# UTILIZATIONOF ELECTRIC POWER

Subject Code : _EE863PE

Regulations : R16 - JNTUH

Class : IV Year B.Tech EEE II Semester

**Department of Electrical and Electronics and Engineering**

**BHARAT INSTITUTE OF ENGINEERING AND TECHNOLOGY**

Ibrahimpatnam - 501 510, Hyderabad

**UTILIZATION OF ELECTRIC POWER (**EE863PE**)**

**COURSE PLANNER**

## COURSE OVERVIEW

This course primarily deals with utilization of electrical energy generated from various sources. It is important to understand the technical reasons behind selection of motors for electric drives based on the characteristics of loads. Electric heating, welding and illumination are some important loads in the industry in addition to motor/drives. Another major share of loads is taken by Electric Traction. Utilization of electrical energy in all the above loads is discussed in detail in this course. Demand side management concepts are alsointroduced as a part of this course

## PRE REQUISITES:

The knowledge of following subjects is essential to understand the subject:

1. Electrical Machines
2. Power Electronics and Drives
3. Power Systems –II

## COURSE OBJECTIVE:

| | |
|---|---|
| 1 | This Course provides an introduction to the principles of electrical drives and their applications in daily life. |
| 2 | This course deals with the fundamentals of illumination and its classification. |
| 3 | Provides knowledge on electrical traction systems |

**COURSE OUTCOMES:**

**At the end of the course the student will be in a position to**

| S.No | Description | Bloom's TaxonomyLevel |
|---|---|---|
| 1 | To understand the operating principles and characteristics of traction motors with respect to speed, temperature, loading condition | Remembering, evaluating (level1,level V) |
| 2 | To acquaint with the different types of heating and welding techniques | Understanding ,level-2 |
| 3 | To study the basic principles of illumination and its measurement | Understanding, level-2 |
| 4 | To understand the basic principle of electric traction including speed–time curves of different traction services | Understanding,evaluating (level-1,level-5**)** |
| 5 | To understand the method of calculation of various traction system for braking, acceleration and other related parameters, including demand side management. | Understanding, level-2 |

**HOW PROGRAM OUTCOMES ARE ASSESSED**

| Program Outcomes | | Level | Proficiency assed by |
|---|---|---|---|
| PO1 | **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. | 3 | Assignments,Mock tests |
| 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. | 1 | Assignments,Mock tests |

| | | | |
|---|---|---|---|
| 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. | 2 | Assignments,Mock tests |
| 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. | - | Assignments,Mock tests |
| 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. | 1 | Assignments,Mock tests |
| 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. | - | Assignments,Mock tests |
| 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. | - | - |
| PO8 | **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. | - | - |
| PO9 | **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. | - | - |
| 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. | - | - |
| 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. | 1 | seminars |
| 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. | 2 | Industrial visits |

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) - : None

**HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED**

| Program Specific Outcomes | | Level | Proficiency assed by |
|---|---|---|---|
| PSO 1 | Talented to analyze, design and implement electrical &electronics systems and deal with the rapid pace of industrial innovations and developments | 1 | Industrial visits, projects |
| PSO 2 | Skillful to use application and control techniques for research and advanced studies in Electrical and Electronics engineering domain | 1 | Guest lecturers projects |

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) - : No

**COURSE CONTENT:**

**JNTUH 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 & ELECTRIC WELDING**

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 D.C. 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, rheostatic braking and regenerative braking. Mechanics of train movement. Speed-time curves for different services – trapezoidal and quadrilateral speed time curves.

**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.

**GATE SYLLABUS:** NOT APPLICABLE**IES SYLLABUS:** NOT APPLICABLE **TEXT BOOKS:**

1. Utilization of Electrical Energy - by E. Opens haw Taylor, University Press.

Art & Science of Utilization of Electrical Energy - by Par tab, Dhanpat Ravi & Sons.

**REFERENCE BOOKS:**

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.

### 3. LESSON PLAN-COURSE SCHEDULE:

| Session | Week | Topic | PPT Link | PDF Link | Small Projects | Course Learning Outcomes | Teaching Methodologies | Reference |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | **UNIT-1** Electric Drives: Type of electric drives, | https://docs.google.com/presentation/d/1zOmt3SXbMVjr7rxOPkL1SMWp-kFUamTH/edit#slide=id.p1 | https://drive.google.com/drive/folders/1phmh7LtfgqOGkh4bOHxPJGXzw38QOp6V | | Know and understand | chalk & talk | **T1 &T2** |
| 2 | | choice of motor | https://docs.google.com/presentation/d/1g-ZDTwq3D6VpSqpHy6CRu7W5SFQsHqs6/edit#slide=id.p1 | https://drive.google.com/drive/folders/1phmh7LtfgqOGkh4bOHxPJGXzw38QOp6V | | Know and understand | chalk & talk | |
| 3 | | starting and running characteristics, | https://docs.google.com/presentation/d/1bV6SsLAv-cglxT2IIoEBy5h-KhO0UwHY/edit#slide=id.p1 | https://drive.google.com/drive/folders/1phmh7LtfgqOGkh4bOHxPJGXzw38QOp6V | | Know and understand | chalk & talk | |
| 4 | 2 | speed control, temperature rise | https://docs.google.com/presentation/d/1tvoLaLuodHuUllUAzdo7Q28SfnwRHoUX/edit#slide=id.p1 | https://drive.google.com/drive/folders/1phmh7LtfgqOGkh4bOHxPJGXzw38QOp6V | | Evaluate the variables | chalk & talk | |
| 5 | | particular applications of electric drives | https://docs.google.com/presentation/d/1RZtfg-zQ-0DpxyRWvxpjNrQsmiC8cFzR/edit#slide=id.p1 | https://drive.google.com/drive/folders/1phmh7LtfgqOGkh4bOHxPJGXzw38QOp6V | | Know and understand | chalk & talk | |
| 6 | | types of industrial loads, | https://docs.google.com/presentation/d/1rEyQ1PqoO2KgR5EkvVHgD8Gbewslmg Z-/edit#slide=id.p1 | https://drive.google.com/drive/folders/1phmh7LtfgqOGkh4bOHxPJGXzw38QOp6V | | Know and understand | chalk & talk | |
| 7 | 3 | continuous, intermittent and variable loads | https://docs.google.com/presentation/d/1rEyQ1PqoO2KgR5EkvVHgD8Gbewslmg Z-/edit#slide=id.p1 | https://drive.google.com/drive/folders/1phmh7LtfgqOGkh4bOHxPJGXzw38QOp6V | | Know and understand | chalk & talk | |
| 8 | | load equalization | https://docs.google.com/presentation/d/1z4MdbI9w53XG8OMXNIlUQ2Ay7z | https://drive.google.com/drive/folders/1phmh7LtfgqOGkh4bOHxPJGXzw38Q | | Evaluate the variables | chalk & talk | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | pwiQa-/edit#slide=id.p1 | Op6V | | | | |
| 9 | | **MOCK TEST-1** | | | | Evaluate | | |
| 10 | 4 | **UNIT-2** Electric Heating: Advantages and methods of electric heating | https://docs.google.com/presentation/d/1m2pwMbJnXcolgKXKy9UxVjMzFGQfre2c/edit#slide=id.p1 | https://drive.google.com/drive/folders/10Em6Lq0T_pbOYjrHcR6m5R3GFsswwPQh | | Know and understand | chalk & talk | |
| 11 | | resistance heating and induction heating | https://docs.google.com/presentation/d/1m2pwMbJnXcolgKXKy9UxVjMzFGQfre2c/edit#slide=id.p1 | https://drive.google.com/drive/folders/10Em6Lq0T_pbOYjrHcR6m5R3GFsswwPQh | | Know and understand | chalk & talk | |
| 12 | | dielectric heating. | https://docs.google.com/presentation/d/10YX4HIFT8OR3c4aDkc7HWcbPbzomoT5t/edit#slide=id.p8 | https://drive.google.com/drive/folders/10Em6Lq0T_pbOYjrHcR6m5R3GFsswwPQh | | Know and understand | chalk & talk | |
| 13 | 5 | Electric welding-resistance welding | https://docs.google.com/presentation/d/1fBuZjYSSPHwg9w9d65r6GM99krjhPidj/edit#slide=id.p1 | https://drive.google.com/drive/folders/10Em6Lq0T_pbOYjrHcR6m5R3GFsswwPQh | electric welding | Know and understand | PPT | **T1 &T2** |
| 14 | | arc welding, | https://docs.google.com/presentation/d/1WGTX9H_ZJSamMGegWdfZGRQRMma0dpuN/edit#slide=id.p1 | https://drive.google.com/drive/folders/10Em6Lq0T_pbOYjrHcR6m5R3GFsswwPQh | arc welding | Know and understand | PPT | |
| 15 | | electric welding equipment | https://docs.google.com/presentation/d/1fBuZjYSSPHwg9w9d65r6GM99krjhPidj/edit#slide=id.p1 | https://drive.google.com/drive/folders/10Em6Lq0T_pbOYjrHcR6m5R3GFsswwPQh | | Know and understand | PPT | |
| 16 | 6 | comparison between A.C. and D.C. Welding | https://docs.google.com/presentation/d/1kzessJpauLpOYJcfGbsSfVrKel70-D6V/edit#slide=id.p1 | https://drive.google.com/drive/folders/10Em6Lq0T_pbOYjrHcR6m5R3GFsswwPQh | | Understand and differentiate | chalk & talk | |
| 17 | | **UNIT-3** Illumination: Introduction, terms used in illumination, | https://docs.google.com/presentation/d/1Cxb43siiMUoxfQiFmo0oceP-b9HcoNhL/edit#slide=id.p1 | https://drive.google.com/drive/folders/12ezgb0FfpJruFIPeN-r6F8YxpTw4132P | | Know and understand | chalk & talk | T1 &T2 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 18 | | laws of illumination | https://docs.google.com/presentation/d/1Cxb43siiMUoxfQiFmo0oceP-b9HcoNhL/edit#slide=id.p1 | https://drive.google.com/drive/folders/12ezgb0FfpJruFIPeN-r6F8YxpTw4132P | | Know and understand | chalk & talk | |
| 20 | 7 | polar curves, photometry, integrating sphere, | https://docs.google.com/presentation/d/1B99UGJHSnKSDO4AyUvWJUi1buUjLuDZB/edit#slide=id.p1 | https://drive.google.com/drive/folders/12ezgb0FfpJruFIPeN-r6F8YxpTw4132P | | Know and understand | chalk & talk | |
| 21 | | sources of light | https://docs.google.com/presentation/d/1ktiLV2hBTW3IPhaiYJzhR3lVXf4NxgtV/edit#slide=id.p1 | https://drive.google.com/drive/folders/12ezgb0FfpJruFIPeN-r6F8YxpTw4132P | | Know and understand | chalk & talk | |
| 22 | | **Various Illumination Methods:** Discharge lamps, MV and SV lamps | https://docs.google.com/presentation/d/1OJM24m7NM-dVXcjN4dX2o8wO7b5rsjOY/edit#slide=id.p1 | https://drive.google.com/drive/folders/12ezgb0FfpJruFIPeN-r6F8YxpTw4132P | | Know and understand | PPT | |
| 23 | 8 | **MID-1 EXAMINATIONS** | | | | Evaluate | | |
| 24 | | | | | | | | |
| 25 | | | | | | | | |
| 26 | 9 | comparison between tungsten filament lamps and fluorescent tubes, | https://docs.google.com/presentation/d/1OJM24m7NM-dVXcjN4dX2o8wO7b5rsjOY/edit#slide=id.p1 | https://drive.google.com/drive/folders/12ezgb0FfpJruFIPeN-r6F8YxpTw4132P | | Understand and differentiate | chalk & talk | |
| 27 | | Basic principles of light control | https://docs.google.com/presentation/d/1OJM24m7NM-dVXcjN4dX2o8wO7b5rsjOY/edit#slide=id.p1 | https://drive.google.com/drive/folders/12ezgb0FfpJruFIPeN-r6F8YxpTw4132P | Design of different light sources | Know and understand | chalk & talk | |
| 28 | | Types and design of lighting | https://docs.google.com/presentation/d/1jM80H1xyrxcZhRE_HJunrBbtDi3v745U/edit#slide=id.p3 | https://drive.google.com/drive/folders/12ezgb0FfpJruFIPeN-r6F8YxpTw4132P | design of lighting | Know and understand | chalk & talk | |
| 2 | 10 | flood lighting | https://docs.google.com/presentation/d/1jM80H1xyrxcZhRE_HJunrBbtDi3v745U/edit#slide=id.p4 | | | Know and understand | PPT | |
| 30 | | **UNIT-4** Electric Traction – I: System of electric traction and track electrification | https://docs.google.com/presentation/d/1pI3POnu14bP_bMYdomvbY7MirKYKYkkc/edit#slide=i | https://drive.google.com/drive/folders/1R8Gfujp1hGdhSNgcthPJtHwNv_BFcGJv | | Know and understand | chalk & talk | T1 &T2 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | d.p1 | | | | | |
| 31 | | Review of existing electric traction systems in India. | https://docs.google.com/presentation/d/1pI3POnu14bP_bMYdomvbY7MirKYKYkkc/edit#slide=id.p1 | https://drive.google.com/drive/folders/1R8Gfujp1hGdhSNgcthPJtHwNv_BFcGJv | | Know and understand | chalk & talk | |
| 32 | 11 | Special features of traction motor | https://docs.google.com/presentation/d/1U3wGzlNs-Vvn8rnVsgXDPYpU7p1V8JJ4/edit#slide=id.p1 | https://drive.google.com/drive/folders/1R8Gfujp1hGdhSNgcthPJtHwNv_BFcGJv | | Know and understand | chalk & talk | |
| 33 | | methods of electric braking | https://docs.google.com/presentation/d/177_hElYom1odvBaUZL2EUNG9fLokqE4P/edit#slide=id.p1 | https://drive.google.com/drive/folders/1R8Gfujp1hGdhSNgcthPJtHwNv_BFcGJv | | Know and understand | chalk & talk | |
| 34 | | **MOCK TEST-2** | | | | Evaluate | chalk & talk | |
| 35 | 12 | plugging rheostat braking | https://docs.google.com/presentation/d/177_hElYom1odvBaUZL2EUNG9fLokqE4P/edit#slide=id.p1 | https://drive.google.com/drive/folders/1R8Gfujp1hGdhSNgcthPJtHwNv_BFcGJv | | Know and understand | chalk & talk | |
| 36 | | regenerative braking. | https://docs.google.com/presentation/d/177_hElYom1odvBaUZL2EUNG9fLokqE4P/edit#slide=id.p1 | https://drive.google.com/drive/folders/1R8Gfujp1hGdhSNgcthPJtHwNv_BFcGJv | | Know and understand | chalk & talk | |
| 37 | | Mechanics of train movement | https://docs.google.com/presentation/d/1EQ82rwdu0s14IaxOkb-Pufb-zC-1mfoM/edit#slide=id.p1 | https://drive.google.com/drive/folders/1R8Gfujp1hGdhSNgcthPJtHwNv_BFcGJv | | Know and understand | chalk & talk | |
| 38 | 13 | Speed-time curves for different services | https://docs.google.com/presentation/d/1EQ82rwdu0s14IaxOkb-Pufb-zC-1mfoM/edit#slide=id.p1 | https://drive.google.com/drive/folders/1R8Gfujp1hGdhSNgcthPJtHwNv_BFcGJv | | Know and understand | PPT | |
| 39 | | trapezoidal and quadrilateral speed time curves. | https://docs.google.com/presentation/d/1Q5P52JHDeeU26cMXGlT1UqB_0HTbVlSU/edit#slide=id.p1 | https://drive.google.com/drive/folders/1R8Gfujp1hGdhSNgcthPJtHwNv_BFcGJv | | Know and understand | PPT | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 40 | | **UNIT-5** Calculations of tractive effort, power, specific energy consumption for given run | https://docs.google.com/presentation/d/1zJBJKWuKQ98PZtVGfKscy-yE37tRVSbO/edit#slide=id.p1 | https://drive.google.com/drive/folders/1O3x2fMsUSxncD5CpwRy78brIJieW8ADY | | Evaluate the variables | chalk & talk | |
| 41 | 14 | effect of varying acceleration and braking retardation | https://docs.google.com/presentation/d/1TGgFY1KGILMgxoJlwpclJ_5-SRpfOMPv/edit#slide=id.p1 | https://drive.google.com/drive/folders/1O3x2fMsUSxncD5CpwRy78brIJieW8ADY | | Know and understand | chalk & talk | T1 &T2 |
| 42 | | adhesive weight and coefficient of adhesion. | https://docs.google.com/presentation/d/1TGgFY1KGILMgxoJlwpclJ_5-SRpfOMPv/edit#slide=id.p1 | https://drive.google.com/drive/folders/1O3x2fMsUSxncD5CpwRy78brIJieW8ADY | | Evaluate the variables | chalk & talk | |
| 43 | | Revision | | | | Evaluate the variables | chalk & talk | |
| 44 | 15 | **II Mid Examinations** | | | | Evaluate | | |

**TEXT BOOKS:**

| | | |
|---|---|---|
| | 1 | E. Openshaw Taylor, Utilisation of Electric Energy – by University press, 1961 |
| | 2 | Partab, H., 'Art and Science of Utilisation of Electrical Energy', Dhanpat Rai and Sons, New Delhi, 1986. |
| | 3 | Utilization of Electrical Power including Electric drives and Electric traction - by N.V. Suryanarayana, New Age International (P) Limited, Publishers, 1996. |
| | 4 | Generation, Distribution and Utilization of Electrical Energy - by C.L. Wadhwa New Age International (P) Limited, Publishers, 1997. |

G.KAMALAKER REDDY
ASSISTANT PROFESSOR EEE

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

| Course Outcomes | Program Outcomes (PO) | | | | | | | | | | | | Program Specific Outcomes (PSO) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | P O3 | P O4 | P O5 | P O6 | P O7 | P O8 | P O9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| C O1 | | - | 1 | 1 | - | 1 | - | - | - | - | - | - | 2 | 1 |
| C O2 | 2 | 1 | 1 | 1 | - | 1 | - | - | - | - | - | - | 2 | 2 |
| C O3 | 2 | 1 | 2 | 1 | - | 1 | - | - | - | - | - | - | 1 | 2 |
| C O4 | 2 | 2 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | 1 | 2 |
| CO5 | 3 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | 1 | 2 |
| Av g | 1.8 | 1.2 | 1.4 | 1.2 | 0.6 | 1.2 | - | - | - | - | - | - | 1.4 | 1.8 |

1: Slight(Low) 2:Moderate(Medium) 3:Substantial(High) 4:None

## QUESTION BANK: (As Per JNTU, Hyderabad)DESCRIPTIVE QUESTIONS:

**UNIT-I**

### LONG ANSWER QUESTIONS

| S.NO | QUESTION | BLOOMS TAXANOMY LEVEL | COURSE OUTCOME |
|---|---|---|---|
| 1 | Discuss the advantages and disadvantages of electric drive over other drives. | knowledge | 1 |
| 2 | Explain in detail the general consideration in selecting motor power ratings | understand | 1 |
| 3 | What are the advantages of equipment operated from high frequency supply?? | understand | 1 |
| 4 | What is meant by load equalization? Derive the expression for instantaneous motor torque, M.O.I of the fly wheel and the motor slip. State any assumptions<br>mad | knowledge | 1 |
| 5 | Discuss the terms 'continuous', 'intermittent' and 'variable' loads with example | understand | 1 |

### SHORT ANSWER QUESTIONS

| S.No | Question | Blooms TaxanomyLevel | Course Outcome |
|---|---|---|---|
| 1 | Distinguish between continuous, Intermittent andvariable loads | knowledge | 1 |
| 2 | "If a high degree of speed control is required, d.c. ispreferable to a.c. for an electric drive" -Justify. | knowledge | 1 |
| 3 | What are the factors governing the selection of motors? | knowledge | 1 |
| 4 | List the advantages and disadvantages of electric driveover other drives. | knowledge | 1 |
| 5 | Explain various characteristics to be considered for selection of electric drive | knowledge | 1 |

**UNIT-II**

### LONGANSWER QUESTIONS

| S.No | Questions | Blooms Taxanomy Level | Course Outcome |
|---|---|---|---|
| 1 | Explain in brief how heating is done in the following cases: i) Resistance heating, ii) Induction heating iii) Dielectric heating. | knowledge | 2 |
| 2 | Explain the principal of dielectric heating also write advantages and its applications. | knowledge | 2 |
| 3 | Explain in detail about resistance and arc welding. | understanding | 2 |
| 4 | Describe the construction and principle of working of an induction furnace. | understanding | 2 |
| 5 | Describe with neat sketches various methods of electric resistance welding. Give its merits and demerits with respect to arc welding | knowledge | 2 |

| | | | |
|---|---|---|---|
| 6 | With a neat sketch explain the working principle of core type and coreless type induction furnace | understanding | 2 |

**SHORT ANSWER QUESTIONS**

| S.No | Questions | Blooms TaxanomyLevel | Course Outcome |
|---|---|---|---|
| 1 | Give some applications of induction heating. | understanding | 2 |
| 2 | Explain about dielectric heating. | knowledge | 2 |
| 3 | List out the properties of heating element. | understanding | 2 |
| 4 | What is the difference between plastic welding &fusion welding? | knowledge | 2 |
| 5 | Give the classification of electric heating methods. | knowledge | 2 |

**UNIT-III**

**LONGANSWER QUESTIONS:**

| S.No | Questions | Blooms Taxanomy Level | Course Outcome |
|---|---|---|---|
| 1 | Explain the following terms w.r.t illumination Engineering: i)Reduction factor ii)Utilization factor iii)Maintenance factor iv)Absorption factor | knowledge | 3 |
| 2 | Explain the construction and working of Sodiumvapor lamp. | knowledge | 3 |
| 3 | State and explain laws of illumination | understanding | 3 |
| 4 | Describe the construction and working principal of mercury vapour lamp. | understanding | 3 |
| 5 | Explain the different measurement techniques used for luminous intensity | knowledge | 3 |
| 6 | Explain how will you measure the candle power of a source of light? | understanding | 3 |
| 7 | A lamp giving 300 C.P in all directions below horizontal is suspended 2m above the centre of a square table of 1m side. Calculate the maximum and minimum illumination on the surface of the table | knowledge | 3 |
| 8 | What is photometry? Explain photovoltaic method of photometry | understanding | 3 |
| 9 | A lamp with mean spherical candle power of 1000 is suspended at a height of 1.2m. Determine i) total flux emitted by the lamp ii) the illumination just below the lamp | knowledge | 3 |

**SHORT ANSWER QUESTIONS**

| S.No | Questions | Blooms Taxanomy Level | Course Outcome |
|---|---|---|---|
| 1 | Define Luminous flux. | knowledge | 3 |
| 2 | Define Solid angle and Space height ratio with respect to illumination. | knowledge | 3 |
| 3 | Define (i) waste light factor (ii) depreciation factor (iii) coefficient of utilization. | knowledge | 3 |
| 4 | Define: Mean spherical Candlepower, | knowledge | 3 |
| 5 | What are the advantages of coiled coil filament gasfilled lamp? | knowledge | 3 |

## UNIT IV

**LONG ANSWER QUESTIONS**

| S.No | Questions | Blooms Taxanomy Level | Course Outcome |
|---|---|---|---|
| 1 | From the simplified speed- time curve, determine themaximum speed, when the actual time of run, values of acceleration, retardation and the distance between stops are given. | understanding | 4 |
| 2 | An electric train is to have acceleration and breakingretardation of 0.8 Km/h/s and 3.2 Km/h/s respectively. If the ratio of maximum to average speed is 1.3 and time for stops 26 seconds, find schedule speed for a run of 1.5 km. Assume simplified trapezoidal speed-time curve | knowledge | 4 |
| 3 | For a quadrilateral speed-time curve of an electric train, derive expression for the distance betweenstops and speed at the end of the coasting period | understanding | 4 |
| 5 | Discuss the main features of various train services. What type of train services corresponds to trapezoidal and quadrilateral speed time curves? | understanding | 4 |
| 6 | What is specific energy consumption of a train? Explain various factors affecting it. | understanding | 4 |
| 7 | A suburban train runs with an average speed of 36 kmph between two stations 1.8 km apart. The values of acceleration and retardation are 1.8 kmphps and 3.6 kmphps. Calculate the maximum speed of the train assuming trapezoidal speed-time curve | knowledge | 4 |

**SHORT ANSWER QUESTIONS**

| S.No | Questions | Blooms TaxanomyLevel | Course Outcome |
|---|---|---|---|
| 1 | What is braking retardation? | knowledge | 4 |
| 2 | Define (i) Average speed, (ii) crest speed, (iii)scheduled speed. | knowledge | 4 |

| | | | |
|---|---|---|---|
| 3 | Why a series motor is preferred for the electrictraction. | knowledge | 4 |
| 4 | What are the disadvantages of diesel electric traction? | knowledge | 4 |
| 5 | Define tractive effort. | knowledge | 4 |

**UNIT V**

**LONG ANSWER QUESTIONS**

| S.No | Questions | Blooms Taxanomy Level | Course Outcome |
|---|---|---|---|
| 1 | Briefly explain the a.c. motors used in traction | understanding | 5 |
| 2 | Show that if the speed-time curves are similar, Specific | understanding | 5 |
| 3 | State the factors that affect the specific energy consumption and their influence on it. | knowledge | 5 |

**SHORT ANSWER QUESTIONS**

| S.NO | QUESTIONS | BLOOMS TAXANOMY LEVEL | COURSE OUTCOME |
|---|---|---|---|
| 1 | What are the advantages of electric braking over mechanical braking | knowledge | 5 |
| 2 | Define Dead weight, Accelerating weight, Adhesive weight | knowledge | 5 |
| 3 | What are the different systems of track electrification | knowledge | 5 |
| 4 | Where will you recommend the hybrid drive | knowledge | 5 |
| 5 | What are the various current collective systems | knowledge | 5 |

**OBJECTIVE QUESTIONS: As Per JNTU, HyderabadUNIT-1**

1. The consideration involved in the selection of the type of electric drive for a particular application depends on

a) Speed control range and its nature b) Starting torque c)Environmental conditions d)All of the above.

2. Which of the following is preferred for automatic drives?

a) Synchronous motors b) Squirrel cage induction motor c) Ward Leonard controlled dcmotors d) Any of the above.

3. Which type of drive can be used for hoisting machinery

a) AC slip ring motor b) Ward Leonard controlled DC shunt motor c) DC compound motor
d) Any of the above.

4. The motor normally used for crane travel is

a) AC slip ring motor b) Ward Leonard controlled DC shunt motor c) Synchronous motor d) DC differentially compound motor.

5. A wound rotor induction motor is preferred over squirrel cage induction motor when the major consideration involved is

a) High starting torque b) Low starting current c) Speed control over limited range b) Allof the above.

6. A synchronous motor is found to be more economical when the load is above

a) 1 kW b) 10 kW c) 20 kW d)100kW.

**UNIT-2**

1. Which of the following joint have high corrosion resistance?

a) Welding joint b) Riveted joint c) Bolted joint d)None of the above

2. Which of the following ray is not produced during welding?
a) Gamma ray b) Visible light rays c) Infrared ray d)Ultra violet rays
3. Single-V and single-U butt welds are used for sheets of thickness:a) upto 10mm b) 5-15mm c) 10-20mm d)15-25mm
4. Double-V and double-U butt welds are used for plates of thickness
a) 1-5mm b) 5-10mm c)10-15mm d) Over 15mm
5. Which of the following types is not fillet weld?
a) butt joint b) lap joint c) T-joint d)Corner joint
6. Which of the following is an example of plastic welding?
a) Gas welding b) Arc welding c) Forge welding d)Thermit welding

**UNIT-3**

1. Radiant efficiency of the luminous source depends on
a) Shape of the source b) Temperature of the source c) Wavelength of light rays d) All ofthe above.
2. Light waves travel with a velocity of
a) 3 x $10^{10}$ cm/s b) 3 x $10^{12}$ cm/s c) 3 x $10^{15}$ cm/s d) 3 x $10^{18}$ cm/s.
3. Carbon arc lamps are commonly used in
a) Domestic lighting b) Street lighting c) Cinema projectors d)Photography.
4. The unit of solid angle is
a) Solid angle b) Radian c) Steradian d)Candela.
5. Candela is the unit of
a) Luminous flux b) Luminous intensity c) Wavelength d)None of the above.
6. The unit of luminous flux is
a) Steradian b) Candela c) Lumen d)Lux.

**UNIT -4**

1. Overall efficiency of steam locomotive system is close toa) 5 to 10% b) 25 to 30% c) 55 to 60% d) 75 to 80%.
2. In a steam locomotive electric power is provided through
a) Battery system b) Diesel engine generator c) Overhead wire d)Small turbo generator.
3. Maximum horse power of steam locomotive isa) 100 b) 500 c) 1500 d)2500.
4. The pressure of steam in a locomotive is
a) 10-15 kg/sq. cm b) 20 - 30 kg/sq. cm c) 40 - 50 kg/sq. cm d)80 - 90 kg/sq. cm
5. The efficiency of diesel locomotives is nearly
a) 20 - 25 percent b) 35 - 40 percent c) 50 - 55 percent d)70 - 75 percent.
6. The advantage of electric traction over other methods is
a) No pollution problems b) Faster acceleration c) Better braking action d) All of theabove.

**UNIT -5**

1. Long distance railways use
a) 200 V DC b) 25 kV Single phase AC c) 25 kV Two phase AC d)25 kV Three phase AC.
2. The range of horsepower for diesel locomotives is
a) 100 to 500 b) 500 to 1000 c) 1500 to 2500 d)4000 to 5500.
3. Steam Engine provided on steam locomotives is
a) Single acting condensing type b) Double acting condensing type c) Double acting non
- condensing type d)Single acting non condensing type.
4. A submarine while moving under water, is provided driving power through
a) Diesel engines b) Steam turbine c) Gas turbine d)Batteries.
5. Overload capacity of diesel engines is usually restricted toa) 2 % b) 10% c) 25% a) 50%.

6. Which locomotive has the highest operational availability?

a) Diesel b) Electric c) Steam d)All have same availability.

**GATE:** Not Applicable **ESE:** Not Applicable **LIST OF JOURNALS:**

1. Electric Traction Systems

URL: http://www.theiet.org/resources/conferences/transport/elec_trac.cfm

2. Electric Traction - Motive Power and Energy Supply: Basics and PracticalURL: https://books.google.co.in/books?id=Hdvr82d23mkC&pg=PR5&lpg=PR5&dq=lecture+on+electric+traction&source=bl&ots=ssz60GTWMf&sig=GiM2W1L44cLV8GEHLFBLlmtRLRU&hl=en&sa=X&ved=0ahUKEwjak6XPtIbNAhXLMo8KHXsFCycQ6AEIKzAD#v=onepage&q=lecture%20on%20electric%20traction&f=false

3. Electric Power Systems Research

URL: http://www.journals.elsevier.com/electric-power-systems-research/

4. International Journal of Electrical Power & Energy Systems URL:http://www.journals.elsevier.com/international-journal-of-electrical-power-and- energy-systems/

5. IEEE Proceedings of the IEE - Part IA: Electric Railway Traction

URL: http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=5239454

6. IEEE Power Engineering Journal

RL: http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=2224

**WEBSITES:**

1. Illumination engineering and electric utility services. URL: http://nptel.ac.in/courses/108105060/
2. Centre for Railways Research at IIT Kharagpur.
3. Nptel.ac.in/courses/108105058/
4. Nptel.ac.in/courses/108105060/