INSTITUTE OF AERONAUTICAL ENGINEERING

(AUTONOMOUS)

Dundigal, Hyderabad - 500 043

INFORMATION TECHNOLOGY

COURSE DESCRIPTION FORM

Course Title	**BASIC ELECTRICAL ENGINEERING**			
Course Code	A30202			
Regulation	**R13 - JNTUH**			
Course Structure	Lectures	Tutorials	Practicals	Credits
	4	-	-	4
Course Coordinator	Ms. S Swathi, Assistant Professor			
Team of Instructors	Ms. S Swathi, Assistant professor			

I. COURSE OVERVIEW:

This course introduces the concepts of basic electrical engineering parameters, quantities, analysis of AC and DC circuits, the construction operation and analysis of transformers, DC and AC machines. It also gives knowledge about measuring instruments operation in detail. The course teaches the fundamentals of faraday-laws, ohms laws, Kirchhoff's laws and different electrical concepts. They will be able to analyze circuit theorems like superposition theorem, Thevenins's theorem, and maximum power transfer theorem problems

II. PREREQUISITE(S):

Level	Credits	Periods/ Week	Prerequisites
UG	4	4	Engineering Physics

III. MARKS DISTRIBUTION:

Sessional Marks	University End Exam Marks	Total marks
Midterm Test There shall be two midterm examinations. Each midterm examination consists of essay paper, objective paper and assignment. The essay paper is for 10 marks of 60 minutes duration and shall contain 4 questions. The student has to answer 2 questions, each carrying 5 marks. The objective paper is for 10 marks of 20 minutes duration. It consists of 10 multiple choice and 10 fill-in-the blank questions, the student has to answer all the questions and each carries half mark. First midterm examination shall be conducted for the first two and half units of syllabus and second midterm examination shall be conducted for the remaining portion. Five marks are earmarked for assignments. There shall be two assignments in every theory course. Assignments are usually issued at the time of commencement of the semester. These are of problem solving in nature with critical thinking.	75	100

Sessional Marks	University End Exam Marks	Total marks
Marks shall be awarded considering the average of two midterm tests in each course.		

IV. EVALUATION SCHEME:

S. No	Component	Duration	Marks
1.	I Mid Examination	80 minutes	20
2.	I Assignment	-	5
3.	II Mid Examination	80 minutes	20
4.	II Assignment	-	5
5.	External Examination	3 hours	75

V. COURSE OBJECTIVES:

I. Be familiar with the basic fundamentals of Electric Circuits, their components and the Mathematical tools used to represent and analyze Electrical circuit.
II. To gain knowledge in fundamental laws such as Ohm's law, Kirchhoff's laws, and able to solve simple Problems.
III. Be familiar with write and solve DC, AC networks including resistors, capacitors, inductors, and independent sources.
IV. Be familiar with basic indicating instruments - permanent magnet moving coil and moving iron Instruments.
V. To gain knowledge in different Electrical AC machines and DC machines and their analysis.

VI. COURSE OUTCOMES:

At the end of the course the students are able to:

1. **Explain** basic electrical concepts, including electric charge, current, electrical potential, electrical Power and energy.
2. **Apply** Kirchhoff's voltage and current laws to the analysis of electric circuits.
3. **Solve** simple problems of electrical circuits.
4. **Differentiate** different types of instruments and their application.
5. **Describe** the electrical machines based on real time system.
6. **Describe** the Machines applications on analyzes the systems on other than mentioned in engineering academic course.
7. **Analyze** simple problems of AC circuits.

VII. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes		Level	Proficiency assessed by
PO1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	H	Assignments, Tutorials
PO2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	H	Assignments
PO3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	S	Mini Projects
PO4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	S	Projects
PO5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	S	Mini Projects
PO6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.	N	--
PO7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	N	--
PO8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	N	--
PO9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	N	--
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.	N	--
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	N	--
PO12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	S	Projects

N - None S - Supportive H - Highly Related

VIII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes		Level	Proficiency assessed by
PSO1	**Professional Skills:** The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient Analysis and design of computer-based systems of varying complexity.	H	Lectures, Assignments
PSO2	**Software Engineering Practices:** The ability to apply standard practices and strategies in software service management using open-ended Programming environments with agility to deliver a quality service for business success.	S	Projects
PSO3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating Innovative career paths, to be an entrepreneur, and a zest for higher studies.	--	Guest Lectures

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

IX. SYLLABUS:

UNIT-I

Introduction to Electrical Engineering: Ohm's law, basic circuit components, Kirchhoff's laws. Simple problems. **Network Analysis:** Basic definitions, types of elements, types of sources, resistive networks, inductive networks, capacitive networks, and series parallel circuits, star delta and delta star transformation. , Network theorems-Superposition, Thevenins's, Maximum power transfer theorems and simple problems

UNIT-II

Alternating Quantities: Principle of ac voltages, waveforms and basic definitions, root mean square and average values of alternating currents and voltage, form factor and peak factor, phasor representation of alternating quantities, the J operator and phasor algebra, analysis of ac circuits with single basic network element, single phase series circuits.

UNIT-III

Transformers : Principles of operation, Constructional Details, Ideal Transformer and Practical Transformer, Losses, Transformer Test, Efficiency and Regulation Calculations (All the above topics are only elementary treatment and simple problems).

UNIT-IV

D.C generators: Principle of operation of dc machines, types of D.C generators, EMF equation in D.C generator. **D.C motors**: Principle of operation of dc motors, types of D.C motors, losses and torque equation, losses and efficiency calculation in D.C generator. **A.C Machines:** Three phase induction motor, principle of operation, slip and rotor frequency, torque (simple problems)..

UNIT-V

Basic Instruments: Introduction, classification of instruments, operating principles, essential features of measuring instruments, Moving coil permanent magnet (PMMC) instruments, Moving Iron of Ammeters and Voltmeters (elementary Treatment only)..

Text books:

1. M. S. Naidu, Kamaraju, "Basic Electrical Engineering", Tata Graw-Hill.

References:

1. D. P. Kothari, I. J. Nagrath, "Basic Electrical Engineering", McGraw-Hill.
2. V.K. Mehta, Rohit Mehta, "Principles of Electrical Engineering", s. chand publications.

X. COURSE PLAN:

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

Lecture No.	Topics to be covered	Course Learning Outcomes	Reference
1 - 3	Ohms' law, basic circuit components	**Understand** basic concept of ohm's law and their limitations the basic circuit components, daily electrical words	T1: 4.4
4 - 6	Kirchhoff's current law, Kirchhoff's voltage law, Simple problems	**Learn** conservation of energy at node, the Kirchhoff's current law, Kirchhoff's voltage law, the conservation of charge in loop	T1: 5.8
7 - 8	Basic definitions, types of elements	**Demonstrate** electrical elements words the basic definitions, basic concepts of different types of elements, independent and dependent elements	T1: 2.2
9 - 10	Types of sources, resistive networks, Inductive networks, capacitive networks	**Demonstrate** the types of sources, resistive networks, inductive networks, capacitive networks, properties	T1: 4.7
10 - 11	Series parallel circuits, Star delta and delta star transformation	**Demonstrate** equations the series parallel circuits, the star delta and delta star transformation, equivalent circuit resistance, inductance, and capacitance	T1: 4.7,10.5
12 - 14	Network theorems- Superposition theorem, Thevenins's, Maximum power transfer theorems, Simple problems on theorems	**Learn** Superposition theorem, Thevenins's, Maximum power transfer theorems, simple problems on theorems	T1:4.8
15 - 16	Introduction to alternating quantities, Principle of AC voltages and wave forms	**Understand** the Principle of AC voltages and wave forms, the Introduction to alternating quantities, advantages of AC	T1:7.1
17 - 19	Basic definitions RMS Value, Avg. Value of Alternating current and voltage, Form factor, peak factor, Simple problems	**Demonstrate** the time period ,frequency, cycle, definitions, RMS Value, Avg. Value of Alternating current and voltage, the form factor, peak factor, the Simple problems, different waveforms	T1:7.2
20 - 22	Phasor representation of alternating quantities, J operator, Phasor algebra	**Learn** the Phasor representation of alternating quantities, J operator, Phasor algebra, polar form, rectangular form	T1:7.4

23 - 26	Analysis of AC circuits with single basic network element, Single phase series circuits, Problems on single phase series circuits, Problems on single phase series circuits	**Demonstrate** the Analysis of AC circuits with single basic network element, the Single phase series circuits, single phase series circuits, single phase series circuits	T1:7.2
27 - 30	Introduction of transformer, Principle of operation, Constructional details, Emf equation	**Demonstrate** mutual inductance, the Introduction of transformer, the Principle of operation, the constructional details, the Emf equation, turns ratio	T1:13.1
31 - 32	Ideal transformer operation, Practical transformer operation	**Learn** the no-load, load ideal transformer operation, the practical transformer operation properties, phasor diagrams	T1:13.2,13.3
33 - 37	Losses in transformer, Transformer test and efficiency ,Regulation calculation, Simple problems on efficiency, Simple problems on regulation of transformer	**Demonstrate** of efficiency and regulation of transformer depends upon these concepts they will find efficiency and regulation of practical of transformer	T1:13.7,13.9
38 - 39	Principle of operation of Dc machines, Construction of Dc machines	**Understand** dynamically induced emf the Principle of operation of Dc machines, the Construction of Dc machines, faraday right hand rule,	T1:11.1
40 - 44	Types of D.C. generators, Types of D.C. generators problems, E.M.F equation of DC generator, Problems on calculation of E.M.F for different generators, Problems on calculation of E.M.F for different generators	**Demonstrate** the knowledge of types of generators and their working condition, calculation of E.M.F for different generators, calculation of E.M.F for different generators, series, shunt generators	T1:11.5
45 - 46	Principle of operation of D.C. motors, Back emf	**Learn** the Principle of operation of D.C. motors, the Back emf, faraday left hand rule	T1:12.1
47 - 48	Types of D.C. Motors, Torque equation of D.C. Motors	**Understand** the Types of D.C. Motors, the torque equation of D.C. Motors, series, shunt motors back emfs	T1:12.5
49 - 51	Losses, Efficiency calculation in D.C. motors, Simple problems	**Learn** the efficiency calculation in D.C. motors, the Losses, brake test	T1:12.7
52 - 53	Three phase induction motor introduction, Principle of operation	**Demonstrate** introduction of the Three phase induction motor, the Principle of operation, rotating magnetic field concept	T1:14.3
54 - 57	Slip and rotor frequency, Problems on slip calculations, Problems on torque calculations, Problems on frequency calculations	**Understand** the concept of slip and torque under different condition ,the Slip and rotor frequency, the Problems on slip calculations, torque calculations**,** on frequency calculations	T1:14.5
58 - 59	Introduction of instruments, Classification of instruments	**Understand** the Introduction and classification of instruments, different effects	T1:17.2

60 - 61	Operating principles of measuring instruments, Essential features of measuring instruments	**Understand** Deflecting Torque, controlling torque, Damping torque, the Operating principles of measuring instruments, the essential features of measuring instruments, Air friction damping, fluid friction damping, eddy current damping	T1:17.3
62 - 64	PMMC Instrument of Voltmeter and Ammeter, PMMI Instrument of Voltmeter and Ammeter, Simple problems	**Understand** the PMMC and PMMI knowledge of instrument and working knowledge of instrument, Attraction and repulsion type of MI instrument	T1:17.7

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				H								S	
II	H					S							S		
III		S						H				S			
IV	H						S						S		
V		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					H							S	
2	S		S	H											
3		H								S			S	S	
4	H							S				S	S		
5	S			H							S				
6		S				H						S			
7	H												S	S	

S - Supportive **H - Highly Related**

Prepared by: Ms S Swathi, Assistant professor

Date:

HOD, IT