

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous) Dundigal, Hyderabad - 500 043

Department of Electrical and Electronics Engineering

COURSE DESCRIPTION FORMS

Course Title	UTILIZATION OF ELECTRICAL ENERGY							
Course Code	A70232							
Regulation	R15							
Course Structure	Lectures	Tutorials	Practicals	Credits				
Course Structure	4	1	0	4				
Course Coordinator	Ms. Lekha Chandran, Assistant Professor, EEE							
Team of Instructors	Ms. Lekha Chandran, Assistant Professor, EEE							

I. COURSE OVERVIEW:

This subject deals with the fundamentals of DC Machines, illumination and its classification, the electric welding, electric heating. It gives detailed study of all varieties of Electric drives and their application to electric traction system. It also deals with the speed time curves for the evaluation and estimation of train speeds.

II. PREREQUISITES:

Level	Credits	Periods	Prerequisite
UG	4	4	Knowledge on DC, AC Machines, Physical Laws

III. COURSE ASSESSMENTMETHODS:

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.	75	100
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 5marks		
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 1 to 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		

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. COURSEOBJECTIVE:

- 1. Understand basic problems and model the associated configurations, circuits and systems related to wiring and illumination designs for buildings, electric heating, welding, electrolysis and other applications.
- 2. Understand the basics of how each renewable energy technology works. And how it can be utilized for electric energy production.
- 3. Distinguish between the main types of renewable energy technology and what each can perform and the process of achieving that.
- 4. Understand which might be the most appropriate technology for any given scenario.
- 5. Understand Generating electricity from sustainable energy sources and keeping track of key public policies affecting renewable power generation and identify the role played by these policies in shaping the electric power industry and make a payback calculation for each technology.

VI. COURSE OUTCOMES:

- 1. Understand expression related Temperature Rise, Types of industrial loads, Load Equalization, Speed-time curves.
- 2. Understand the knowledge of advantages
- 3. Understand methods of electrical heating.
- 4. Understand the electrical welding and comparison between A.C and D.C welding.
- 5. Understand the basic fundamentals of illumination
- 6. Attain the knowledge of various illumination methods.
- 7. Understand the various modern methods of speed control & braking techniques
- 8. The ability to use modern approach of electric traction system instruments.
- 9. Understand of impact of engineering solutions on the society and also on contemporary issues.
- 10. Understand the power electronics technology in efficient utilization of electrical power
- 11. Understand power electronics technology in efficient utilization of electrical power
- 12. Understand effective utilization of Power Electronic Technologies in Electrical Traction.
- 13. L Understand fundamentals of Solar radiation & measurement
- 14. Understand the use of Power Electronic Technologies in various process control.
- 15. Create lighting system using LED Technologies.

VII. HOW PROGRAM OUTCOMES ARE ASSESSED:

	Program Outcomes	Level	Proficiency Assessed By
I	PO1 Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	Н	Assignments and Exercise
I	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.	N	
I	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	Н	Assignments, discussion

	health and safety, and the cultural, societal, and environmental considerations		
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.	N	
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.	N	
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	S	Assignments, discussion
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	Ν	
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	Prototype, discussions
	N= None S=Supportive	H=higł	nly related

VIII. 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.	Н	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.	N	
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	Seminars and Projects

VIII. SYLLABUS:

UNIT-I

Electric Drives: Type of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, particular applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, load equalization.

UNIT-II

Electric Heating & Welding: Electric heating: Advantages and methods of electric heating, resistance heating induction heating and dielectric heating.

Electric welding: resistance and arc welding, electric welding equipment, comparison between A.C. and Welding.

UNIT-III

Illumination: Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light. Discharge lamps, MV and SV lamps – comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of lighting and flood lighting.

UNIT-IV

Electric traction-I: System of electric traction and track electrification. Review of existing electric traction systems in India. Special features of traction motor, methods of electric braking-plugging rheostat braking and regenerative braking. Mechanics of train movement. Speed-time curves for different services – trapezoidal and quadrilateral speed timecurves.

UNIT-V

Electric traction-II: Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and braking retardation adhesive weight and coefficient of adhesion.

IX. TEXT BOOKS:

- 1. Generation and Utilization of Electrical Energy by S. Sivarnagaraju, D. Srilatha, M. Balasubbareddy published by person education on India2010
- 2. Utilizations of Electric Energy by E. Openshaw Taylor, OrientLongman.
- 3. Art & Science of Utilization of electrical Energy by Partab, Dhanpat Rai & Sons.

X. REFERENCES:

- 1. Utilization of Electrical Power including Electric drives and Electric traction –by N. V. Suryanarayana, New Age International (P) Limited, Publishers, 1996.
- 2. Generation, Distribution and Utilization of electrical Energy by C.L. Wadhwa, New Age International (P) Limited, Publishers, 1997.

XI. COURSEPLAN:

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

Lecture No.	Learning Objectives	Topics to be covered	Referenc e
1-2	To understand the concept of Electric drive	ELECTRIC DRIVES: Introduction to Electric drive Type of electric drives.	T1,R1
3-4	To understand the starting and running characteristics	Choice of motor, starting and running characteristics.	T1,R1
5-6	Ability to know the speed control of lectric drive.	Speed control, temperature rise, and particular applications of electric drives.	T1,R1
7	To Know the types of different loads	types of industrial loads	T1,R1
8	Understand the Continuous type loads	Continuous loads	T1,R1
9	Understand the Intermittent and variable type loads	Intermittent and variable loads	T1 ,R1
10	Aware of Load equalization	load equalization	T1,R1

11-12	To understand the concept of Electric Heating	Electric Heating: Advantages and methods of electric heating.	T1,R1
13-14	To understand the concept of Electric Heating methods	Methods of electric heating	T1,R1
15	To understand the concept of resistance Heating methods	Resistance heating	T1,R1
16-1	To know the induction heating and dielectric heating	Induction heating And dielectric heating.	T1,R1
18	To understand the concept of Electric welding	Electric welding: Introduction resistance and arc welding.	T1,R1
19-20	To understand the concept of resistance welding and arc welding	Resistance and arc welding	T1,R1
21-22	To understand the concept of arc welding	Arc welding Electric welding equipment,	T2,R1
23-24	Ability to differ the A.C. and D.C. Welding	Comparison between A.C. and D.C. Welding	T1,R2
25	To understand the concept of Illumination and its laws	ILLUMINATION: Introduction, terms used in illumination.	T1,R2
26-30	Realize the illumination laws	laws of illumination	T1,R2
31-34	To Know the Polar curves	Polar curves	T1,R2
35-36	To Know the Photometry, sources of light	Photometry, integrating Sphere.	T1,R2
37	Understand the Sources of light	Sources of light	T1,R2
38-39	To recognize the discharge lamps	TYPES OF LAMPS: Discharge lamps	T1.R2
40	Understand the operation of MV Lamp & SV Lamps	MV Lamp & SV Lamp	T1,R2
41-42	Ability to differ the tungsten filament lamps and fluorescent tubes	Comparison between tungsten filament lamps and fluorescent tubes. Basic principles of light control	T1,R2
43	design of lighting	Types and design of lighting and flood lighting.	T1,R2
44	To Introduce the Electric Traction	ELECTRIC TRACTION - I: System of electric traction	T1,R2
45-46	Know the practical applications Electric Traction in India	Track electrification. Review of existing electric traction systems in India.	T2,R1
47-48	To Know the electric braking and the its methods	Special features of traction motor, methods of electric braking- plugging	T2,R1
49	Understand the concept of braking and its types	Rheostat braking and Regenerative braking.	T2,R1
50-51	Ability to know the Mechanics of train movement.	ELECTRIC TRACTION - II: Mechanics of train movement.	T2,R1
52-53	Ability to analyze the Speed time curves for different applications	Speed-time curves for different services – trapezoidal and Quadrilateral speed time curves.	T2,R1
54-56	To understand the mechanics and dynamics of Electric traction	ELECTRIC TRACTION– III: Calculations of tractive effort, power, specific energy consumption for given	T2,R1
57-59	Know the effects of varying acceleration	Effect of varying acceleration and braking retardation.	T2,R1
59-61	To understand the traction concept of adhesive weight	adhesive weight and braking retardation adhesive weight	T2,R1
62	Know the coefficient of adhesion	coefficient of adhesion	T2,R1

XII. MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENT OF THE PROGRAM **OUTCOMES:**

Course Objectives	Program Outcomes											
	a	b	с	d	е	f	g	h	i	j	k	l
Ι	Н	Н	S	Н	Н	S					Н	
П			S	S	Н	S	Н			S	Н	Н
III			S	S		S		Н				S
IV		Н		Н			Н		S		Н	
V	S	Н	S					S				S
-												

S=Supportive

H= Highly related

XIII. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF THE PROGRAM **OUTCOMES:**

Course	Program Outcomes											
Outcomes	a	b	с	d	е	f	g	h	i	j	k	1
1		Н	Н	S		S		S		S		
2	S			Н		Н	Н		S	S		S
3	S		S					S		S		S
4		S	Н	Н	S				Н		Н	
5		S	Н	Н	S		Н					
6	S		S		Н	Н					Н	S
7	S	S	Н		Н	S				S		Н
8	S			Н		Н	Н		S	S		S
9	S		S					S		S		S
10		S	Н	Н	S				Н		Н	
11		S	Н	Н	S		Н					
12	S		S		Н	Н					Η	S
13	S	S	Н		Н	S				S		Н
14	S			Н		Н	Н		S	S		S
15	S		S		Н	Н					Н	S
	S-Supportive U- Uighlyreleted											

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PREPARED BY: Ms. Lekha Chandran, Assistant Professor, EEE

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