INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad - 500 043

ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE DESCRIPTION

Course Title	PRINCIPLES OF ELECTRICAL ENGINEERING			
Course Code	A40215			
Regulation	R13-JNTUH			
Course Structure	Lectures	Tutorials	Practicals	Credits
	4	1	-	4
Course	Mr.A Naresh Kumar, Assistant Professor			
Team of Instructors	Mr. P Shiva Kumar, Assistant Professor Ms. G Leckha chandran, Associate Professor			

I. COURSE OVERVIEW:

This course it is aimed to introduce the students the principles and applications of control systems in everyday life. The basic concepts of block diagram reduction, time analysis solutions to time invariant systems and also deals with the different aspects of stability analysis of systems in frequency domain and time domain

II. PREREQUISITES:

Level	Credits	Periods	Prerequisite
UG	**4**	**4**	Basic Knowledge of Network theory and fundamentals of physics

III. COURSE ASSESSMENT METHODS:

a) Marks distribution:

Session marks	University end exam marks	Total marks
There shall be two mid tem examinations. Each id term exam consists of subjective type and objective type test. The subjective test is for 10 marks, with duration of 1 hour. Subjective test of each semester shall contain four questions; the student has to answer two out of them. Each carrying 5 marks The objective test paper Is prepared by JNTUH, which consists of 20 questions each carrying 0.5 marks and total of 10 marks. The student is assessed by giving two assignments, one, after completion of 1to 4 units and the second, after the completion of 4 to 8 units each carrying 5 marks. On the total the internal marks are 25. The average of two internal tests is the final internal marks. The external question paper is set by JNTUH consisting of 8 questions each carrying 15 marks out of which 5 questions are to be answered their by external examination is of total 75 mark	75	100

IV. EVALUATION SCHEME:

S.No	Component	Duration	Marks
1	I mid examination	90 minutes	20
2	I assignment	--	05
3	II mid examination	90 minutes	20
4	II assignment	--	05
5	External examination	3 hours	75

V. COURSE OBJECTIVE:

At the end of the course, the students will be able to:

i. To introduce students to the basic concepts, techniques and applications of network theory
ii. Understand the basic principles of transients for first order and second order DC system using time- domain analysis and Laplace transforms
iii. To impart the knowledge of various fundamental techniques for analysis of electrical networks..
iv. To introduce transient behavior at the time of switching machines, circuit breakers, relays and other electrical components.
v. To present lucid and comprehensive treatment of transformers and common types of rotating machines

VI. COURSE OUTCOMES:

After completing this course the student must demonstrate the knowledge and ability to:

1. Understand the DC transient analysis of RL, RC and RLC circuits.
2. Apply the basic fundamentals to construct and operate DC generators, DC Motors, transformers**.**
3. Develop the basic skills needed to perform and design experimental projects
4. Apply the principles to form simple electric apparatus and machinery that are of use in practical situations.
5. Formulate problems and projects and to plan a process for solution, taking advantage of diverse technical knowledge and skills.
6. Impart knowledge of electrical engineering principles along with the required supporting knowledge of computing, engineering fundamentals, mathematics, and science.
7. Develop analytical skills, problem solving techniques and practical considerations for the control and design of various electrical situations.
8. An ability to understand the principles of electric filters.
9. An ability to write the equilibrium equations for a given network and solve them analytically, and also using appropriate software as needed for the steady state (DC) solution

VII. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program outcomes		Level	Proficiency assessed by
PO1	**General knowledge**: An ability to apply the knowledge of mathematics, science and Engineering for solving multifaceted issues of Electrical Engineering.	H	Assignments
PO2	**Problem Analysis**: An ability to communicate effectively and to	S	Excercise

	prepare formal technical plans leading to solutions and detailed reports for electrical systems.		
PO3	**Design/Development of solutions**: To develop Broad theoretical knowledge in Electrical Engineering and learn the methods of applying them to identify, formulate and solve practical problems involving electrical power.	H	Assignments, discussion
PO4	**Conduct investigations of complex problems**: An ability to apply the techniques of using appropriate technologies to investigate, analyze, design, simulate and/or fabricate/commission complete systems involving generation, transmission and distribution of electrical energy.	S	Excercise
PO5	**Modern tool usage:** An ability to model real life problems using different hardware and software platforms, both offline and real-time with the help of various tools along with upgraded versions.	N	------
PO6	**The engineer and society:** An Ability to design and fabricate modules, control systems and relevant processes to meet desired performance needs, within realistic constraints for social needs	S	Excercise
PO7	**Environment and sustainability:** An ability To estimate the feasibility, applicability, optimality and future scope of power networks and apparatus for design of eco-friendly with sustainability	H	Discussion, seminars
PO8	**Ethics:** To Possess an appreciation of professional, societal, environmental and ethical issues and proper use of renewable resources	N	-----
PO9	**Individual and team work:** An Ability to design schemes involving signal sensing and processing leading to decision making for real time electrical engineering systems and processes at individual and team levels	S	Discussions
PO10	**Communication:** an Ability to work in a team and comprehend his/her scope of work, deliverables , issues and be able to communicate both in verbal ,written for effective technical presentation	S	Discussion, seminars
PO11	**Life-long learning:** An ability to align with and upgrade to higher learning and research activities along with engaging in life-long learning.	S	Discussions, seminars
PO12	**Project management and finance**: To be familiar with project management problems and basic financial principles for a multi-disciplinary work.	S	Prototype, discussions

N= None **S=Supportive** **H=highly related**

VIII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes		Level	Proficiency assessed by
PSO1	**Professional Skills:** An ability to understand the basic concepts in Electronics & Communication Engineering and to apply them to various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of complex systems.	N	Lectures, Assignments
PSO2	**Problem-solving skills:** An ability to solve complex Electronics and communication Engineering problems, using latest hardware and software tools, along with analytical skills to arrive cost effective and appropriate solutions.	N	Projects

Program Specific Outcomes		Level	Proficiency assessed by
PSO3	**Successful career and Entrepreneurship:** An understanding of social-awareness & environmental-wisdom along with ethical responsibility to have a successful career and to sustain passion and zeal for real-world applications using optimal resources as an Entrepreneur.	N	Guest Lectures

N - None **S - Supportive** **H - Highly Related**

IX. SYLLABUS:

UNIT-I

Transient analysis (first and second order circuits) transient response of RL, RC, RLC Series circuits DC excitations, initial conditions, solution using differential equations approach and Laplace transform method

UNIT-II

Two Port Networks: Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission (ABCD) Parameters, Conversion of one Parameter to another, Conditions for Reciprocity, and Symmetry, Interconnection of Two Port networks in Series, Parallel and Cascaded configurations, Image Parameters, Illustrative problems.

UNIT-III

Filters and Symmetrical Attenuators: Classification of Filters, Filter Networks, Classification of Pass Band and Stop Band, Characteristics Impedance in the Pass and Stop Bands, Constant-l Low Pass Filter, High Pass Filter, m- derived T-Section, Band Pass filter and Band Elimination filter, Illustrative Problems, Symmetrical Attenuators- T-Type Attenuator, p- Type Attenuator, Bridged T0type Attenuator, Lattice Attenuator.

UNIT-IV

D.C. Machines:-

D.C Generators: Principle of operation of DC Machines, EMF equation, types of generators, magnetization

And load characteristics of DC generators.

D.C. Motors: Types of DC motors, characteristics of DC motors, losses and efficiency, Swinburne's test, Speed control of DC shunt motor, flux and armature voltage control methods.

UNIT-V

Transformers: Principle of operation of single phase transformer, types, constructional features, phasor diagram on no load and load, equivalent circuit, losses and efficiency of transformer and regulation, OC and SC tests, (Simple problems). Synchros, Stepper Motor

Text books:

1. Electric Circuits- A. Chakrabarhty, Dhanipat Rai & Sons
2. Basic concepts of Electrical Engineering- PS Subramanyam, BS Publications

References:

1. Engineering Circuit analysis- William Hyat and Jack E. Kemmerly, McGraw Hill Company, 7th Edition
2. Basic Electrical Engineering- S.N.Singh,PHI.
3. J. B. Gupta (2006), Theory and Performance of Electrical Machines, S. K. Kataria & Sons, New Delhi

X. COURSE PLAN:

At the end of the course, the students are able to achieve the following course learning outcomes:

Lecture no.	Learning objectives	TOIPC TO BE COVERED	Reference
1	Introduction	To understand the basic concepts of principles of basic electrical engineering.	T1,R1
2	Show the Transient behavior of R, L and C elements in a circuit.	Introduction to transient analysis and initial conditions of the R L & C	T1,R1
3-4	Compute initial conditions and time response for current and voltage in first order R-L and R-C circuits	DC Transient analysis of a series RC and RL Circuit using Differential equation approach.	T1,R1
5-6	Compute initial conditions and time response for current and voltage in first order R-L and R-C circuits	DC Transient analysis of a series RC and RL Circuit using Laplace transform method.	T1,R1
7-8	Analyze and solve problems on complicated RC and RL circuits	Problems on DC Transient analysis of a series RC and RL Circuit.	T1,R1
9	Compute initial conditions for current and voltage in second order RLC circuit s	DC Transient analysis of a series RLC Circuit using differential equation approach and numerical problems.	T1,R1
10	Compute initial conditions for current and voltage in second order RLC circuit s	DC Transient analysis of a series RLC Circuit using Laplace transform and numerical problems.	T1,R1
11-12	Analyze and solve problems on complicated RLC circuits	Problems on DC Transient analysis of a series RLC Circuit	T1,R1
13-14	Analyze and solve problems	Tutorial	T1,R1
15	Able to know how can parameters useful for computing different Networks	Introduction to Parameters	T1,R1
16	Able to compute Impedance parameters for two port networks	Impedance Parameters	T1,R1
17	Able to compute Admittance parameters for two port networks	Admittance Parameters	T1,R1
18	Able to compute Hybrid parameters for two port networks	Hybrid Parameters	T1,R1
19	Able to compute ABCD Parameters for two port networks	ABCD Parameters	T1,R1
20	Analyze some questions	Problems on Impedance, Admittance and Hybrid Parameters	T1,R1
21	Able to Convert one parameter to another	Conversion of one Parameters to another Parameters	T1,R1
22	Able to formulate the conditions for Reciprocity and Symmetry	Condition for Reciprocity and Symmetry	T1,R1
23	Able to Analyze the Network if they are connected in series, parallel and cascaded	Interconnection of Two port networks in series, Parallel and Cascaded configuration	T1,R1
24	Able to compute Image parameters for two port networks	Image Parameters	T1,R1
25-26	Doubts clarification on Parameters	Tutorial	T1,R1
27	Able to know Filters and its Applications	Introduction to Filters	T1,R1
28	Discuss filters concept, filter networks,	Introduction to filters, Ideal and Practical	T1,R1

	classification, and its types.	Filters, filter networks.	
29	Infer impedance in different filters.	Characteristic impedance in the pass and stop bands.	T1,R1
30	Classification of filters	Classification of filters	T1,R1
31	Designing constant k-low pass filter	Constant k-filters-constant k-low pass filter	T1,R1
32	Designing constant k-low pass filter	constant k-high pass filter	T1,R1
33	Exercise problems	Constant-k low pass filter, high pass filter and problems	T1,R1
34	Designing m-derived band pass filter	M-derived filter, band pass filter	T1,R1
35	Designing m-derived band elimination filter	M-derived filter, band elimination filter	T1,R1
36	Designing Symmetrical T-type attenuator	Symmetrical Attenuators: T-type Attenuators	T1,R1
37	Designing P-type attenuator	Symmetrical Attenuators: P-type Attenuator	T1,R1
38	Designing Symmetrical lattice type attenuators	Lattice Attenuator	
39	Designing Bridged T type attenuator	Bridged T-type Attenuators	T1,R1
40	Doubts Clarification	Tutorial	T1,R1
41	Able to know what is a Machine	Introduction to electrical machines	T2,R2
42-43	Able to know the D.C. generator working principle and its parts	Dc generator, principle ,its working and construction	T2, R2
44-45	Able to analyze the E.M.F. induced in the Armature and	E.M.F equation and Problems	T2, R2
46-47	Analyze the generator characteristics	Generator characteristics ,types of generators, Losses and Efficiency	T2,R2
48	Able to know the D.C. Motor working principle and its parts	Motor working principle, types of motors	T2, R2
49	Able to differentiate motors depend upon excitation	Types of motors and exercise problems	T2, R2
50-51	Able to calculate the efficiency of the machine, armature torque	Efficiency, Armature torque, Exercise problems	T2, R2
52-54	Able to analyze the dc motor characteristics	Characteristics of D.C motor and tests, problems	T2, R2
55-57	Able to know Transformer and its applications	Introduction-Principle, Constructional features,types,ideal transformer, practical transformer,appications	T2,R2
58-59	know the types of transformer	Types of transformer and emf equation	T2, R2
60	To understand the pharos diagrams of transformers	Phasor diagram of ideal and practical transformer	T2,R2
61-62	To understand Losses and Efficiency of Transformer and Regulation	Losses and efficiency of transformer, Regulation	T2,R2
63-64	know how to perform OC and SC tests on transformer	Test on transformer-OC and SC test on transformer	T2,R2
65	Understand the concept of stepper motor and synchros.	Synchrous and stepper motor, Doubts	T2,T3
24	Able to compute Image parameters for two port networks	Image Parameters	T1,R1
25-26	Doubts clarification on Parameters	Tutorial	T1,R1

XI. MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Objectives	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
I	S	S	S		S	H			S	S	S	S	S	S	S
II	S	S	H	S	S	H	S		S		S	S	S	H	S
III	S	S	H	S	S		S		S		S	S	S	H	S
IV	S	H	H	S	S	S			S	S	S	S	S	S	S
V	H	H	S	S	S	H	S		S	S	S	S	S	H	S

S – Supportive **H - Highly Related**

XII. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	S	S	S		S	H			S	S	S	S	S	S	S
2	S	S	H	S	S	H	S		S			S	S	S	S
3	S	H	H		S							S	S	H	S
4	S	H	H	S	H	S			S	S	S	S	S	S	S
5	H	H	S	S		H	S		S	S	S	S	S	H	S

S – Supportive **H - Highly Related**

Prepared by: Mr. A Naresh Kumar, Assistant Professor

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