final conditions on networks.
CO3	Understand and examine behavior of network for the applications of Step, Impulse and Ramp functions.
CO4	Explain the fundamental principle Fourier transform of Waveform Analysis.
CO5	Analysis of electrical networks using two port networks concept and Concepts of Poles and Zeros.

List of Experiments

Sr. No.	Details
1	Loop and Nodal analysis.
2	Duality.
3	Time constants.
4	Initial and final conditions in networks.
5	Applications of Step, Impulse and Ramp functions.
6	Network Theorems (any two): Superposition, Thevenin's and Norton's, Reciprocity, Substitution theorems, Maximum power theorem applied to networks with all types of sources.
7	Fourier Method of Waveform Analysis.
8	Transfer function, Concepts of Poles and Zeros, Transform impedance, Transform admittance.
9	Complex frequency, driving point and transfer impedance and admittances.

Mapping of Course outcome with Program Outcomes

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15
CO1	3	2						1	1				1	1	1
CO2	3	2					1	1	1				1	1	1
CO3	3	2						1	1				1	1	1
CO4	3	2	1				1	1	1				1	1	1
CO5	3	2						1	1				1	1	1

1 -Low 2 – Medium 3 - High

EE2006: Lab Analog Electronics	
Teaching Scheme Practicals : 2 Hrs/Week TotalCredits 1	**Examination Scheme** TermWork :25Marks PracticalExam : 25Marks

Pre-requisites:
Knowledge of basics of Engineering Physics and Electrical Engineering

Course description:
Lab Analog Electronics (EE2006) is a one-semester course compulsory to all second year engineering students of the department.

Course objectives:
The objectives of the course are
On completion of this course the student shall be able to

1. Understand the applications of basic electronic components in variety ofways
2. Plot characteristics of various electroniccircuits

Course Outcome:
After completion of this course students will be able to

CO1. use basic electronic components such as diodes and transistors for various applications
CO2. differentiate the performance of various rectifiers with and withoutfilters
CO3analyze the performance of variousregulators
CO4. record input and output waveforms forvarious simple electronic circuits and write technical reports
CO5. work individually and in team effectively

List of Experiments:

Sr. No.	Details
1	Regulation characteristics of half wave and full wave rectifier with and without filter
2	Measurement of line regulation and load regulation of shunt regulator
3	Measurement of line regulation and load regulation of series regulator
4	Measurement of h parameters of CE amplifier
5	Frequency response of RC coupled amplifier
6	Frequency response of Transformer coupled amplifier
7	Study of RC low pass circuit
8	Study of RC high pass circuit
9	Study of clipper
10	Study of clamper
11	Study of differentiator
12	Study ofintegrator
13	Study of Bistablemultivibrator

Term work:

The term work will consist of submitting a file for minimum eight experiments with neatly written records of the study, circuit diagrams, observations, and graphs with results.
The term work will be assessed by the course coordinator

Practical Examination:

The Practical Examination will comprise of performing the experiment and viva voce on the syllabus.
The practical will be assessed by two examiners, one will be the course coordinator and other will be examiner appointed byDSB.

Mapping of Course outcome with program outcomes (Electrical Engineering):

Corse outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15
CO1	3		1	1	1	1	1	1	1	1	3	1			1
CO2	3		1	1	1	1	1	1	1	1		1			1
CO3	3		1	1	1	3	1	1	1	1		1			1
CO4	3		1	1	1	1	1	1	1	3		1			1
CO5	3		1	1	1	1	1	1	3	1		1			1

1 -LOW 2-MEDIUM 3-HIGH

EE2007:Lab Computer Programming	
Teaching Scheme Practical: 2 Hrs/Week Credit: 1	**Examination Scheme** Term Work : 25 Marks Practical Examination & Viva Voce :25 Marks

Pre-Requisites:

Course Description:

Lab Computer Programming (ES2007) is a one-semester course compulsory to all second year engineering students of the department.

Course Objective:

1. To demonstrate the implementation of simple algebra in C.
2. To demonstrate the implementation of arrays and pointer in C.
3. To demonstrate the implementation of search algorithm in C.

Course Outcome:

At the end of the course student will have ability to

CO1	To write a C program for simple algebra and matrices algorithm
CO2	To write a C program using arrays and pointer
CO3	To write a C program for search algorithm

List of Experiments:

Sr. No.	Details
1	**To write a C program for simple algebra and matrices algorithm**, To find the sum of individual digits of a positive integer, generate the first n terms of the Fibanocci sequence and generate all the prime numbers between 1 and n, where n is a value supplied by the user; to calculate the Sum =1-x2/2! +x4/4!- x6/6!+x8/8!-x10/10!
2	**To write C programs** That use both recursive and non-recursive functions, To find the factorial of a given integer and To find the GCD (greatest common divisor) of two given integers; Also, to write a C program, which takes two integer operands and one operator from the user,performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use SwitchStatement) and to write a C program that uses functions to perform the Addition of Two Matricesand Multiplication of Two Matrices;
3	**To write a C program** That uses functions to perform the operations: To insert a substringin to a given main string from a given position; To delete n Characters from a given positionin a given string; To write a C programto determine if the given string is a palindrome or not; Also To write a C programthat displays the position or index in the string S where the string T begins,or – 1 if S doesn't contain T; To **w**rite a C program to count the lines, words and characters in a given text.
4	**To write a C program** To generate Pascal"s triangle and also to construct a pyramid ofnumbers**;** Also to write a C program that uses functions to perform the following operations on singly linked list: Creation, Insertion, Deletion,Traversal

5	**To write C programs** That implements stack (its operations) using Arrays, Pointers and that implements Queue (its operations) using Arrays, Pointers;
6	**To write a C program** That implements the following sorting methods to sort a given listof integers in order using - Bubble sort, Selection sort;Also, **to write C programs**that use both recursive and non-recursive functions to perform the following searching operations for a Key value in a given list of integers- Linear search, Binary search;
7	**To write a C program** That implements the following sorting method to sort a given list of integers in ascending order- Quick sort;Also to write a C programthat implements the followingsorting method to sort a given list of integers in ascending order- Merge sort;

Term work:

The term work will consist of submitting a file for minimum eight experiments with neatly written records of the study, circuit diagrams, observations, and graphs with results

The term work will be assessed by the course coordinator

Practical Examination:

The Practical Examination will comprise of performing the experiment and viva voce on the syllabus

The practical will be assessed by two examiners, one will be the course coordinator and other will be examiner appointed by DSB

Mapping of Course outcome with Program Outcomes

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15
CO1	3		3		3								1	1	1
CO2	3		3		3								1	1	1
CO3	3		3		3								1	1	1

1 – Low 2 – Medium 3 – High

EE2008 : Electrical Machines-I			
Teaching Scheme		**Examination Scheme**	
Lectures	: 3 Hrs/Week	Class Test I	: 15Marks
Tutorial	: 1 Hr/Week	Class Test II	: 15Marks
Total Credits	: 4	Teachers' Assessment	: 10 Marks
		End -Semester Exam	: 60 Marks

Pre-requisites: EE 143 -Basics of Electrical Engineering,
GE 151- Engineering Mathematics-II

Course description:
EE2008: Electrical Machines-I is a one-semester course compulsory to all second year engineering students of the Electrical Engineering Department Course is aimed to introduce fundamentals of Electromechanical energy conversion to undergraduate students. The goal of this course is to understand and apply basic principle of Transformer and DC Machines & their applications.

Course objectives:
The objectives of the course are to learn
1. The principles electromechanical energy conversion.
2. Fundamental concepts of Transformer and DC machines.
3. The details of construction, operation, Characteristics and applications Transformer and DC machines
4. Basic knowledge to develop practical skills

Course outcomes:
After completing the course, students will able to

CO1	Apply electrical engineering laws to electromechanical energy conversion systems
CO2	Explain the construction and function of single and three phase transformer, Autotransformer, DC machines
CO3	Analyse the different types of connection of three phase transformer
CO4	Investigate the effect of armature reaction and commutation on DC machines
CO5	Evaluate the performance characteristics of DC machines & transformer

Detailed Syllabus:

UNIT-I	**Electromechanical Energy Conversion Principles:** Forces and torques in magnetic field systems, Energy balance, Energy in singly excited magnetic field systems, Determination of magnetic force and torque from energy, Determination of magnetic force and torque from coenergy, Multiply Excited magnetic field systems, Forces and torques in systems with permanent magnets, Energy Conversion via electrical field, Electric field energy, Dynamic equations ofElectromechanical systems and analytical techniques
UNIT-II	**Single Phase Transformers:** Transformer construction and practical consideration, Transformer reactance's and equivalent circuits, Effect of load on power factor, Phasor diagrams, Testing: Ratio And Polarity test, Open circuit test, Short circuit test, Sumpner's test, Auto Transformer and its applications
UNIT-III	**Three Phase Transformers:** Review of poly-phase circuit, Special constructional features, Three phase Transformer connections, Labeling of Transformer terminals, Star/Star connection, Delta/Delta Connection, Star/Delta, Delta/Star connection, Delta/Zigzag Star, Star/Zigzag Star, Phase groups, Choice of Transformer connections, Parallel operation of Transformers, Three winding Transformers and its equivalent circuits, Stabilization by tertiary winding, Phase conversion/Open Delta connection, Three/Two phase conversion (Scott connection), Three/Six conversion, Three/One conversion, On: Off load tap changing Transformers, Type and routine tests according to ISI specifications
UNIT-IV	**DC Generators:**Constructional features, Basic principle of working, EMF equation, Armature windings, Types, Characteristics and applications, Armature reaction, Commutation.
UNIT-V	**DC Motors:** Principle of working, Significance of back EMF, Torque equation, Separately &self excited motors, Characteristics and selection of DC Motors for various applications, Starting, Speed control, Various tests to find losses and efficiency.

Text Books:

1. A. E. Fitzgerald & C. Kingsley & S. D. Umans, "Electric Machinery", Tata McGraw Hill, New Delhi, 5thEdition.
2. I. J.Nagrath& D. P. Kothari, "Electric Machines", Tata McGraw Hill, New Delhi, 2nd Edition.
3.Dr. P. S. Bhimbra, Electric Machinery, 5th edition, Khanna Publishers, Delhi.
4.J.B.Gupta, "Theory and Performance of Electrical Machines" S.K.Kataria& Sons. 14th Edition Delhi.

Reference Books:

1. Syed A. Nasar, "Electric Machines & Power Systems", Volume I, Tata McGraw Hill, New
2. Alexander S. Langsdorf,"Theory of Alternating current Machines" Second Edition, Tata McGraw Hill, New Delhi
3. George Mcphersion ,"An Introduction to Electrical Machines and Transformers", John Wiley & Sons, NY
4. A.E. Clayton & N.N. Nancock, "The Performance & Design of DC Machines", CBS Publications &
Distributors, Delhi, 3rd Edition.

Mapping of Course Outcome with Program Outcomes :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 13	PSO 14	PSO 15
CO1	2					1	1		2	2		3			
CO2	2	2		1		1	1		2	2		3			
CO3	2					1	1		2	2		3		2	
CO4	2					1	1		2	2		3		2	
CO5	3					1	1		2	2		3		2	

1- LOW2- MEDIUM 3- HIGH

Teaching Strategies:
The teaching strategy is planed through the lectures, tutorials and team based home works. Exercises are assigned weekly to stimulate the students to actively use and revise the learned concepts which also help the students to express their way of solving the problems fluently in written form. Most critical concepts and mistakes are emphasized.

Teacher's Assessment: Teacher's Assessment of 10 marks is based on one of the /or combination of the few of the following.

1) Home Assignments
2) Power point presentation
3) Develop working models
4) Test with multiple choice questions

EE2009: Electrical Measurement and Instrumentation			
Teaching Scheme		**Examination Scheme**	
Lectures	: 3 Hrs/Week	Test I	: 15Marks
Tutorial	: NIL	Test II	: 15 Marks
Total Credits	: 3	Teachers Assessment	: 10Marks
		End Semester Exam	: 60 Marks

Course Description: This is the course in Electrical Engineering which introduces anolag and digital measurement of different electrical and mechanical quantities o the students.

Pre-Requisites:

EE 143 – Basic of Electrical Engineering
GE 142 – Engineering Physics
GE 152 – Engineering Chemistry

Course Objectives:

The objectives of the course are to

1. Introduce the student fundamentals of Electrical and Electronics Instruments and Measurement providing an in-depth understanding of Measurement Bridge measurements, Digital instruments, Function Generator and Analyzer, Display devices and transducers.
2. Become familiar with methods of measurement/Instruments for measuring electrical and mechanical quantities
3. Become familiar with digital measurement.
4. Become familiar measurement of R, L, C, by using standard bridge.
5. Become familiar with measurement of mechanical quantity.

Course Outcomes :

After completing the course, students will able to:

CO1	Explain working principle of different electrical measuring instruments
CO2	Determine the circuit parameters using AC bridges.
CO3	Compute the errors in CTs and PTs and explain construction and working of electrical measuring instruments.
CO4	Explain working of measuring instruments for non electrical quantities.
CO5	Compare the digital equipments for measurement of various electrical parameters

Detailed Syllabus:

Unit 1	Introduction: Philosophy of Measurement: Methods of measurement, Measurement system, Errors in measurement and its analysis, Review of Standards and units, Dimensional equations and applications. Measurement of Electrical quantities: Measurement of voltage, current Measurement of three phase power under balanced and unbalanced condition, Measurement of reactive power, Measurement of energy.	4 Hrs
Unit 2	Measurement of Resistance, Inductance and Capacitance: Measurement of Low, Medium and High Resistance – Kelvin's bridge, loss of charge	8 Hrs

	method. Measurement of inductance, Quality Factor - Maxwell's bridge, Hay's bridge, Anderson's bridge, Owen's bridge. Measurement of capacitance and Loss Angle - Desauty bridge. Wien's bridge, Schering Bridge. Magnetic measurements: Terms related magnetic measurement, Hysteresis loop & B-H curve determination (using step by step method).
Unit 3	Measuring Instruments: 8 Hrs General features of indicating, recording & integrating instruments, Types of instruments, Construction, Principle of operation and torque equation of moving coil, moving iron, electrodynamometer, Induction, and electrostatic type instruments. Principle of operation of the thermoelectric, rectifier type instruments. Power factor meter. AC Potentiometer: Polar type & Coordinate type AC potentiometers, Applications of AC Potentiometer in electrical measurements, construction and theory of instrument transformer, Equations for ratio and phase angle errors of C. T. and P. T., applications. Output power meters, Field Strength meter, Phase meter, Q-meter, LCR Bridge, RX meter, Automatic bridges, megger, Transistor tester.
Unit 4	Instrumentation: 5 Hrs Purpose of instrumentation, Classification of instrumentation system, Basic elements of instrumentation. Transducers, classification & selection of transducers, Strain gauges, Inductive & Capacitive transducers, Piezoelectric and Hall-effect transducers, Thermistors, Thermocouples, Photo-diodes & Photo-transistors, Encoder type digital transducers, Signal conditioning and telemetry systems, Basic concepts of smart sensors and application. Measurement of non-electrical quantities such as torque, pressure, vibration, temperature, force, humidity etc.
Unit 5	Digital Measurement of Electrical Quantities: 5 Hrs Concept of digital measurement, Study of digital voltmeter, Frequency meter, Power Analyzer and Harmonics Analyzer; Electronic Multimeter, Data Acquisition Systems, Data transmission system. Display Devices and Generators: X-Y recorders, LCD and LED displays, Signal generators and Function generators

Mapping of Course Outcome with Program Outcomes

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15
CO1	2					2	2					3			1
CO2	2	2				2	2					3			1
CO3	2	2					2					3			1
CO4	2					2	2					3			1
CO5	2					2	2					3			1

1 – Low 2 – Medium 3 – High

Teacher's Assessment: Teachers Assessment of 10 marks is based on one of the / or combination of few of following,

1. Assignments based on Numerical from exercise (unsolved problems from Text books).
2. Objective type test.
3. Model/ circuit for Parameter Measurement.

EE 2010: Power System –I			
Teaching Scheme		**Examination Scheme**	
Lectures	: 3 Hrs/Week	Class Test I	: 15 Marks
Tutorial	: 1	Class Test II	: 15 Marks
Total Credits	: 4	Teachers' Assessment	: 10 Marks
		End -Semester Exam	: 60 Marks

Pre-Requisites: Knowledge of basics of Electrical Engineering

Course Description: -

Power System -I (EE 2010) is a one-semester course compulsory to all second year Electrical Engineering students. It is the fundamental course related to Power System Engineering.

Course Objectives:

The objectives of the course are to

1. introduce Electrical Power System
2. introduce operation of various power plants, transmission network and distribution network
3. develop an understanding of the environmental aspects of power generation
4. develop professional skills required to design electrical power transmission system
5. provide fundamental knowledge required for modeling and analyzing transmission networks
6. develop professional skills required to formulate and solve numericals related to distribution systems

Unit wise Course Outcomes expected:

After completion of this course students will be able to

CO1	Demonstrate working of various power plants
CO2	Explain merits and demerits of high transmission voltage;Compare the conductor costs for various transmission systems
CO3	Illustrate constructional and other aspect related to overhead conductors and underground cables
CO4	Compare various distribution systems, calculate voltages *etc.* related to distribution systems and describe various aspects related to substation
CO5	Describe fundamentals related to corona and power factor improvement and its impact on power system

Detail Syllabus:

UNIT-I	**Power Generation:** A. **Conventional Power Generation:** Study of hydro, Thermal, Nuclear, Diesel engine & Gas cycle power plants: working principle, classification, functions of various component, advantages and disadvantages. **B. Nonconventional Power Generation:** Introduction to nonconventional power plants (Solar, Wind, Geothermal, Tidal, Biomass, MHD generation *etc.*)

UNIT-II	**General Structure of Power System :** Overview of transmission & distribution system, various levels of power transmission, voltage levels at generation, transmission and distribution, symmetrical three phase system, alternator as a part of power grid, the power transformer, HVAC and HVDC transmission systems. Ways of transmission- overhead transmission lines and underground cables, different overhead transmission systems, effect of transmission voltage, practical working voltage, comparison of conductor cost for various transmission systems, Kelvin's law
UNIT-III	**Mechanical Design:** **A. Overhead Lines:** Introduction to mechanical design, types of conductors, line supports, spacing between the conductors, length of span, calculation of sag Overhead line insulators – materials, types of insulators such as pin type, suspension type, strain type insulators, voltage distribution along string of suspension insulators, methods of improvement of string efficiency **B. Underground Cables:** Cable construction, conductors, insulation, types of cable, insulation resistance, capacitance grading, dielectric stress in cable, heating, current rating of cable
UNIT-IV	A. **Distribution Systems:** Introduction, primary & secondary distribution, distribution system losses, various methods of distribution, general, radial and ring main systems, calculations with concentrated and distributed loads **B. Substation:** Classification, layout, substation equipments, substation grounding & earthling, merits & demerits of indoor & outdoor substation, types of bus bar arrangements
UNIT-V	**Corona and Power Factor Improvement:** A. **Corona:** Introduction, theory of corona formation, power loss due to corona, advantages & disadvantages of corona, effect of corona on line design, factors affecting corona, methods of reducing corona effect **B. Power Factor Improvement:** Introduction, advantages of power factor improvement, methods of improving power factor

Textbooks:

1. Mahesh Verma, Power Plant Engineering, Metropolitan Book Co., Pvt. Ltd.
2. George W. Sutton (Editor), Direct Energy Conversion, Inter University Electronics Series Vol.: 3, McGraw:Hill
3. C. L. Wadhawa, Generation, Distribution and Utilization of Electrical Energy, New Age International Publishers
4. I. J. Nagrath and D.P. Kothari, Modern Power System Analysis, Tata McGraw:Hill.
5. W. D. Stevenson, Elements of Power Systems Analysis, McGraw Hill
6. M. V. Deshpande, Elements of Electrical Power, Transmission and Distribution, Tata McGraw:Hill.

Reference Books:

1. H. Cotton, Transmission and Distribution of Electrical Energy, ISAAC Pitman & Sons Ltd.
2. Luces M. Faulkenberry and Walter Coffer, Electrical Power Distribution and Transmission, Pearson Education.
3. Allen J. Wood and B.F. Wollenberg, Power Generation, Operation and Control, John Wiley
4. O.I. Elgerd, Electric Energy Systems Theory, Tata McGraw:Hill.

Mapping of Course outcome with program outcomes (Electrical Engineering):

Corse outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 13	PSO 14	PS0 15
CO1	3					1	1					1			
CO2	3					1	1					1	2		
CO3	3					1	1					1	2		
CO4	3					1	1					1	2		
CO5	3					1	1					1	2		

1- LOW 2- MEDIUM 3-HIGH

Teaching Strategies:

The teaching strategy is planed through the lectures and home assignments. Exercises are assigned weekly to revise the concepts.

Teacher's Assessment: : Teachers Assessment of 10 marks is based onattendance of the student and/or one of the or combination of few of following.

1. Home Assignments
2. MCQ
3. Quizzes
4. Surprise tests
5. Power point presentation

EE2011: Linear Integrated Circuits and Applications			
Teaching Scheme		**Examination Scheme**	
Lectures	: 3 Hrs/Week	Class Test 1	: 15Marks
Tutorial	: NIL	Class Test 2	: 15Marks
Total Credits	: 3	Teachers' Assessment	: 10 Marks
		End -Semester Exam	: 60 Marks

Pre-requisites

EE 2003 Analog Electronic

Course Description

Linear Integrated Circuits and Applications is a one-semester course compulsory to all second year engineering students of the department.

Course Objectives

The objectives of the course are to-

1. Introduce the basic building blocks, configurations of operational amplifiers and basic applications; and its parameters
2. Understand the various linear and non-linear applications of op-amp
3. Study different types of active filters and their frequency response
4. Study internal functional blocks and the applications of ICs like Timer and PLL circuits
5. Explain various types of signal generators

Course Outcomes: After completion of this course students will be able to-

CO1. Discuss the op-amp basic construction, characteristics, parameter limitations, various configurations and basic applications of op-amp
CO2. Construct basic op-amp circuits, linear and non-linear circuits
CO3. Explain & construct different types of active filters and to plot their frequency response
CO4. Discuss functional block diagram of timer & PLL and their applications
CO5. Describe various types of signals i.e. triangular, saw-tooth etc using op-amp

Detailed Syllabus

UNIT-I	**Op-Amp Fundamentals:** The operational amplifier, Block diagram representation and analysis of a typical Op-amp, Ideal op-amp, Open loop Op-amp configurations, Negative feedback, Non – ideal closed loop characteristics, Input bias and offset current, Input offset error compensation, Frequency response, Slew rate limiting, Input and output impedance, Operation limits, compensated and uncompensated op-amps, Compensation techniques.
UNIT-II	**Linear and Non-linear Op-Amp Circuits:** I to V and V to I converters, Current amplifiers, Difference amplifiers, Instrumentation amplifiers, Transducer bridge amplifier and applications, Voltage comparators, Monolithic voltage comparator, Voltage comparator applications, Schmitt trigger and its application, Precision rectifiers, Limiters, Analog switches, Peak detectors, Sample and hold circuits, Integrator and differentiator, Log/antilog amplifiers, Practical log/antilog circuits, Analog multipliers.
UNIT-III	**Active Filters:**

	Classification, Transfer function, Butter worth filters, Low pass, High pass, Band pass, Band stop, Notch and all pass.
UNIT-IV	**Special Function ICs:** Timer: IC 555, Functional block diagram, Applications of Timer IC. Phase-Locked Loops: Introduction, Basic principle, Phase Detector/comparator, Voltage controlled oscillator, PLL Applications.
UNIT-V	**Signal Generators:** Sine wave generators, Free running multivibrator, Triangular wave generators, Saw tooth wave generators, V/F and F/V converters.

Text books

1. R. A. Gaikwad, "Op-amps and Linear Integrated Circuits Technology", PHI Publications
2. D. Roy Chaudhari, "Linear Integrated Circuits", New Age International Publishers
3. S. Franco, "Design with Operational Amplifiers and Analog ICs", Tata McGraw-Hall

Reference Books

1. G. B. Clayton, "Operational Amplifiers", Butterworth & Co. Publications
2. K. R. Botkar, "Integrated Circuits", Khanna Publications

Mapping of Course outcome with program outcomes (Electrical Engineering)

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15
CO1	3	2	1					1	1	1					2
CO2	3	2						1	1	1					2
CO3	3	2	1					1	1	1					2
CO4	3	2	1					1	1	1					2
CO5	3	2						1	1	1					2

1. LOW 2. MEDIUM 3. HIGH

Teaching Strategies:

The teaching strategy is planed through the lectures, tutorials, NPTEL lectures and home Assignments etc.

Teachers' Assessment:

Teacher's Assessment mark is based on any one or two of the following components and attendance of the student. However, the course co-ordinatorhas to announce assessment components at the beginning of the course.

1) Multiple Choice Question Test
2) PPT presentation
3) Surprise test
4) Quiz
5) Home assignments
6) Development of working model

EE 2012: Lab Electrical Machines-I	
Teaching Scheme Practical: 2 Hrs/Week Credit:1	**Examination Scheme** Term Work : 25 Marks Practical Examination & Viva Voce :25 Marks

Course Description:

Electrical Machines-I Lab (EE2012) is a one-semester course compulsory to all second year engineering students of the department.

Course Objective:

On completion of this Course the student shall be able to

1. To prepare the students to have a basic knowledge of transformers.
2. To prepare the students to have a basic knowledge of D. C. motors.

Course Outcomes:

At the end of the course student will have ability to

CO1	Select range of apparatus based on the ratings of DC Machines and Transformers.
CO2	Determine equivalent circuit parameters of transformer by open circuit and short circuit test
CO3	Evaluate the performance and parameters of transformer by analyzing load test results
CO4	Investigate the magnetization characteristics of dc generator and performance of dc motor at no load and full load
CO5	Select and demonstrate various methods to control the speed of D.C. machines for wide speed range

List of Experiments:

Sr. No.	Details
1	Determination of efficiency, regulation of single phase transformer using open circuit & short circuit test
2	Determination of constants of equivalent circuit using open circuit & short circuit test single phase Transformer.
3	Parallel operation of single phase/three phase Transformers
4	To determine Efficiency & regulation of single phase Transformer by direct loading.
5	To perform Sumpner's test on Transformers
6	To perform Scott: connection of single phase Transformers.
7	To verify of voltage relationships for various Three phase Transformer winding connections
8	To plot Magnetization, external and internal characteristics of a DC generator
9	To control Speed of a DC shunt motor by: (i) armature voltage control (ii) field control method
10	To Study of performance of DC shunt motor by load test.
11	To Separate the losses of DC Motor by ABCD constant method
12	To perform Retardation test on DC Machines.
13	Study of conventional and industrial starters for DC Motors
14	Visit to industry related to any machine or transformer related plant

Term work:

The term work will consist of submitting a file for minimum eight experiments with neatly written records of the study, circuit diagrams, observations, and graphs with results. The term work will be assessed by the course coordinator

Practical Examination:

The Practical Examination will comprise of performing the experiment and viva voce on the syllabus.

The practical will be assessed by two examiners, one will be the course coordinator and other will be examiner appointed by DSB.

Mapping of Course outcome with Program Outcomes

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14	PSO 15
CO1	2					1	1	2	2	2		2		2	
CO2	2	2				1	1	2	2	2		2		2	
CO3	2	2				1	1	2	2	2		2		2	
CO4	2	2				1	1	2	2	2		2		2	
CO5	2					1	1	2	2	2		2		2	

1 – Low 2 – Medium 3 - High

EE2013: Lab Electrical Measurement and Instrumentation	
Teaching Scheme Lectures : 2Hrs/Week Tutorial : NIL Total Credits : 01	**Examination Scheme** Term Work : 25Marks Practical/Oral :25Marks

Laboratory Course Outcomes :

As an outcome of completing the Laboratory course, students will able to:

CO1	Select the suitable type and range of measuring instruments for experiments
CO2	Demonstrate the fundamental principle for measurement of power
CO3	Analyze the bridge methods for measurement of wide range of R-L-C.
CO4	Determine and analyze the CT and PT ratio error
CO5	Record and write the report effectively

List of Experiments:

Sr. No.	Details
1	Demonstration of working parts of types of meter by opening the devices & Showing it to students
2	Study of operation of Oscilloscope and Measurement of voltage, current by using Oscilloscope
3	Calibrate the three phase Wattmeter /single phase wattmeter
4	Calibrate A.C. single phase and three Energy meter / Measurement of energy at different P.F.
5	Measurement of resistance using Kelvin Double Bridge
6	Measurement of Power using Instrument transformers
7	Measurement of Power in Polyphase circuits
8	Measurement of low, medium & high resistances.
9	Measurement of Frequency by Wien Bridge using Oscilloscope
10	Measurement of Inductance by A.C. Bridges
11	Measurement of Capacitance by A.C. Bridges
12	Study of D.C. potentiometer, megger, earth tester
13	Study of power analyzer.
14	Experimental set up for measurement of non electrical quantities
15	Study of D.C. potentiometer & its applications.
16	Testing of C.T. and P.T.
17	Measurement of energy at different power factor.

Mapping of Course outcome with Program Outcomes:

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15
CO1	2	1						2	2	1		3			
CO2	2	1				2		2	2	1		3			
CO3	2	1				2		2	2	1		3			
CO4	2	1						2	2	1		3			
CO5	2					2		2	2	1		3			

1 – Low 2 – Medium 3 – High

EE2014: Lab Linear Integrated Circuits and Applications			
Teaching Scheme		**Examination Scheme**	
Practical	: 2 Hrs/Week	Term Work	: 25Marks
Total Credits	: 1	Practical Exam/Oral	: 25 Marks

Course Objectives:

The objectives of the course are to-

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

Course Outcomes:

After completion of this course students will be able to-

CO1. Plot and analyze frequency response of inverting and non-inverting op-amp
CO2. Measure op-amp parameters
CO3. Construct and analyze circuits for various applications using analog ICs

List of the Experiments:

The student shall perform minimum eight experiments of the following:

Sr. No.	Name of the Experiments
1	To build Inverting amplifier using IC 741 and plot its frequency response
2	To build Non-inverting amplifier using IC 741 and plot its frequency response
3	To build summing amplifier in inverting and non-inverting mode
4	To measure Op-Amp parameters such as Input offset voltage, input bias current, Input offset current, PSRR and CMRR
5	To measure slew rate of Op-Amp
6	To build different types of comparators and observe the waveforms on CRO
7	To build voltage limiter and to observe the output waveforms
8	To build and to observe the output waveforms for various values of R and C
9	To build and to observe the output waveforms for various values of R and C
10	To build astable& monostable multivibrator and to observe the output waveforms using IC 555
11	To build precision rectifiers and to observe the output waveforms

Term work:

The term work shall consist of submitting a file for minimum eight experiments performed with neatly written records of the study, circuit diagrams, observations, and graphs with results.

The term work will be assessed by the course coordinator

Practical Examination:

The Practical Examination shall comprise of performing the experiment and viva voce on the syllabus

The practical will be assessed by two examiners, one will be internal examiner and other will be external examiner appointed by DSB

Mapping of Course outcome with Program Outcomes:

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	PO 15
CO1	3		1			2	2	1	1	1					3
CO2	3					2	2	1	1	1					3
CO3	3		1			2	2	1	1	1					3

1 - Low 2 – Medium 3 - High

EE 2020: Numerical Computational Techniques			
Teaching Scheme		**Examination Scheme**	
Lectures	:2 Hrs/Week	Class Test I	: 15Marks
Tutorial	: ---	Class Test II	: 15 Marks
Total Credits	: 2	Teachers' Assessment	: 10 Marks
		End -Semester Exam	: 60 Marks

Pre-Requisites:

MA1001: Engineering Mathematics- I, MA1002:Engineering Mathematics- II

MA2001: Engineering Mathematics-III, EE2004:Computer Programming

Course Description: Numerical Computational Techniques is a optional course belongs to Engineering Science course to second year electrical engineering students of the institute in the Semester –IV.

Course Objectives:

This course strives to enable students

1. To provide the necessary basic concepts of a few numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology
2. To emphasize the need of computational techniques and analyze errors involved in the computation.
3. To provide an overview of numerical techniques to solve ordinary and partial differential equations, which we apply to solve many engineering problems of electrical , mechanical& civil Engineering.
4. To apply various numerical methods to obtain solution of different types of equations such as transcendental, simultaneous, and also for interpolation, integration and differentiation.

Course Outcomes Expected:

After completion of this course students will be able to

CO1	To demonstrate different types of computational techniques to find the roots of the equations
CO2	Apply appropriate numerical method for solution of Transcendental and polynomial equation
CO3	Apply and compare various numerical methods to solve first and second order ODE
CO4	Apply different numerical methods for interpolation, numerical differentiation and integration.
CO5	To demonstrate the applications of numerical computational techniques to engineering problems drawn from industry and other engineering fields.

Detailed Syllabus:

UNIT-I	**Introduction** Basic principle of numerical methods and necessity of computers for high-speed calculations, representation of numbers and number systems, floating point algebra with normalized floating point technique. Error: types, causes of occurrence and remedies to minimize them. Significant digits and numerical instability in computations **Concept of roots** of an equation and methods to find the same. Methods to solve equations like Bisection, Secant, Regula-False and Newton-Raphson Method, Synthetic division, Birge-Vieta,, Newton-Raphson Methods for complex variable and complex roots
UNIT-II	**A) Solution of Transcendental and polynomial equation** : Bisection, Secant, Regula-Falsi, Chebyshev and Newton-Raphson methods, NewtonRaphson method for two variables. **B) Curve Fitting** using least square approximation – First order and second order.
UNIT-III	**Interpolation:** A) Difference operators, Introduction to interpolation - Newton's forward, backward interpolation formulae, Stirling's and Bessel's central difference formulae, Newton's divided difference formula, Lagrange's interpolation. B) Numerical Differentiation using Newton's forward and backward interpolation formulae
UNIT-IV	**Solution of Linear algebraic simultaneous equations**: Direct Methods like Crammer's rule, Gauss elimination and Gauss-Jordan method. concept of pivoting – partial and complete. Iterative methods like Gauss, simple Gauss-Seidel and Newton-Raphson Method. **Matrix Inversion** using Jordon method and Eigen values using Power method and Jacobi methods.Introduction to Eigen value and Eigen vectors
UNIT-V	**Numerical Differentiation and Integration** **Numerical differentiation** using simple interpolation technique like Lagrangian and Newton-Gregory polynomials. Solution of ordinary differential equations using Euler's methods, Nystrom's method, Taylor's series method, Runge-Kutta second and fourth order technique using Hune's and Polygon method. Introduction to simple Predictor-Corrector techniques **Numerical integration** using Trapezoidal, Simpson's rule as a special case of Newton-Cote's quadrature techniques for single and double integrals

Text Books:

1. Numerical Methods for Scientific and Engineering Computations – M. K. Jain / S. R.K.Iyangar / R. K. Jain
2. V Rajaraman., " Computer oriented Numerical Methods", Prentice Hall Publication
3. Fransis Scheid, "Numerical Analysis", Tata McGraw Hill Publication
4. Calculus of Finite Difference and Numerical Analysis – Gupta / Malik.
5. Numerical Methods for Engineers by Steven Chapra, Raymond P. Canale – Tata McGraw Hill Publication.
6. Numerical Methods, second edition, S. Arumugan, A. Thangapandi Isaac, A. Somasundaram, SCITECH Publications (India) Pvt. Ltd.

Reference Books:

1. Numerical Mathematical Analysis – J. B. Scarborough.
2. Robert Schilling, Sandra L. Harries, "Applied Numerical Methods for Engineers", Thomson
3. Numerical Methods – E. Balgurusamy - Tata McGraw Hill Publication
4. Numerical Methods with Programs in C and C++ - T. Veerarajan and T. Ramchandran - Tata McGraw Hill Publication.

Mapping of Course Outcome with Program Outcomes

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14	PSO 15
CO1	3				1							1			
CO2	3				1							1			
CO3	3				1							1			
CO4	3				1							1			
CO5	3				1							1			

1- LOW 2- MEDIUM 3-HIGH

Teaching Strategies:

The teaching strategy is planed through the lectures, tutorials and team based home works. Exercises are assigned to stimulate the students to actively use and revise the learned concepts which also help the students to express their way of solving the problems fluently in written form. Most critical concepts and mistakes are emphasized.

Teacher's Assessment: : Teachers Assessment of 10 marks is based on attendance of the student and/or one of the or combination of few of following.

1. Home Assignments
2. Surprise written Test with multiple choice question
3. Solution of different numerical problems using software
4. Quizzes
5. Application development.