SCHEME OF EXAMINATION

And

SYLLABI

For

BACHELOR OF VOCATION

In

(Power Distribution Management)

3rd Semester & 4th Semester

Offered by

University School of Engineering and Technology

Guru Gobind Singh Indraprastha University
Dwarka, Delhi – 110078 [INDIA]

www.ipu.ac.in

Scheme and Syllabi for B. Voc. (Power Distribution Management)(2nd year) w. e. f. batch 2016-17, approved in the BOS of USET/USICT held on 19th July, 2016 & AC Sub Committee Meeting of USET/USICT held on 27th July, 2016.
NOMENCLATURE OF CODES GIVEN IN THE SCHEME OF B.VOC

1. ET stands for Engineering and Technology.
2. AP stands for Architecture and Planning.
3. V stands for Vocation.
4. MC stands for Mobile Communication.
5. SD stands for Software Development.
6. AE stands for Automobile.
7. CE stands for Consumer Electronics.
8. PT stands for Printing Technology.
9. CT stands for Construction Technology.
10. RA stands for Refrigeration & Air-Conditioning.
11. PD stands for Power Distribution Management.
12. ID stands for Interior Design.
13. AA stands for Applied Arts.
14. CS stands for Computer Science.
15. MS stands for Management Studies.
16. EN stands for Environmental Engineering.
17. PH stands for Physics.
18. AS stands for Applied Science.
19. HS stands for Humanities and Social Sciences.
20. SS stands for Social Services.
22. P stands for Practical.

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BACHELOR OF VOCATION  
(Power Distribution Management)  
THIRD SEMESTER EXAMINATION  
(LEVEL-VI)  

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TOTAL 15 18 33

NOTE:
There are five industrial trainings to be carried out by the student(s) in B.Voc course. Industrial Trainings I, III and V will be with weightage of two credits each. These trainings are to be carried out during winter vacations for the duration of two weeks. Industrial Trainings II and IV will be with weightage of four credits each. These trainings are to be carried out during summer vacations for the duration of four to six weeks. These training may be done from industry/Skill Knowledge Providers (SKPs) /Sector Skill Councils (SSCs) / Training Centers/Institutes. Student should submit training report during evaluation. Industrial Training done at the end of the semester will be evaluated in the subsequent semesters.

GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY

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**NOTE FOR PROJECT:**
The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format, thereafter he/she will have to present the progress of the work through seminars and progress reports.
ENERGY RESOURCES AND CONVERSION PROCESS

Paper Code: ETVPD-601
Paper: Energy Resources and Conversion Process

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

MAXIMUM MARKS: 75

Objective and pre-requisite: Students should have basic understanding of energy and electromagnetic. Students are to be exposed about the energy resources and power generation scenario as well as alternators.

Learning Outcomes: After going through the course, students should develop basic understanding of power generation process, type of energy resources involved and alternators.

UNIT-I
(a) Sources of energy, Classification of energy sources, Quality and Concentration of Energy Source, Fossil fuels: Coal, Oil, Gas,
(b) Alternative sources of energy, Geothermal, Tidal, and Nuclear Energy, Solar, Wind, Hydro Power, Biomass, Fuel Cell, MHD, Resources of energy use pattern in different regions of the world, Global trend for clean technology
(c) Power generation through conventional and nonconventional source: Delhi, India and some developed countries of world;

UNIT-II
(a) Steam power station; Schematic arrangement and functioning of in brief, choice of site, efficiency of steam power station, Types of prime movers, auxiliaries,
(b) Hydro power station: Schematic arrangement functioning of in brief, choice of site, constituents of hydro power plant, Hydro turbine. Environmental aspects for selecting the sites and locations of hydro power stations

UNIT-III
(a) Nuclear power station: Schematic arrangement and functioning of in brief, selection of site, types of reactors, Hazards, Environmental aspects for selecting the sites and locations of nuclear power stations.
(b) Gas turbine power plant: Schematic arrangement, advantages and disadvantages of Gas turbine power plant. Open cycle and Closed cycle gas turbine power plant, combined cycle power plant, Comparison of various power plants

UNIT-IV
Basic principal of alternators, types of alternators, construction details of alternator, salient pole rotor, cylindrical type rotor. Load characteristics of alternators, reasons for change in terminal voltage, basic concept of armature reaction, synchronous impedance, regulation, Necessity and conditions for parallel operation of alternators, load sharing of alternator on infinite bus bar

Text Book(s):
[T3] Electrical Machines (UPTU) by J B Gupta, S K Kataria & Sons, New delhi

Reference Book(s):
[R1] Arora and Domkundar–A course in Power Plant Engineering 2000, Dhanpat Rai Publication, ND
[R2] BLACK and VEATCH, Power Plant Engineering, Ed. 2000
[R3] CEGB, Modern Power Station Practice

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SWITCH GEAR & PROTECTION SYSTEMS

Paper Code: ETVPD-603
Paper: Switch Gear & Protection Systems

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective and pre-requisite: Students should have basic understanding of power distribution system. Students are to be exposed about the various switchgear and protection systems used in power distribution system.

Learning Outcomes: After going through the course, students should develop basic understanding of various switchgear and protection systems used in power distribution systems.

UNIT-I
Introduction to Protection System: Introduction to protection system and its elements, functions of protective relaying, protective zones, primary and backup protection, desirable qualities of protective relaying, basic terminology. Relays: Electromagnetic, attracted and induction type relays, thermal relay, gas actuated relay, design considerations of electromagnetic relay.

UNIT-II
Relay Application and Characteristics: Amplitude and phase comparators, over current relays, directional relays, distance relays, differential relay Static Relays: Comparison with electromagnetic relay, classification and their description, over current relays, directional relay, distance relays, differential relay.

Protection of Transmission Line: Over current protection, distance protection, pilot wire protection, carrier current protection, protection of bus, auto re-closing.

UNIT-III
Circuit Breaking: Properties of arc, arc extinction theories, re-striking voltage transient, current chopping, resistance switching, capacitive current interruption, short line interruption, circuit breaker ratings; Testing of Circuit Breaker: Classification, testing station and equipments, testing procedure, direct and indirect testing

UNIT-IV
Apparatus Protection: Protection of Transformer, generator and motor. Circuit Breaker: Operating modes, selection of circuit breakers, constructional features and operation of Bulk Oil, Minimum Oil, Air Blast, SF6, Vacuum and d. c. circuit breakers.

Text Books

Reference Books
INDUSTRIAL INSTRUMENTATION

Paper Code: ETVPD-605
Paper: Industrial Instrumentation

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3 0 3

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

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**Objective and pre-requisite:** Students should have generalised understanding of basic physics. Students are to be exposed about measurement systems for various basic quantities like force, displacement, pressure, temperature etc.

**Learning Outcomes:** After going through the course, students should develop basic understanding of measurement systems for various basic quantities like force, displacement, pressure, temperature etc.

**UNIT-I**

**Measurements:** Importance of measurements, basic measuring systems, advantage and limitations of each measuring systems, generalized measurement systems, signal conditions and display device.

**Transducer:** Theory, construction and use of various transducers (resistance, inductance, capacitance, electromagnetic, piezoelectric type) optical transducers, tacho generators, photovoltaic cell.

**UNIT-II**

**Measurements of displacement and strain:** Displacement measuring devices: wire wound potentiometer, LVDT, stain gauge, different strain gauges such as inductance type, resistive type wire and foil etc. gauge factor gauge material and their selection, source of error and its compensation. Use of electric strain gauge, strain gauge bridge amplifier.

**Force and torque measurements:** Different types of force measuring devices and their principles, load measurement by using elastic transducer and electrical strain gauge. Load cell providing rings. Measurement of torque by break dynamometer, electrical stain gauge, speed measurements by different methods and devices.

**UNIT-III**

Bourdon pressure gauges, electrical pressure pickups and their principles, construction and application, use of pressure cells; Basic principle of magnetic and ultra-sonic flow meters; Transfer functional devices: Principle of operation, construction detail and transfer function of electrical components like limit switches, potentiometer, synchros, auto transformer, servomotors (DC & AC) stepper motors, operational amplifiers.

**UNIT-IV**

**Measurements of temperatures in industry:** Importance of temperature measurements in industry, seeback effect, peltier’s effect, temperature and limitations of the following:

- Vapor filled thermometers, gas filled thermometers, liquid filled thermometers, mercury in glass thermometers.
- Bimetallic thermometers.
- Pressure spring thermometers.
- Thermocouples.
- Resistance thermometers
- Radiation pyrometers.
- Optical pyrometers.
- Location of sensor for measurement and speed of response of sensor.
- Lead wire compensation.
- Installation of thermometers.

**Text Book(s):**

[T1] Industrial instrumentation by SK Singh

**Reference Book(s):**

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[R1] Experimental Methods for Engineers by JP Holman
POWER GENERATION & TRANSMISSION SYSTEMS

Paper Code: ETVPD-607  
Paper: Power Generation & Transmission Systems

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Objective and pre-requisite: Students should have generalised understanding of basic physics and basics of electrical engineering. Students are to be exposed about power generation and power transmission.

Learning Outcomes: After going through the course, students should develop basic understanding of basics of power generation and power transmission systems.

UNIT-I
Layout, flow diagram and brief explanation of operation of Different type of power station - thermal, hydro, diesel and nuclear power stations
Comparison of power station on the bases of capital cost, running cost, efficiency, space, maintenance and availability of the resources.

UNIT-II
Load estimation, load curves. Demand factor, load factor, Diversity factor, Simple problems there on; Base and peak load power stations; Interconnection of power station and its advantages; Concept of regional and national grid. Brief explanation of operation of various types of renewable energy sources.

UNIT-III
Layout of transmission system; Effect of increase of voltage on (a) weight of copper (b) Efficiency of line and (c) line drop; practical working voltage for generation transmission and distribution; comparison between: (a) three phase and single phase system (b) Overhead and underground transmission and distribution; Construction features of transmission lines; Type of supports, type of insulators, Selection of insulators, Conductors, earth wiring and their accessories, Transposition and stringing of lines

UNIT-IV
Mechanical features of line: importance of sag, calculation of sag at level supports, effects of wind and ice, simple problems; Indian electricity rules pertaining to clearance. Electrical features of line: concept of resistance, inductance and capacitance in A.C. transmission line (single phase, three phases) simple problems on efficiency and regulation of short lines; physical concept of corona. Effects of corona and remedial measures; HVDC transmission lines: salient features; advantages, description of system to block diagram, ground return

Text Book(s):

Reference Book(s):
FINANCIAL ACCOUNTING
(Open Elective-III)

Paper Code: ETVMS-611
Paper: Financial Accounting

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INSTRUCTIONS TO PAPER SETTERS: MAXIMUM MARKS: 75

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Objectives & prerequisites: The primary objective of the course is to familiarize the students with the basic accounting principles and techniques of preparing and presenting the accounts for user of accounting information.

UNIT-I
Meaning and Scope of Accounting: Objectives and Nature of Accounting, Definition and Functions of Accounting, Book Keeping and Accounting, Interrelationship of Accounting with other Disciplines, Branches of Accounting, Limitation of Accounting, Accounting Equation.

Accounting Principles and Standards: Accounting Principles, Accounting Concepts and Conventions, Accounting cycle system of accounting Introduction to Accounting Standards Issued by ICAI.

Journalizing Transactions: Journal, Rules of Debit and Credit,


[T1][No. of Hrs. 11]

UNIT-II

Inventory Valuation: Meaning of Inventory, Objectives of Inventory Valuation, Inventory Systems, Methods of Valuation of Inventories,


[T2][No. of Hrs. 11]

UNIT-III


[T1][No. of Hrs. 11]

UNIT-IV
Company Final Accounts: Preparation of Final Accounts, Manufacturing Account; Trading Account, Profit and Loss Account; Balance Sheet (with adjustments), Contents of Corporate Annual Reports with Annexures.

[T2][No. of Hrs. 12]

Text Book(s):

Reference Book(s):

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ORGANIZATIONAL BEHAVIOR
(Open Elective-III)

Paper Code: ETVMS-613
Paper: Organizational Behavior

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3 0 3

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Objective: The aim of this paper is to provide managerial skills in the students.

UNIT-I
Introduction: Concept and nature of Organizational Behaviour; Contributing disciplines to the field of O.B.; O.B. Models; Need to understand human behaviour; Challenges and Opportunities, Management functions, Tasks and responsibilities of a professional manager; Managerial skills.

UNIT-II
Individual & Interpersonal Behaviour: Biographical Characteristics; Ability; Values; Attitudes-Formation, Theories, Organization related attitude, Relationship between attitude and behaviour; Personality – determinants and traits; Emotions; Learning-Theories and reinforcement schedules, Perception –Process and errors.

UNIT-III

UNIT-IV
Interactive Aspects of Organizational Behaviour; Interpersonal Behaviour; Johari Window; Transactional Analysis – ego states, types of transactions, life positions, applications of T.A, Group Dynamics; Management of Organizational Conflicts; Leadership Styles.

Text Book(s):

References Book(s):
[R1] Stoner, R. James A.F., Edward Freeman Daniel R Gilbert Jr., Management 6TH Ed, PHI
OPERATIONS RESEARCH
(Open Elective-III)

Paper Code: ETVMS-615
Paper: Operations Research

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Objective: The objective of the paper is to acquaint the student with mathematical techniques being adopted in industry which help managers in decision making.

UNIT-I

UNIT-II

UNIT-III
Sequencing Theory: Processing of n-jobs through m-machines with each job having same processing order. Processing of two jobs through m-machines with each job having different processing order. Decision Theory: Decision making under uncertainty and under risk, Multistage decision making, Multi criteria decision making.

UNIT-IV

Text Book(s):

Reference Book(s):
INDUSTRIAL MANAGEMENT  
(Open Elective-III)

Paper Code: ETVMS-617  
Paper: Industrial Management

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INSTRUCTIONS TO PAPER SETTERS:  
MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The course provides a broad introduction to some aspects of business management and running of business organization.

UNIT-I  
Industrial relations- Definition and main aspects. Industrial disputes and strikes. Collective bargaining.  

[T1, T2][No. of Hrs. 11]

UNIT-II  

[T1, T2][No. of Hrs. 11]

UNIT-III  

[T1, T2][No. of Hrs. 11]

UNIT-IV  

[T1, T2][No. of Hrs. 12]

Text Book(s):  

Reference Book(s):  
MANAGERIAL ECONOMICS
(Open Elective-III)

Paper Code: ETVMS-619
Paper: Managerial Economics
L T/P C
3 0 3

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives: The objective of this subject is to give understanding of the basic concepts and issues in economics and their application in business decisions.

UNIT-I

UNIT-II
Demand Analysis and Theory of Production: Demand Function, Determinants of Demand, Elasticity of Demand, Demand Estimation and Forecasting, Applications of Demand Analysis in Managerial Decision Making; Theory of Production: Production Function, Short Run and Long Run Production Analysis.

UNIT-III

UNIT-IV

Text Book(s):

Reference Book(s):
[R3] Peterson, Lewis and Jain, (2016), Managerial Economics, Pearson Education.
ENERGY RESOURCES AND CONVERSION PROCESS LAB

Paper Code: ETVPD-651
Paper: Energy Resources and Conversion Process Lab

Note: The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.

List of Experiments:

1. Collecting recent data about various energy resources and their respective use for power generation with global perspective and preparing a report on it
2. Collecting recent data about various energy resources and their respective use for power generation in India and preparing a report on it
3. Collecting recent data about various energy resources and their respective use for power generation in Delhi and preparing a report on it
4. Collecting recent data about solar power generation in Delhi and preparing a report on it
5. Collecting data about power factor of load for a year in an installation (commercial / industrial / educational).
6. Collecting relevant data and preparing a report on voltage regulation in Delhi
7. Visiting a power station and preparing a report detailing operations
8. Study of synchronous generator: construction and operation
9. Plotting characteristics of synchronous generator characteristics
SWITCH GEAR & PROTECTION SYSTEMS LAB

Paper Code: ETVPD-653

Paper: Switch Gear & Protection Systems Lab

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Note: The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.

List of Experiments:

1. To study IDMT relay and plot its characteristics.
2. To study the operation of static over voltage relay
3. To study Use of differential relay for transformer protection
4. To study differential relays and plot its protection
5. To calculate efficiency and voltage regulation of three-phase transmission line
6. Simulation of various types of faults using software.
7. To have Hands-on practice on power system protection in electric substation
8. To study applications of switchgear equipments for power system protection
INDUSTRIAL INSTRUMENTATION LAB

Paper Code: ETVPD-655  
Paper: Industrial Instrumentation Lab  
L  T/P  C  0  4  4

Note: - The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.

List of Experiments:

1. Study of strain gauge and measurements of strain in given samples.
2. Study of synchro transmitter and receiver.
3. Study of piezoelectric pressure transducer.
4. Study and calibration of LVDT
5. Study of variable capacitive transducer.
7. Study of servo motors.
8. Study of solenoid valve and motor operated value.
CASE STUDY - INDUSTRY BASED

Paper Code: ETVPD-657
Paper: Case Study - Industry Based

NOTE:
Students will be required to identify a specific issue in Power Distribution Companies/Power Sector and carry out a case study for the same in consultation with subject in-charge.

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POWER SYSTEM ANALYSIS

Paper Code: ETVPD-602
Paper: Power System Analysis

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective and pre-requisite:

1. To model the power system under steady state operating condition,
2. To understand power flow analysis.
3. To model and analyze the power systems fault conditions.

To model and transient behavior of power system when it is subjected to a fault

Learning Outcomes:

1. To understand the necessity and to become familiar with the modeling of power system and components
2. To understand different methods to analyze power system for the purpose of system planning and operation

UNIT-I
Basic components of a power system: Generator models, transformer model, transmission system model; load representation; Single line diagram; per phase and per unit representation – change of base; formation of Y-Bus matrix and Z- Bus matrix.

UNIT-II
Classification of buses into P-Q buses, P-V (voltage-controlled) buses and slack bus. Development of Power flow model in complex variables form and polar variables form; Iterative solution using Gauss-Seidel method, Iterative solution using Newton - Raphson (N-R) method, Development of Fast Decoupled Power Flow (FDPF) model and iterative solution, Comparison of the three methods;

UNIT-III
Balanced Faults: Basic assumptions in fault analysis of power systems; Symmetrical / balanced three phase faults, basic problem formulation; Introduction to symmetrical components, representation of single line to ground, line to line and double line to ground fault conditions, Unbalanced fault analysis (qualitative study, no numerical).

UNIT-IV
Stability Analysis: Classification of power system stability, angle and voltage stability, simple treatment of angle stability into small-signal and large-signal (transient) stability; Single Machine Infinite Bus (SMIB) system; Development of swing equation – equal area criterion; determination of critical clearing angle.

Text Book(s):

Reference Book(s):

Scheme and Syllabi for B. Voc. (Power Distribution Management)(2nd year) w. e. f. batch 2016-17, approved in the BOS of USICT held on 19th July, 2016 & AC Sub Committee Meeting of USICT held on 27th July, 2016.
DESIGN OF POWER SUBSTATION

Paper Code: ETVPD-604
Paper: Design of Power Substation

L  T/P  C
3    0    3

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective and pre-requisite: students should have basic understanding of power distribution system and its operation. Students are expected to be exposed for basic substation design considerations

Learning Outcomes: after going through this course students should be able to provide basic design specifications for a distribution substation layout and equipments to be used.

UNIT-I
Consideration of voltage regulation and losses in power system, shifting of distribution transformer centre; Types, Layouts, Sizes, Locations of distribution substations; Single line diagram, General criteria for sub-station design: reliability, cost, operational flexibility and environment impact.

[T1, T2][No. of Hrs. 11]

UNIT-II

[T1, T2][No. of Hrs. 11]

UNIT-III
Specifications, ratings and selection of Power Transformers, SCADA and communications systems, Regulatory provisions regarding distribution substation, Smart grid and Net metering.

[T1, T2][No. of Hrs. 11]

UNIT-IV
Substation Safety: Substation Access, Minimum Approach Distance, Clearance Zones and Isolation Guarantees, Temporary Protective Grounds, substation earthing system, Project record "as-built" documentation.

[T1, T2][No. of Hrs. 12]

Text Book(s):
[T2] Electrical Substation Engineering and Practice: S. Rao, Khanna Publishers

Reference Book(s):
UTILIZATION OF ELECTRICAL ENERGY

Paper Code: ETVPD-606
Paper: Utilization of Electrical Energy

L T/P C
3 0 3

INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

MAXIMUM MARKS: 75

Objective and pre-requisite: Students are expected to have basic understanding of physics and electrical engineering concepts related to motor operations and physics. Students will be made to understand various aspects of utilising electrical power in rotary drives, illumination, traction, heating and welding.

Learning Outcomes: After going through this course, students should be able to understand various aspects of utilising electrical power in rotary drives, illumination, traction, heating and welding.

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
(a) Electric Heating: Advantages and methods of electric heating, resistance heating, induction heating and dielectric heating.
(b) Electric Welding: Electric welding, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

UNIT-III
Illumination Fundamentals & Various Illumination Methods: 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: 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, regenerative braking, Mechanics of train movement. Speed-time curves for different services – trapezoidal and quadrilateral speed time curves. 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.

Text Book(s):

Reference Book(s):

Scheme and Syllabi for B. Voc. (Power Distribution Management)(2nd year) w. e. f. batch 2016-17, approved in the BOS of USET/USICT held on 19th July, 2016 & AC Sub Committee Meeting of USET/USICT held on 27th July, 2016.
RENEWABLE ENERGY SYSTEM
(Core Elective-I)

Paper Code: ETVPD-608
Paper: Renewable Energy System

L T/P C
3 0 3

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective and pre-requisite: Students are supposed to have understanding of basic concepts of physics. Students will be made to develop understanding of solar power generation, energy storage, wind energy and energy from biomass.

Learning Outcomes: After going through the course, students are expected to develop understanding of solar power generation, energy storage, wind energy and energy from biomass.

UNIT-I

UNIT-II

UNIT-III

UNIT-IV
Wind energy – Principles of wind energy conversion – Site selection considerations – Wind power plant design – Types of wind power conversion systems – Operation, maintenance and economics – Geothermal energy – Availability, system development and limitations – Ocean thermal energy conversion – Wave and tidal energy – Scope and economics – Introduction to integrated energy systems.

Text Book(s):

Reference Book(s):

Scheme and Syllabi for B. Voc. (Power Distribution Management)(2nd year) w. e. f. batch 2016-17, approved in the BOS of USET/USICT held on 19th July, 2016 & AC Sub Committee Meeting of USET/USICT held on 27th July, 2016.
Scheme and Syllabi for B. Voc. (Power Distribution Management)(2nd year) w. e. f. batch 2016-17, approved in the BOS of USET/USICT held on 19th July, 2016 & AC Sub Committee Meeting of USET/USICT held on 27th July, 2016.
ENERGY AUDIT AND EXERCISE
(Core Elective-I)

Paper Code: ETVPD-610
L T/P C
Paper: Energy Audit and Exercise
3 0 3

INSTRUCTIONS TO PAPER SETTERS: MAXIMUM MARKS: 75
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective and pre-requisite: Students are supposed to have understanding of energy, electrical power and physics. Students will be made to understand efficient use of energy and electrical power.

Learning Outcomes: After going through the course, students are expected to develop understanding of energy audit and efficient use of energy in general and electric power in particular.

UNIT-I
Energy Conservation Act 2001, Objectives and implementation Strategy, Study of Energy consumption patterns in various sectors, Comparison of consumption pattern with developed and other developing countries and identifying basic potential of conservation.

UNIT-II

UNIT-III

UNIT-IV
Incentives for Energy Conservation, Energy Efficient equipment and technologies, Stakeholders awareness program, Development of Energy audit personnel, Target setting and implementation Strategy, Managerial aspects of energy conservation

Text Book(s):
[T2] Course Material of Bureau of Energy Efficiency for National Energy Auditor/ Manager Exam

Reference Book(s):
[T4] Energy Conservation in selected Govt. Firms, Energy Management Centre

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Scheme and Syllabi for B. Voc. (Power Distribution Management)(2nd year) w. e. f. batch 2016-17, approved in the BOS of USET/USICT held on 19th July, 2016 & AC Sub Committee Meeting of USET/USICT held on 27th July, 2016.
ENEPY EFFICIENCY IN BUILDINGS & ECBC  
(Core Elective-I)

Paper Code: ETVPD-612  
Paper: Energy Efficiency in Building & ECBC  
L T/P C  3 0 3

INSTRUCTIONS TO PAPER SETTERS:  
MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective and pre-requisite: Objective and pre-requisite: students are supposed to have understanding of energy, electrical power and physics. Students will be made to understand efficient use of energy and electrical power.

Learning Outcomes: After going through the course, students are expected to develop understanding of energy audit and efficient use of energy in general and electric power in particular.

UNIT-I


UNIT-II

UNIT-III
Voltage and reactive power in Distribution System:- Voltage and reactive power calculations and control: Voltage classes and nomenclature, voltage drop calculations, Voltage control, VAR requirements and power factor, Capacitors unit and bank rating, Protection of capacitors and switching, Controls for switched capacitors and fields testing.

UNIT-IV

Text Books:
[T1] Energy Engineering and Management; Amlan Chakrabarti; Prantice Hall of India; 1st Edition; 2011
[T2] Demand-side management from a sustainable development perspective: experiences from Quebec (Canada) and India by Pierre Baillargeon, TERI Press, New Delhi

Reference Books

Scheme and Syllabi for B. Voc. (Power Distribution Management)(2nd year) w. e. f. batch 2016-17, approved in the BOS of USET/USICT held on 19th July, 2016 & AC Sub Committee Meeting of USET/USICT held on 27th July, 2016.

Scheme and Syllabi for B. Voc. (Power Distribution Management)(2nd year) w. e. f. batch 2016-17, approved in the BOS of USET/USICT held on 19th July, 2016 & AC Sub Committee Meeting of USET/USICT held on 27th July, 2016.
GLOBAL WARMING & CLIMATE CHANGE
(Open Elective-IV)

Paper Code: ETVCT-614

Paper: Global Warming & Climate Change

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INSTRUCTIONS TO PAPER SETTERS:

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

MAXIMUM MARKS: 75

Objectives & Pre-requisites: To study concepts of global warming & climatic change. To study factors responsible for global warming, impact of climatic change, national and international policies. To study and understand Kyoto mechanism. Basic knowledge of environmental studies subject is a pre requisite.

Learning outcomes: Understanding of philosophy of global warming and climatic change. Able to realize the factors responsible for global warming and corresponding climatic change. Understanding the importance and nuances of Kyoto mechanism.

UNIT-I
The Climate system: Sun, Atmosphere, Ocean, Ice and energy balance of the earth, history of climate change, human caused climate change, impacts of climate change on human well-being and the natural world.

UNIT-II
Key concepts of global warming, climate change, greenhouse gas effect, Interrelationship between these three phenomenon, Green-House Effect as a Natural Phenomenon and increase in Greenhouse gas effect because of anthropogenic activities, Green House Gases (GHGs) and their Emission Sources; Global Warming Potential (GWP) of GHGs, Past Present and Future trends of global warming.

UNIT-III
Impacts of climate change Extreme weather events, Temperature Rise, Sea Level rise, Coastal Erosion and landslides; future impacts of global warming, global warming and the hydrological cycle, climate change impact on ecosystems and agriculture.

UNIT-IV
Possible remedies of global warming- various mitigation and adaptation measures taken/ proposed to combat global warming; National and International policies to combat global warming and climate change-UNFCCC-Kyoto Protocol, Paris agreement its role in Climate Change; IPCC - its role in global climate protection Role of countries and citizens in containing Global Warming.

Text Book(s)

Reference Book(s)
[R3] Contemporary climatology-Robinson, Taylor and Francis group

NOTE: Seminars/ discussions should be carried out on issues pertaining to global warming and climate change among the students.

Scheme and Syllabi for B. Voc. (Power Distribution Management)(2nd year) w. e. f. batch 2016-17, approved in the BOS of USET/USICT held on 19th July, 2016 & AC Sub Committee Meeting of USET/USICT held on 27th July, 2016.
ENTREPRENEURSHIP DEVELOPMENT AND PLANNING
(Open Elective-IV)

Paper Code: ETVMS-616
Paper: Entrepreneurship Development and Planning

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INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives: The Course Aims at Instituting Entrepreneurship Skills in the Students by giving an overview of the process of entrepreneurship. The Course aims at inculcating entrepreneurial spirit among the students.

UNIT-I

[Time (T1, T2)][No. of Hrs.11]

UNIT-II
Launching Entrepreneurial Ventures: Creativity and innovation. Methods to initiate ventures. Legal challenges in Entrepreneurship ventures. The search for Entrepreneurial capital. Class exercise- Survey your locality and come up with at least one entrepreneurial venture. Discuss in class about ways to enhance the business in most innovative manner.

[Time (T1, T2)][No. of Hrs.11]

UNIT-III

[Time (T1, T2)][No. of Hrs.11]

UNIT-IV
Institutions Supporting Small Business Enterprises: Central level institutions. State level institutions. Other agencies. Industry Associations. Class exercise- discussions on current government schemes supporting entrepreneurship and finding out which scheme will most suit the business plan devised by the student.

[Time (T1, T2)][No. of Hrs.12]

Text Books

References Books

Scheme and Syllabi for B. Voc. (Power Distribution Management)(2nd year) w. e. f. batch 2016-17, approved in the BOS of USET/USICT held on 19th July, 2016 & AC Sub Committee Meeting of USET/USICT held on 27th July, 2016.
BUSINESS INFORMATICS
(Open Elective-IV)

Paper Code: ETVMS-618
Paper: Business Informatics

L T/P C
3 0 3

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective and pre-requisite:
The objective of this paper is to provide understanding of business processes and managing these processes through improved information management and better use of business intelligence systems.

Learning Outcomes: After this course the student is expected to understand how the information in the organizations can be handled effectively using various information types of information systems.

UNIT-I

[1, 2][No. of Hrs. 11]

UNIT-II

[1, 2][No. of Hrs. 11]

UNIT-III

[1, 2][No. of Hrs. 11]

UNIT-IV

[1, 2][No. of Hrs. 12]

Text Book(s):

Reference Book(s):

Scheme and Syllabi for B. Voc. (Power Distribution Management)(2nd year) w. e. f. batch 2016-17, approved in the BOS of USET/USICT held on 19th July, 2016 & AC Sub Committee Meeting of USET/USICT held on 27th July, 2016.
POWER SYSTEM ANALYSIS LAB

Paper Code: ETVPD-652
Paper: Renewable Energy System Lab

Note: The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.

List of Experiments:

1. To study the IDMT over current relay and determine the time current characteristics.
2. To study Ferranti effect and voltage distribution in H.V. long transmission line using transmission line model.
3. To determine location of fault in a cable using cable fault locator.
4. To study operation of oil testing set.
5. To study percentage differential relay.
6. To obtain formation of Y-bus and perform load flow analysis
7. To perform symmetrical fault analysis in a power system
8. To perform unsymmetrical fault analysis in a power system
DESIGN OF POWER SUBSTATION LAB

Paper Code: ETVPD-654
Paper: Design of Power Substation Lab

Note: The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.

List of Experiments:
Students will be made to visit a power substation located in-house/nearby and conduct following study

1. Conducting a system and facility review for a power substation facility
2. Studying environmental issues for a power substation facility
3. Studying physical and equipment layout design of a power substation facility
4. Studying project schedule and budgetary estimate for another (similar) power substation
5. Studying design aspects of SCADA and communication system of a power substation facility
6. Studying capacitor requirement and capacitor bank design considerations
7. Study of protective relaying design and relay programming
8. Study of metering system design
9. Study of Power Sub-Station project construction management
10. Studying scope of modernisation to new microprocessor based relays
RENEWABLE ENERGY SYSTEM LAB
(Core Elective-I)

Paper Code: ETVPD-658                   L   T/P   C
Paper: Renewable Energy System Lab        0    3    3

Note:- The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.

List of Experiments:

1. Preparing a report on scope/potential of solar power generation in Delhi
2. Preparing a report on scope/potential of solar power generation in India
3. Visiting a solar power generation installation and preparing a report on various aspects
4. Study of solar power based water heater/air conditioning system
5. Study of biomass based power generation unit and preparing a report on various aspects
6. Study of a liquid media storage system for energy storage
7. Study of a solid media storage system for energy storage
8. Studying the scope/potential of solar power in disaster management
ENERGY AUDIT AND EXERCISE LAB
(Core Elective-I)

Paper Code: ETVPD-660
Paper: Energy Audit and Exercise Lab

L   T/P   C
0   3     3

Note:- The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.

List of Experiments:

1. Study of energy consumption patterns in select countries
2. Study of energy consumption patterns in various states of India
3. Study of energy consumption patterns in various sectors at national level in India
4. Study of energy consumption patterns in various sectors in Delhi
5. Study of star labelling program of Bureau of Energy Efficiency (BEE) for various electrical appliances
6. Study of an Energy Audit Case for commercial installation
7. Study of an Energy Audit Case for industrial installation
8. Study of an Energy Audit Case for residential complex
ENERGY EFFICIENCY IN BUILDINGS & ECBC
(Core Elective-I)

Paper Code: ETVPD-662

Paper: Energy Efficiency in Building & ECBC

L  T/P  C
0  3  3

Note:- The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.

List of Experiments:

1. Conducting a study of present state and scope / possibilities for energy conservation in a domestic installation.
2. Conducting a study of present state and scope / possibilities for energy conservation in a commercial installation.
3. Conducting a study of present state and scope / possibilities for energy conservation in an industrial installation.
5. Study of power factor improvement possibilities in an electrical installation.
7. Conducting a study about recent trends towards energy efficiency in buildings in Delhi and NCR.