

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

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.
21. **L/T** stands for Lecture and Tutorial
22. **P** stands for Practical.
23. **S/D** stands for Drawing/Studio
24. **P/D** stands for Practical/Drawing



**GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY**

**BACHELOR OF VOCATION
(POWER DISTRIBUTION MANAGEMENT)
THIRD SEMESTER EXAMINATION
(LEVEL-VI)**

Paper Code	Paper ID	Paper	L	T/P	Credits
THEORY PAPERS					
ETVPD-601		Energy Resources and Conversion Process	3	0	3
ETVPD-603		Switch Gear & Protection Systems	3	0	3
ETVPD-605		Industrial Instrumentation	3	0	3
ETVPD-607		Power Generation & Transmission Systems	3	0	3
OPEN ELECTIVE-III (Select any one)					
ETVMS-611		Financial Accounting	3	0	3
ETVMS-613		Organizational Behaviour	3	0	3
ETVMS-615		Operations Research	3	0	3
ETVMS-617		Industrial Management	3	0	3
ETVMS-619		Managerial Economics	3	0	3
PRACTICAL/VIVA VOCEs					
ETVPD-651		Energy Resources and Conversion Process	0	4	4
ETVPD-653		Switch Gear & Protection Systems	0	4	4
ETVPD-655		Industrial Instrumentation	0	4	4
ETVPD-657		Case Study-Industry Based	0	4	2
ETVPD-659		Industrial Training-II	0	2	4
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.

**BACHELOR OF VOCATION
(POWER DISTRIBUTION MANAGEMENT)
FOURTH SEMESTER EXAMINATION
(LEVEL-VI)**

Paper Code	Paper ID	Paper	L	T/P	Credits
THEORY PAPERS					
ETVPD-602		Power System Analysis	3	0	3
ETVPD-604		Design of Power Substation	3	0	3
ETVPD-606		Utilization of Electrical Energy	3	0	3
CORE ELECTIVE-I (Select any one)					
ETVPD-608		Renewable Energy System	3	0	3
ETVPD-610		Energy Audit and Exercise	3	0	3
ETVPD-612		Energy Efficiency in Buildings & ECBC	3	0	3
OPEN ELECTIVE-IV (Select any one)					
ETVCT-614		Global Warming & Climate Change	3	0	3
ETVMS-616		Entrepreneurship Development and Planning	3	0	3
ETVMS-618		Business Informatics	3	0	3
CORE ELECTIVE-I LAB (Select any one based on the theory)					
ETVPD-658		Renewable Energy System Lab	0	3	3
ETVPD-660		Energy Audit and Exercise Lab	0	3	3
ETVPD-662		Energy Efficiency in Buildings & ECBC Lab	0	3	3
PRACTICAL/VIVA VOCE					
ETVPD-652		Power System Analysis Lab	0	4	4
ETVPD-654		Design of Power Substation Lab	0	4	4
ETVPD-656		Industrial Training-III	0	0	2
ETVPD-664		Project-II	0	6	3
TOTAL			15	17	31

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.

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**

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 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;

[T1][No. of Hrs. 11]**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

[T2][No. of Hrs. 11]**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

[T2][No. of Hrs. 11]**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

[T3][No. of Hrs. 12]**Text Book(s):**

- [T1] Energy Management by Umesh Rathore, S K Kataria & Sons, 2nd Edition, 2014
 [T2] A Textbook Of Power Plant Engineering by R K Rajput, Laxmi Publications, New Delhi, 3rd Publication, 2015
 [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
 [R4] Fuel Map of India, CEA, August 1998
 [R5] Energy Resource Handbook
 [R6] SKROTZI, Bernhardt Power Station Engineering and Economy, 1988, Tata Mc Graw Hill
 [R7] 4th National Power P lan 1997-2012, 1997, CEA 8. Aschner (F.S.) Planning Fundamentals of Thermal Power Plants 1978, Wiley Eastern Ltd.

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SWITCH GEAR & PROTECTION SYSTEMS**Paper Code: ETVPD-603****Paper: Switch Gear & Protection Systems**

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. 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.

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

[T1][No. of Hrs.11]**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

[T1][No. of Hrs. 11]**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.

[T1][No. of Hrs. 12]**Text Books**

[T1] S. S. Rao, "Switchgear and Protection", Khanna Publishers.

Reference Books

[R1] B. Ram and D. N. Vishwakarma, "Power System Protection and Switchgear", Tata Mc Graw Hill

[R2] Y. G. Paithankar and S R Bhide, "Fundamentals of Power System Protection", Prentice Hall of India.

[R3] B. Ravindranath and M. Chander, Power system Protection and Switchgear, Wiley Eastern Ltd.

[R4] T.S.M Rao, "Power System Protection: Static Relays with Microprocessor Applications" Tata McGraw

INDUSTRIAL INSTRUMENTATION**Paper Code: ETVPD-605****Paper: Industrial Instrumentation**

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 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.

[T1][No. of Hrs. 11]**UNIT-II**

Measurements of displacement and strain : Displacement measuring devices: wire wound potentiometer, LVDT, strain 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 strain gauge, speed measurements by different methods and devices.

[T1][No. of Hrs. 11]**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.

[T1][No. of Hrs. 11]**UNIT-IV**

Measurements of temperatures in industry: Importance of temperature measurements in industry, seebeck effect, peltier's effect, temperature and limitations of the following:

- a. Vapor filled thermometers, gas filled thermometers, liquid filled thermometers, mercury in glass thermometers.
- b. Bimetallic thermometers.
- c. Pressure spring thermometers.
- d. Thermocouples.
- e. Resistance thermometers
- f. Radiation pyrometers.
- g. Optical pyrometers.
- h. Location of sensor for measurement and speed of response of sensor.
- i. Lead wire compensation.
- j. Installation of thermometers.

[T1][No. of Hrs. 12]**Text Book(s):**

[T1] Industrial instrumentation by SK Singh

Reference Book(s):

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[R1] Experimental Methods for Engineers by JP Holman



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POWER GENERATION & TRANSMISSION SYSTEMS

Paper Code: ETVPD-607

Paper: Power Generation & Transmission Systems

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 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.

[T1][No. of Hrs.11]

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;

[T1][No. of Hrs.11]

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

[T1][No. of Hrs.11]

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

[T1][No. of Hrs.12]

Text Book(s):

[T1] M. L. Soni, P. V. Gupta and U. S. Bhatnagar, "A Course in Electrical Power", Dhanpat Rai & Sons

Reference Book(s):

[R1] B. R. Gupta, "Generation of Electrical Energy", Eurasia Publishing House.

[R2] S. L. Uppal, "Electrical Power", Khanna Publishers.

FINANCIAL ACCOUNTING
(Open Elective-III)

Paper Code: ETVMS-611
Paper: Financial Accounting

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 & 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,

Sub Division of Journal: Cash Journal, Petty Cash Book, Purchase Journal, Purchase Return, Sales Journal, Sales Return Journal, Voucher System.

[T1][No. of Hrs. 11]

UNIT-II

Ledger Posting and Trial Balance: Ledger, Posting, Rules Regarding Posting, Trial Balance. Capital and Revenue: Classification of Income, Classification of Expenditure, Classification of Receipts, Difference between Capital Expenditure & Capitalized, Expenditure.

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

Depreciation Provisions and Reserves: Concept of Depreciation, Causes of Depreciation, Basic Features of Depreciation, Meaning of Depreciation Accounting, Objectives of Providing Depreciation, Fixation of Depreciation Amount, Method of Recording Depreciation, Methods of Providing Depreciation, Depreciation Policy, AS-6 (Revised) Provisions and Reserves, Change of Method of Depreciation (by both Current and Retrospective Effect).

[T2][No. of Hrs. 11]

UNIT-III

Shares and Share Capital: Introduction to Joint Stock Company, Shares, Share Capital, Accounting Entries, Under Subscription, Oversubscription, Calls in Advance, Calls in Arrears, Issue of Share at Premium, Issue of Share at Discount, Forfeiture of Shares, Surrender of Shares, Issue of Two Classes of Shares, Right Shares, Re-issue of Shares.

Debentures: Classification of Debentures, Issue of Debentures, Different Terms of Issue of Debentures, Writing off Loss on Issue of Debentures, Accounting Entries, Redemption of Debentures.

[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):

[T1] Tulsian, P.C., (2015), *Financial Accountancy*, Pearson Education.

[T2] Maheshwari, S.N. and Maheshwari, S. K., (2015), *An Introduction to Accountancy*, Vikas Publishing House.

Reference Book(s):

[R1] Bhattacharyya, Ashish K., (2015), *Essentials of Financial Accounting*, Prentice Hall of India.

[R2] Rajasekran, (2015), *Financial Accounting*, Pearson Education.

[R3] Bhattacharyya, S.K. and Dearden, J., (2015), *Accounting for Manager – Text and Cases*, Vikas Publishing House.

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[R4] Glautier, M.W.E. and Underdown, B., (2015), *Accounting Theory and Practice*, Pearson Education.



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ORGANIZATIONAL BEHAVIOR
(Open Elective-III)

Paper Code: ETVMS-613
Paper: Organizational Behavior

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: 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.

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

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.

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

UNIT-III

Organization Structure and Process: Organizational climate and culture, Organizational Structure and Design, Managerial Communication, Motivation, Stress and its management, Decision Making: Organizational Context of Decisions, Decision Making Models; Problem Solving.

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

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.

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

Text Book(s):

- [T1] Luthans Fred., “Organizational Behaviour”, McGraw Hill, 2010, 12th Ed.
[T2] Robbins & Judge (15th Ed.), “Essentials of Organizational Behaviour”, Pearson 2012.

References Book(s):

- [R1] Stoner, R. James A.F., Edward Freeman Daniel R Gilbert Jr., Management 6TH Ed, PHI
[R2] George, J. M. & Jones, G.R. (2009). Understanding and Managing Organizational Behaviour, 5th Edition, Pearson Education.
[R3] Green Berg, J. and Baron, R.A. (2008), Behaviour in Organization. Prentice Hall of India.
[R4] Mcshane, S.L., Von Glinow, M.A., Sharma, R.R. (2006) Organizational Behaviour. Tata McGrawHill

OPERATIONS RESEARCH
(Open Elective-III)

Paper Code: ETVMS-615
Paper: Operations Research

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

UNIT-I

Linear Programming: Formulation of LP Problem. Graphical method, Simplex method for maximization and minimization LP Problems. Duality in Simplex Problems,

Queuing Theory: Introduction to probability concept for queuing problems. Basic structure, Terminology, Classification, Birth and Death Process. Queuing Models.

[T1][No. of Hrs. 11]

UNIT-II

Transportation Models: MODI method for optimality check, North West Corner Method, Least-cost Method and Vogel's Approximation Method (VAM) for solving balanced and unbalanced transportation problems. Problems of degeneracy and maximization.

Assignment Models: Assignment model for maximization & minimization problems. Travelling Salesman Problems, Industrial Problems.

[T2][No. of Hrs. 11]

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.

[T1][No. of Hrs. 11]

UNIT-IV

Network Models: Introduction to PERT and CPM. Fundamental concept of Network models and construction of network diagrams. Activity time estimates. Critical path and project time duration. Probability of completing the project on or before specified time. Concept of Float and slack.

Game Theory: Two person zero-sum games. Minimax and Maximin principle. Arithmetic, Algebraic, Matrix Algebra method. Solution by Dominance, Subgame, Graphical method, Linear programming method.

[T2][No. of Hrs. 12]

Text Book(s):

- [T1] Hira and Gupta, "Operation Research" S. Chand Publications
[T2] H.A. Taha, "Operations Research", Prentice-Hall India, 6th Edition, 2004.

Reference Book(s):

- [R1] S.Kalavathy, "Operations Research", Vikas Publication, 4th Edition, 2013.
[R2] N.D. Vohra, "Operations Research", Tata McGraw Hill, 2004.
[R3] Richard Bronson, Govindasami Naadimuthu, "Operations Research", Tata McGraw Hill, 2004
[R4] A.P. Verma, "Operations Research", S.K. Kataria & Sons, 2004.
[R5] J.K. Sharma, "Operation Research", Macmillan India Ltd. 2005.

INDUSTRIAL MANAGEMENT
(Open Elective-III)

Paper Code: ETVMS-617
Paper: Industrial Management

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: 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.

Labour Legislation- Labour management cooperation/worker's participation in management. Factory legislation. International Labour Organization.

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

UNIT-II

Trade Unionism- Definition, Origin, Objectives of Trade Unions. Methods of Trade unions. Size and finance of Indian Trade unions-size, frequency distribution, factors responsible for the small size. Finance-sources of income, ways of improving finance.

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

UNIT-III

Work Study-Method study and time study. Foundations of work study. Main components of method study. Time study standards. Involvement of worker's unions. Work Sampling. Application of work study to office work.

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

UNIT-IV

Quality Management- What is Quality? Control Charts. Quality is everybody's job. Taguchi Philosophy. Service Quality. What is Total Quality Management (TQM)? Roadmap for TQM. Criticism of TQM. Six Sigma.

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

Text Book(s):

[T1] Sinha, P.R.N., Sinha I.B. and Shekhar S.M.(2013), Industrial Relations, Trade Unions and Labour Legislation. Pearson Education

[T2] Chary, S.N. (2012), Production and Operations Management. Tata McGraw Hill Education.

Reference Book(s):

[R1] Srivastava, S.C. (2012), Industrial Relations and Labour Laws, Vikas Publishing

[R2] Shankar R (2012), Industrial Engineering and Management. Galgotia Publications

[R3] Telsang, M. (2006), Industrial Engineering and Production Management. S.Chand

[R4] Thukaram, Rao (2004), M.E. Industrial Management. Himalaya Publishing House.

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

Introduction: Nature, Scope and Significance of Managerial Economics, its Relationship with other Disciplines, Role of Managerial Economics in Decision Making; Opportunity cost Principle, Production Possibility Curve, Incremental Concept, Cardinal and Ordinal Approaches to Consumer Behaviour: Equi-marginal principle, Law of Diminishing Marginal Utility, Indifference curve Analysis.

[T1][No. of Hrs. 11]

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.

[T2][No. of Hrs. 11]

UNIT-III

Theory of Cost and Market Structures: Traditional and Modern Theory of Cost in Short and Long Runs, Economies of Scale and Economies of Scope; Market Structures: Price-Output decisions under Perfect Competition, Monopoly, Monopolistic Competition.

[T1][No. of Hrs. 11]

UNIT-IV

Introduction to Macro Economics: Nature and Importance; Economic Growth and Development, Methods of Measurement of National Income; Inflation: meaning, Theories, and Control measures.

[T2][No. of Hrs. 12]

Text Book(s):

- [T1] Samuelson, Paul and Nordhaus, William, (2016), *Economics*, McGraw Hill Education.
[T2] Dwivedi, D.N., (2015), *Managerial Economics*, Vikas Publishing House.

Reference Book(s):

- [R1] Salvatore, Dominick, (2015), *Managerial Economics in a Global Economy*, Oxford University Press.
[R2] Kreps, David, (2015), *MicroEconomics for Managers*, Viva Books Pvt. Ltd.
[R3] Peterson, Lewis and Jain, (2016), *Managerial Economics*, Pearson Education.
[R4] Colander, David, C., (2015), *Economics*, McGraw Hill Education.

ENERGY RESOURCES AND CONVERSION PROCESS LAB**Paper Code: ETVPD-651****L T/P C****Paper: Energy Resources and Conversion Process Lab****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. 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



**GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY**

SWITCH GEAR & PROTECTION SYSTEMS LAB**Paper Code: ETVPD-653****L T/P C****Paper: Switch Gear & Protection Systems Lab****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. 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



**GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY**

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.
6. Study of variable inductive transducer.
7. Study of servo motors.
8. Study of solenoid valve and motor operated valve.
9. Study of optical transducers.



**GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY**

CASE STUDY-INDUSTRY BASED

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

L	T/P	C
0	4	2

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.



**GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY**

POWER SYSTEM ANALYSIS

Paper Code: ETVPD-602
Paper: Power System Analysis

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:

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.

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

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;

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

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).

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

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.

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

Text Book(s):

[T1] C.L. Wadhwa, 'Electrical Power Systems', New Age International, New Delhi, 2009.

[T2] I.J. Nagrath and D.P. Kothari, 'Modern Power System Analysis', Tata McGraw-Hill Publishing Company, New Delhi, 1990.

Reference Book(s):

[R1] M. L. Soni, P. V. Gupta and U.S. Bhatnagar, "A course in electrical power" Dhanpat Rai & Sons

[R2] K. Nagasarkar and M.S. Sukhija, Oxford University Press, 2007

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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**

Substation equipments specifications, ratings and selection: Busbar, Disconnect Switches, Circuit Breakers, Relay, Relaying Schemes, Instrument Transformers, Capacitors, and Reactors.

[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):**

- [T1] Substation Design and Equipment By: P.S. Satnam, P.V. Gupta, Dhanpat Rai Publications, 2012
 [T2] Electrical Substation Engineering and Practice: S. Rao, Khanna Publishers

Reference Book(s):

- [R1] Electric Power Substations Engineering, Third Edition, John D. McDonald, CRC Press

UTILIZATION OF ELECTRICAL ENERGY**Paper Code: ETVPD-606****Paper: Utilization of Electrical Energy**

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 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.

[T1][No. of Hrs. 11]**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.

[T1][No. of Hrs. 11]**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.

[T1][No. of Hrs. 11]**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.

[T1][No. of Hrs. 12]**Text Book(s):**

- [T1] J.B. Gupta, “Utilization of Electric Power and Electric Traction”, Kataria & Sons publishers, Delhi, IX Edition, 2004. (Units 1-5)

Reference Book(s):

- [R1] C.L. Wadhwa, “Generation, Distribution and Utilization of electrical Energy”, New Age International (P) Limited Publishers, 3rd Edition, 2010. (Units 1-5)
- [R2] N.V. Suryanarayana, “Utilization of Electrical Power including Electric drives and Electric traction”, New Age International (P) Limited Publishers, 1st Edition, 1994.
- [R3] E. Open Shaw Taylor, “Utilization of Electric Energy”, Orient Longman, 1st Edition, 1937.

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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

Solar energy – The Sun – Production and transfer of solar energy – Sun-Earth angles – Availability and limitations of solar energy – Measuring techniques and estimation of solar radiation – Solar thermal collectors – General description and characteristics – Flat plate collectors – Heat transfer processes – Short term and long term collector performance – Solar concentrators – Design, analysis and performance evaluation.

[T2][No. of Hrs. 11]

UNIT-II

Energy storage – Sensible heat storage – Liquid media storage – Solid media storage – Dual media storage – Phase change energy storage – Storage capacity – Other storage methods – Solar dehumidification – Design, performance and applications – Combined solar heating and cooling systems – Performance and cost calculations – Special topics on solar energy.

[T2][No. of Hrs. 11]

UNIT-III

Energy from biomass – Sources of biomass – Different species – Conversion of biomass into fuels – Energy through fermentation – Pyrolysis, gasification and combustion – Aerobic and anaerobic bio-conversion – Properties of biomass – Biogas plants – Types of plants – Design and operation – Properties and characteristics of biogas.

[T2][No. of Hrs. 11]

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.

[T2][No. of Hrs. 12]

Text Book(s):

- [T1] Renewable Energy Technologies: A Practical Guide for Beginners by Chetan Singh Solanki, PHI Learning, Eastern Economy Edition
- [T2] Kothari: Renewable Energy Sources and Emerging Technologies, PHI, Eastern Economy Edition, 2012
- [T3] G.N. Tiwari: Solar Energy-Fundamentals, Design, Modelling and Applications, Narosa Publishers, 2002.

Reference Book(s):

- [R1] J.A. Duffie and W.A. Beckman: Solar Energy thermal processes, J. Wiley, 1994.
- [R2] A.A.M. Saigh (Ed): Solar Energy Engineering, Academic Press, 1977.
- [R3] F. Kreith and J.F. Kreider: Principles of Solar Engineering, McGraw Hill, 1978.
- [R4] Ahmed: Wind energy Theory and Practice, PHI, Eastern Economy Edition, 2012
- [R5] H.P. Garg, S.C. Mullick and A.K. Bhargava: Solar Thermal Energy Storage, 1985.
- [R6] K.M. Mittal: Non-conventional Energy Systems-Principles, Progress and Prospects, Wheeler Publications, 1997.

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ENERGY AUDIT AND EXERCISE
(Core Elective-I)

Paper Code: ETVPD-610
Paper: Energy Audit and Exercise

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 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.

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

UNIT-II

Thermal Energy System, Electrical Energy System, Energy Balancing, Maintenance standards, Demand side Management

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

UNIT-III

Energy management, Scope, Energy Audit, Energy Accounting, Audit for Buildings and Commercial Complexes, Industrial Energy Audit, Tools and Methodologies for Energy audit, analysis and decision making on the basis of energy audit Report, Energy audit Case studies in various sectors of economy, Energy Audit for Generation, Transmission, and Distribution Utilities.

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

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

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

Text Book(s):

- [T1] Energy Conservation Handbook, Mc Graw Hill
[T2] Course Material of Bureau of Energy Efficiency for National Energy Auditor/ Manager Exam

Reference Book(s):

- [T3] Energy Conservation Act 2001
[T4] Energy Conservation in selected Govt. Firms, Energy Management Centre
[T5] S. David, Handbook of Industrial Energy Conservation Van Nostrand, Reind Company

ENERGY 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

Energy Conservation: Principles of Energy Conservation, Energy conservation Planning, Energy conservation in small scale industries, Large scale industries and in electrical generation, transmission and distribution. Energy conservation Legislation

Energy Audit: Aim of energy Audit, Strategy of Energy Audit, Energy management Team Considerations in implementing energy conservation Program, Instruments for energy audit, Energy audit of Electrical System, HVAC, Buildings, Economic analysis

[T1, T3][No. of Hrs. 11]

UNIT-II

Demand Side Management:- Concept and Scope of Demand Side Management, Evolution of Demand Side Management, DSM Strategy ,Planning, Implementation and its application. Customer Acceptance & its implementation issues National and International Experiences with DSM.

[T2][No. of Hrs. 11]

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.

[T1, T3][No. of Hrs. 11]

UNIT-IV

Efficiency in Motors and Lighting system:- Load scheduling/shifting, Motor drives- motor efficiency testing, energy efficient motors, and motor speed control. Lighting- lighting levels, efficient options, fixtures, day lighting, timers, Energy efficient windows. UPS selection, Installation operation and maintenance. Energy Conservation Act 2001, Electricity Bill 2003, Energy Conservation Building Code (ECBC) 2007

[T1, T3][No. of Hrs. 12]

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
[T3] Tripathy S. C., "Electric Energy Utilization and conservation", Tata McGraw Hill

Reference Books

- [R1] Industrial Energy Conservation Manuals, MIT Press, Mass, 1982.
[R2] "The Efficient Use of Energy", Edited by I.G.C.Dryden, Butterworths, London, 1982.
[R3] Energy Management Handbook, Edited by W.C.Turner, Wiley, New York, 1982.
[R4] L.C.Witte, "P.S.Schmidt, D.R. Brown, Industrial Energy Management and Utilization", HemispherePubl, Washington, 1988
[R5] Power Capacitor Handbook, Butterworth & Co (Publishers) Ltd, 1984.
[R6] Electrical Systems Analysis and Design for Industrial Plants, McGraw-Hill Book Company.
[R7] IEEE Bronze Book, 'Recommended Practice for Energy Conservation and cost effective planning in Industrial facilities, IEEE Press.

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- [R8] ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications- Rating System, TERI PUBLICATIONS – GRIHA Rating System, LEEDS Publications



GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY

GLOBAL WARMING & CLIMATE CHANGE
(Open Elective-IV)

Paper Code: ETVCT-614

Paper: Global Warming & Climate Change

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 12.5 marks.

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.

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

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.

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

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.

[T1, T2, T3][No. of Hrs. 11]

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-UNFCC-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.

[T1, T2, T3][No. of Hrs. 12]

Text Book(s)

- [T1] Current trends in Global Environment by A.L. Bhatia (2005) Energy Sources
 [T2] Global Warming – A Very Short Introduction, Mark Maslin, oxford.
 [T3] UNFCC & IPCC reports (www.unfccc.int & <http://www.ipcc.ch/>)

Reference Book(s)

- [R1] Global Warming The Complete Briefing - John T Houghton Cambridge press
 [R2] Climate Change: A Multidisciplinary Approach, by William James Burroughs, Cambridge press
 [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.

ENTREPRENEURSHIP DEVELOPMENT AND PLANNING
(Open Elective-IV)

Paper Code: ETVMS-616

Paper: Entrepreneurship Development and Planning

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 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

Foundations of Entrepreneurship: What is an Entrepreneur? The benefits of Entrepreneurship. The power of small business. Class exercise- case discussion on entrepreneurs like - Dhirubhai Ambani, Karsenbhai Patel, Ramesh Babu, Kailash Katkar, Patricia Narayan etc.

[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.

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

UNIT-III

Formulation of the Entrepreneurial Plan: The assessment functions with opportunities. The marketing Aspects of new ventures. Business plan preparation for new ventures. Class Exercise- Building your own Business Plan.

[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.

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

Text Books

[T1] Kuratko, D.F. & Rao T.V. (2012). Entrepreneurship: A South Asian Perspective. Cengage

[T2] Charantimath, P. (2009). Entrepreneurship Development: Small Business Enterprises. Pearson

References Books

[R1] Naggendra S.and Manjunath V.S. (2009). Entrepreneurship and Management. Pearson

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

Foundations of Information Systems in Business: Data, Information and Knowledge, Information system and its components, Uses of IS in Business, Types of Information systems, Using Information Systems for competitive advantage, Porter's competitive forces model

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

UNIT-II

Functional Business Systems: Overview of system analysis and design; Role of Information systems in marketing, Human Resource Management, Accounting and Finance, manufacturing.

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

UNIT-III

Enterprise Business Systems: Customer Relationship Management -Benefits and Challenges of CRM, Trends in CRM; Supply Chain Management-Benefits and Challenges of SCM, Trends in SCM; Enterprise Resource Planning-Benefits and Challenges of ERP, Causes of ERP failures, Trends in ERP;e-Commerce-Categories of e-commerce, Essential e-Commerce processes, Electronic payment processes

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

UNIT-IV

Decision Support in Business: Management Information Systems, Decision Support Systems, Online Analytical Processing, Executive Information Systems, Knowledge Management Systems, Expert Systems

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

Text Book(s):

- [T1] James A O'Brien, George M Marakas and Ramesh Behl (2013). Management Information Systems, Tenth Edition, Tata McGraw Hill Education, New Delhi.
- [T2] Ken Laudon and Jane Laudon (2014). Management Information Systems, Twelfth Edition, Pearson, New Delhi.

Reference Book(s):

- [R1] D.P.Goyal (2014). Management Information Systems-Managerial Perspectives, Fourth Edition, Vikas Publishing House, New Delhi.
- [R2] Waman S Jawadekar(2009). Management Information Systems. Fourth Edition, Tata McGraw Hill, New Delhi

POWER SYSTEM ANALYSIS LAB**Paper Code: ETVPD-652****L T/P C****Paper: Renewable Energy System Lab****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. 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



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DESIGN OF POWER SUBSTATION LAB**Paper Code: ETVPD-654****L T/P C****Paper: Design of Power Substation Lab****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:

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



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RENEWABLE ENERGY SYSTEM LAB
(Core Elective-I)

Paper Code: ETVPD-658

Paper: Renewable Energy System 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. 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



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ENERGY AUDIT AND EXERCISE LAB
(Core Elective-I)

Paper Code: ETVPD-660

L	T/P	C
0	3	3

Paper: Energy Audit and Exercise 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. 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



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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 a industrial installation.
4. Conducting a study of present state and scope / possibilities for energy conservation in a multi-story residential building.
5. Study of power factor improvement possibilities in a electrical installation
6. Study of star labelling system of bureau of Energy Efficiency for various electrical appliances
7. Conducting a study about recent trends towards energy efficiency in buildings in Delhi and NCR

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