INSTITUTE OF AERONAUTICAL ENGINEERING

(AUTONOMOUS)

Dundigal, Hyderabad - 500 043

CIVIL ENGINEERING

COURSE DESCRIPTION

Department	:	**CIVIL ENGINEERING**			
Course Title	:	**ELECTRICAL AND ELECTRONICS ENGINEERING**			
Course Code	:	**A30203**			
Course Category	:	CORE			
Course Structure	:	Lectures	Tutorials	Practical's	Credits
		5	-	-	4
Course Coordinator	:	Mr. A Sathishkumar, Assistant Professor			
Team of Instructors	:	Mr. A Sathishkumar, Assistant Professor Mr. M Diva Kumar, Assistant Professor			

I. Course Overview:

Electrical and Electronics Engineering course deals with the concepts of electrical circuits, basic law's of electricity, different methods to solve the electrical networks and the instruments to measure the electrical quantities. It also focuses on the construction, operational features of energy conversion devices such as DC and AC machines, Transformers. It also emphasis on basic electronics semiconductor devices and their characteristics and operational features

II. Prerequisites:

Level	Credits	Periods / Week	Prerequisites
UG	4	5	Basic knowledge of Electrical components, electromagnetic principles and Semiconductor materials.

III. Course Assessment Methods:

Marks Distribution:

Sessional Marks	University End Exam Marks	Total Marks
There shall be 2 midterm examinations. Each midterm examination consists of one objective paper, one subjective paper and one assignment. The objective paper is for 10 marks and subjective paper is for 10 marks, with duration of 1 hour 20 minutes (20 minutes for objective and 60 minutes for subjective paper). Objective paper is set with 20 bits of multiple choice questions, fill-in the blanks and matching type of questions for a total of 10 marks. Subjective paper contains 4 full questions of which, the student has to answer 2 questions, each question carrying 5 marks. First midterm examination shall be conducted for 1-2.5 units of the syllabus and second midterm examination shall be conducted for 2.5-5	75	100

units of syllabus. 5 marks are allocated for Assignments (as specified by the concerned subject teacher) – first Assignment should be submitted before the conduct of the first mid, and the second Assignment should be submitted before the conduct of the second mid. The total marks secured by the student in each midterm examination are evaluated for 25 marks, and the average of the two midterm examinations shall be taken as the final marks secured by each candidate		

IV Evaluation Scheme:

S. No.	Component	Duration	Marks
1	I Mid Examination	1 hour 20 min	20
2	I Assignment		5
		Total	**25**
3	II Mid Examination	1 hour 20 min	20
4	II Assignment		5
		Total	**25**
MID Examination marks to be considered as average of above 2 MID's TOTAL			
5	External Examination	3 hours	75
		GRAND TOTAL	**100**

V. Course Objectives:

I. To get the knowledge on basic concepts of electrical circuits, its components and the fundamental laws such as Ohm's law, Kirchhoff's laws.
II. To understand the series, parallel networks and star-delta transformation techniques which are used to reduce a complex network to a simple network.
III. To understand basic principle and operation of indicating instruments - permanent magnet moving coil and moving iron instruments.
IV. To know the construction, operational features of energy conversion devices such as DC Machines, AC Machines and Transformers.
V. To know the operation and characteristics of different semiconductor devices such as Diodes, Transistors and SCR.
VI. To understand the operation of CRO and its application to measure the voltage, current and frequency.

VII. Course Outcomes:

1. Ability to apply the Ohms law in the analysis of electrical circuits.
2. Ability to apply the Kirchhoff's Voltage and Current laws in the analysis of electrical circuits.
3. Shall have the ability to use permanent magnet and moving coil instruments in the measurement of current, voltage and power in electrical circuits.
4. Able to know the construction and operation of DC machines
5. Able to get the thorough knowledge on operation of the transformers in the energy conversion process.
6. Able to know the performance of transformer
7. Ability to operate and control the electro mechanical energy conversion devices such as DC Machines and AC Machines

8. Able to know the fundamental of semiconductor devices
9. Shall have the ability to find the characteristics and application of different semiconductor devices such as Diodes, Transistors and SCR.
10. Shall have the ability to measure the voltage, current and frequency using CRO

VIII. How course outcomes are assessed:

Program outcomes		Level	Proficiency assessed by
PO1	An ability to apply the knowledge of mathematics, science and Engineering for solving multifaceted issues of Electrical Engineering.(General knowledge)	H	Assignments, Practicals, Midterm and University examinations
PO2	An ability to communicate effectively and to prepare formal technical plans leading to solutions and detailed reports for electrical systems.(Problem Analysis)	H	Assignments, Practicals, Midterm and University examinations
PO3	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. (Design/Development of solutions).	S	Assignments, Practicals, Midterm and University examinations
PO4	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. (Conduct investigations of complex problems)	S	Assignments, Practicals, Midterm and University examinations
PO5	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. (Modern tool usage**)**	H	Assignments, Practicals, Midterm and University examinations
PO6	An Ability to design and fabricate modules, control systems and relevant processes to meet desired performance needs, within realistic constraints for social needs.(The engineer and society)	N	--
PO7	An ability To estimate the feasibility, applicability, optimality and future scope of power networks and apparatus for design of eco-friendly with sustainability (Environment and sustainability)	N	--
PO8	To Possess an appreciation of professional, societal, environmental and ethical issues and proper use of renewable resources.(Ethics)	S	Assignments, Practicals, Midterm and University examinations
PO9	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. **(**Individual and team work)	H	Assignments, Practicals, Midterm and University examinations
PO10	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. **(**Communication)	N	--
PO11	An ability to align with and upgrade to higher learning and research activities along with engaging in life-long learning.	H	Assignments, Practicals, Midterm and University examinations

PO12	To be familiar with project management problems and basic financial principles for a multi-disciplinary work.(Project management and finance)	S	Practicals, Midterm and University examinations

IX. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes		Level	Proficiency assessed by
PSO1	**Professional Skills:** Able to utilize the knowledge of high voltage engineering in collaboration with power systems in innovative, dynamic and challenging environment, for the research based team work.	H	Lectures, Assignments
PSO2	**Problem-Solving Skills:** Can explore the scientific theories, ideas, methodologies and the new cutting edge technologies in renewable energy engineering and use this erudition in their professional development and gain sufficient competence to solve the current and future energy problems universally.	S	Projects
PSO3	**Successful Career and Entrepreneurship:** The understanding of technologies like PLC, PMC, process controllers, transducers and HMI one can analyze, design electrical and electronics principles to install, test , maintain power system and applications.	S	Projects

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

X. Syllabus:

UNIT-I

Electrical circuits: Basic definitions, types of elements. Ohm's law, resistive networks, Kirchhoff's laws, inductive networks, capacitive networks, series, parallel circuits and star/delta and delta-star transmission.

Instruments: Basic principle of indicating instruments-PMMC and MI instruments.

UNIT-II

DC Machines: Principle operation of DC generator – E.M.F equation-types-dc motor types-torque equations-applications-three point stator.

UNIT-III

Transformers: Principle of operation of single phase transformers- E.M.F equation-losses-efficiency and regulations.

AC Machines: Principle of operation of alternator- regulation by synchronous impedance method-Principle of operation of Induction Motor-Slip-Torque characteristics- Applications.

UNIT-IV

Diodes: P-N junction diode, symbol, V-I characteristics, Diode applications, and rectifiers-Half wave, Full wave and Bridge rectifiers (simple problems).

Transistors: PNP and NPN junction transistors, Transistor as an Amplifier, SCR characteristics and applications.

UNIT-V

Cathode ray oscilloscope: Principles of CRT (cathode ray tube), Deflection, sensitivity, Electro static and Magnetic Deflection, Applications of CRO- voltage, Current and Frequency Measurements

TEXT BOOKS:

T1. Fundamentals of Electric Circuits – Charles K. Alexander, Matthew N.O. Sadiku, Mc Graw Hill

T2. Basic Electrical Engineering – S.N.Singh, PHI
T3. Electronic Devices and Circuits – S.Salivahanan, N.Suresh Kumar, A.Vallavaraj, TMH
T4. Electronic Devices and Circuits – K.Lal Kishore, BS Publications.

REFERENCE BOOKS:

R1. Basic Electrical Engineering – D.P Kothari, I.J.Nagrath, McGraw-Hill.
R2. Theory and performance of Electrical Machines – J.B.Gupta, S.K. Kataria & Sons
R3. Electronic Devices and Circuits – R.L Boylestad and Louis Nashelsky, PEI/PHI.
R4. Introduction to Electronic Devices and Circuits – Rober T.Paynter, PE.

XI. Course Plan:

The course plan is meant as a guideline. There may probably be changes.

Lecture No.	Course Learning Outcomes	Topics to be covered	Reference
	UNIT-I **Electrical Circuits**		
1	**Understand** the of Basic Definitions of Electrical Circuits	Basic Definitions of Electrical Circuits	T1, R1
2	**Understand** the Basic Elements	Types of elements and basic problems	T1, R1
3	**Apply** ohm's law to simple circuits	Ohm's law and simple problems	T1, R1
4	**Understand** Kirchhoff's laws	Kirchhoff's laws	T1, R1
5	**Apply** Kirchhoff's laws to simple problems	Problems on Kirchhoff's laws	T1, R1
6	**Classify** the types of networks	Resistive Networks, Inductive Networks, Capacitive Networks	T1, R1
7	**Apply** Series and parallel networks to simple problems	Problems on series and parallel networks	T1, R1
8	**Understand** star connected and Delta connected systems	Star-Delta conversion and Delta- Star conversion	T1, R1
9	**Apply** Star-Delta conversion and Delta- Star conversion to simple problems	Problems on Star-Delta conversion and Delta- Star conversion	T1, R1
10	**Understand** the Basic Principles of instruments	Basic Principles of indicating instruments	T2, R1
11-12	**Differentiate** the different types of instruments and their application	permanent magnet moving coil and moving iron instruments	T2, R1
	UNIT-II **DC Machines**		
13	**Understand** the Basic Principles and Laws of EMF	Introduction of faraday law's and Lenz's law.	T2, R2
14	**Understand** principle of operation of D.C. generator	Principle and operation of DC generator	T2, R2
15	**Understand** construction of DC machine	Construction of DC Machine	T2, R2
16	**Derive** the equation for EMF of DC generator	EMF equation	T2, R2

17	**Apply** EMF Equation of generator to simple problems	Problems on EMF equation	T2, R2
18	**Classify** the different types of Generators	Type of Generators and simple problems.	T2, R2
19	**Understand** Magnetization and Load Characteristics of DC Generators	Magnetization and Load Characteristics of DC Generators.	T2, R2
20	**Understand** Losses and efficiency of Dc generator	Losses and Efficiency of DC generator	T2, R2
21	**Understand** principle of operation of D.C. motor	Principle and operation of DC motor, Significance of Back EMF	T2, R2
22	**Classify** the different types of motors	Types of motors	T2, R2
23	**Derive** the equation for Armature Torque of DC motor	Armature Torque of DC motor	T2,R2
24	**Determine** the Armature Torque	Problems on Armature Torque	T2, R2
25	**Derive** the expression for Efficiency and regulation of DC motor	Efficiency and regulation Of DC motor	T2, R2
26	**Calculate** the Efficiency of generator and motor	Problems on Efficiency of DC machines	T2, R2
27	**Understand** the three point stator and the applications of DC motors	Three Point Starter and applications	T2, R2
UNIT-III Transformers & AC Machines			
28	**Understand** the Principle of operation of Single Phase transformer	Principle of operation of Single Phase transformer	T2, R2
29	**Understand** the construction and types of Transformers	Types and constructional features	T2, R2
30	**Derive** the EMF Equation of Transformer and **apply** it to solve simple problems	EMF equation and Simple problems	T2, R2
31 & 32	**Understand** the Losses and Efficiency of Transformer and its Regulation	Losses and Efficiency of Transformer and Regulation and simple problems	T2, R2
33	**Know** how to perform OC and SC tests on transformer	OC and SC Tests	T2, R2
34	**Understand** the working principle of Alternator	Alternators working Principle	T2, R2
35 & 36	**Derive** EMF Equation of alternator and apply it to solve simple problems	EMF Equation of alternator and simple problems on frequency and synchronous speed	T2, R2
37	**Determine** the regulation of alternator by Synchronous Impedance Method	Predetermination of regulation by Synchronous Impedance Method.	T2, R2
38	**Understand** the basic principle of three phase induction motor	Principle of operation of three phase induction motors	T2, R2

39	**Classify** the types of three phase induction motors	Slip ring and Squirrel cage motors	T2, R2
40	**Draw** the Slip-Torque characteristics of three phase induction	Slip-Torque characteristics	T2, R2
41	**Understand** the applications of three phase induction motor	Applications	T2, R2
42	**Apply** slip-torque relation to solve simple problems	Problems on slip and torque of induction motor	T2, R2
UNIT- IV Diodes & Transistors			
43	**Know** the working of a Diode	Introduction to PN-junction diode, Symbol.	T3, T4
44	**Draw** the characteristics of Diode and also **know** the diode applications	V I- characteristics of diode and its applications	T3, R3
45	**Know** the internal parameters of diode	Diffusion current, Diffusion capacitance	T3, R3
46	**Find** the theoretical resistance of diode	Static and dynamic resistance	T3, T4, R3
47	**Derive** the equation to find theoretical current of diode	Diode current equation	T3, R4
48	**Know** the operation of half wave rectifier(power supply)	Half Wave rectifier-calculations	T4, R4
49 & 50	**Know** the operation of Full wave rectifier(power supply)	Full wave rectifier-calculations	T4, R4
51	**Know** the operation of Bridge wave rectifier(power supply)	Bridge wave rectifier-calculations	T4, R4
52	**Analyze** the Rectifiers (Half, Full and Bridge wave)	Problems	T4, R4
53 & 54	**Understand** the construction, operation and characteristics of BJT.	PNP and NPN Transistor	T3, R3
55 & 56	Understand the different configurations of Transistors	CB, CE, CC configurations	T3, R3
57	**Know** the parameters of transistor configuration	Relation between α, β, λ	T3, R3
58	**Understand** the operation of Transistor as an amplifier	Transistor as an Amplifier	T3, R3
59	**Understand** the operation of SCR and its applications	SCR characteristics and applications	T3, T4
UNIT-V Cathode Ray Oscilloscope			
60	**Understand** the principle of operation of CRT.	Principle of CTR (Cathode Ray Tube)	T4, R4
61	**Understand** the principle of operation of CRO.	Operation of CRO	T4, R4
62	**Understand** the dynamics of electrons	Deflection Sensitivity	T4, R3, R4
63	**Understand** the dynamics of electrons	Electrostatic and magnetic deflection	T4, R3, R4
64	**Know** the applications of	CRO Applications	T4, R3, R4

	CRO		
65	**Determine** the Voltage, Current and frequency using CRO	Voltage ,Current and Frequency measurement	T4, R3, R4

XII. MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF THE 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	H	H	S		H						H	S	H		S
II	H	H	S	S				S	H			S	S	H	S
III	H	H	S		H								H	S	
IV	H	H	S		H							S		S	
V	H	H	S		H				H				H		S
VI	H			S							S				

S – Supportive H= Highly related

XIII. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF THE 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	H	H	S	S	H								H		S
2	H	H	S		H			H			H	S	H	S	S
3	H	H	S		H							S	S	S	
4	H	H	S	S	H			S	H		H		S	S	S
5	H	H	S		H						H	S		H	
6		H							S					S	S

S=Supportive **H=Highly Related**

Prepared By: A Sathishkumar, Assistant Professor

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