

SCHEME OF EXAMINATION

And

SYLLABI

For

BACHELOR OF VOCATION

In

(POWER DISTRIBUTION MANAGEMENT)

**BRIDGE COURSE
LEVEL IV SKILL COMPONENT**

And

1st SEMESTER to 2nd SEMESTER

Offered by

University School of Engineering and Technology



**GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY**

**Guru Gobind Singh Indraprastha University
Sector 16-C, 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. **AS** stands for Applied Science.
18. **HS** stands for Humanities and Social Sciences.
19. **SS** stands for Social Services.
20. **L/T** stands for Lecture and Tutorial
21. **P** stands for Practical.
22. **S/D** stands for Drawing/Studio
23. **P/D** stands for Practical/Drawing



**GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY**

TITLE OF THE PROGRAMME
BACHELORS OF VOCATION IN POWER DISTRIBUTION MANAGEMENT

Preamble:

Availability of Electric Power is one of the essential elements for industrial growth. It is also one of the primary indicators of living standards in any nation. Developed nations have much higher per capita electric power consumption as compared to developing countries.

Indian power sector has faced challenges like deficit in power generation capacity and less efficient operation in transmission and distribution. It resulted in lesser availability of power with sub-standard quality.

Government has passed 'The Electricity Act 2003', aiming at restructuring Indian power sector with focus on improving quality and availability of electric power. It has provisions of unbundling state electricity boards and privatization of power distribution in urban areas.

It has led to entry of private players in power distribution in many urbanized centers. Many state electricity boards have also been restructured with separate power distribution companies being formed.

It has created demand of specifically trained manpower in the field of power distribution. This course is designed to cater the need of such specifically trained manpower for power distribution sector in urban areas. The course is highly relevant for all those who want to pursue a professional career in Power Distribution Sector.

Aim:

The program aim is to train individuals not only in theoretical aspects in power distribution sector, but to impart skills required to perform their job efficiently. Focus is to prepare manpower, having strong technical skills as well as reasonable exposure to inter-personnel, accounting, finance, regulatory mechanism and entrepreneurship skills.

Objective:

Objective of the course is to generate manpower for power distribution having following capabilities

1. Technical knowledge required for operation and maintenance of power distribution systems
2. Inter-personnel skills required to team work as well as to supervise & lead team of skilled workers.
3. Basic accounting and finance related knowledge, leading to prudent and informed decisions being taken
4. Understanding of regulatory framework in the field of power distribution sector
5. Hands of experience in operation, maintenance and projects handling in the field of power distribution.

Program Structure

It is a three year full time program. Course is on semester system pattern. Intervening periods between the semesters will be used for imparting practical hands on training in industry / in-house. It will be a multiple entry/exit program with option to exit at the end of first year or second year. Students exiting at the end of first year, and completing minimum required credits will be awarded diploma in discipline. Students exiting at the end of second year and acquiring minimum credits will be awarded advance diploma in discipline. Students completing three years course with minimum required credit will be awarded Bachelors degree in Power Distribution Management. Students having diploma awarded will be admitted in second year of the course.

Program Outcome:

- a) Trainees completing first year of the course and exiting with Diploma will be equipped with skills required to perform the required job independently in the field of power distribution sector.
- b) Trainees completing second year of the course and exiting with Advanced Diploma will be equipped with skills required to perform his/her own job independently as well as supervise job of the fellow technicians.
- c) Trainees completing third year of the course and exiting with Bachelor in Vocational degree will be equipped with skills required for managing his/her own job as well as to perform managerial functions for concerned team.

Students will be awarded of Diploma:

1. Student shall be required to appear in examinations of all courses. However, to award the Diploma (Power Distribution Management) a student shall be required to earn a minimum of **60 credits**.

Students will be awarded of Advanced Diploma:

1. Student shall be required to appear in examinations of all courses. However, to award the Advanced Diploma (Power Distribution Management) a student shall be required to earn a minimum of **120 credits**.

Students will be awarded of B.Voc Degree:

1. Student shall be required to appear in examinations of all courses. However, to award the degree a student shall be required to earn a minimum of **180 credits**.

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**BACHELOR OF VOCATION
BRIDGE COURSE FOR (10+2)/10+ITI STUDENTS
(FOR ALL ENGINEERING DISCIPLINES)
(FIRST SEMESTER EXAMINATION)**

Paper Code	Paper ID	Paper	L/T/P	Credits
ETVPD-401		Module-I*	6	6
ETVPD-403		Module-II*	6	6
TOTAL			12	12

No. of Hours: 12 x 15 Hours =180 Hours

**BACHELOR OF VOCATION
BRIDGE COURSE FOR (10+2)/10+ITI STUDENTS
(FOR ALL ENGINEERING DISCIPLINES)
(SECOND SEMESTER EXAMINATION)**

Paper Code	Paper ID	Paper	L/T/P	Credits
ETVPD-402		Module-III*	6	6
ETVPD-404		Module-IV*	6	6
TOTAL			12	12

No. of Hours: 12 x 15 Hours =180 Hours

*Non University Examination System (NUES)

NOTE I:

The institute is advised to teach/provide relevant skills through Module I to IV, which are pre-requisite for first year of B.Voc.

OR

Relevant qualification pack in alignment with NSQF Level IV may be taught by the institute, which is pre-requisite for B.Voc.

NOTE II:

Bridge course is to be taught during first year. Evaluation for bridge course modules will be in Non University Examination System (NUES) pattern. Each module will be of 100 marks.

SCHEME OF EXAMINATION**And****SYLLABI****For****BACHELOR OF VOCATION****In****(POWER DISTRIBUTION MANAGEMENT)
1st SEMESTER to 2nd SEMESTER****Offered by****University School of Engineering and Technology****GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY****Guru Gobind Singh Indraprastha University
Sector 16-C, Dwarka, Delhi – 110078 [INDIA]****www.ipu.ac.in**

**BACHELOR OF VOCATION
(POWER DISTRIBUTION MANAGEMENT)
FIRST SEMESTER EXAMINATION
(LEVEL-V)**

Paper Code	Paper ID	Paper	L	T/P	Credits
THEORY PAPERS					
ETVPD-501		Electrical Circuit Theory	3	0	3
ETVPD-503		Electrical Measurement & Measuring Instruments	3	0	3
ETVPD-505		Installations, Commissioning and Maintenance of Electrical Equipments	2	0	2
ETVHS-519		Communication Skills (Common to all Disciplines)	2	1	3
OPEN ELECTIVE-I (Select any one)					
ETVAS-507		Applied Mathematics	3	0	3
ETVAS-511		Aptitude & Logical Reasoning	3	0	3
GENERAL ELECTIVE-I (Select any one)					
ETVHS-513		Human Values and Professional Ethics	2	0	2
ETVHS-517		Personality Development & Behavioural Science	2	0	2
PRACTICAL/VIVA VOCE (Select any one Lab based on OPEN ELECTIVE-I)					
ETVAS-557		Applied Mathematics Lab	0	3	3
ETVAS-555		Aptitude & Logical Reasoning Lab	0	3	3
PRACTICAL/VIVA VOCE					
ETVPD-551		Electrical Circuit Theory Lab	0	3	3
ETVPD-553		Electrical Measurements & Measuring Instruments Lab	0	3	3
ETVPD-555		Installations, Commissioning and Maintenance of Electrical Equipments Lab	0	3	3
ETVPD-557		Vocation Workshop – I (Discipline specific)	0	3	3
ETVCS-559		Basic Programming Lab (Common to all disciplines except MC,SD, PT,CT)	0	2	2
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
SECOND SEMESTER EXAMINATION
(LEVEL-V)**

Paper Code	Paper ID	Paper	L	T/P	Credits
THEORY PAPERS					
ETVPD-502		Power Distribution Systems	3	0	3
ETVPD-504		Industrial Electronics	3	0	3
ETVPD-506		Power Distribution System Automation	2	0	2
ETVEN-502		Environmental Science (Common to all disciplines)	3	0	3
OPEN ELECTIVE-II (Select any one)					
ETVPD-508		Electrical Engineering Materials	3	0	3
ETVEC-506		Basic Electronics	3	0	3
PRACTICAL/VIVA VOCE					
ETVPD-552		Power Distribution Systems Lab	0	3	3
ETVPD-554		Industrial Electronics Lab	0	3	3
ETVEN-552		Environmental Science Lab / Field work (Common to all disciplines)	0	2	2
ETVPD-556		CADD (Electrical) Lab	0	2	2
ETVPD-558		Project-I	0	6	3
ETVPD-560		Industrial Training-I	0	0	2
ETVPD-562		Vocation Workshop-II	0	3	3
TOTAL			14	19	32

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.

ELECTRICAL CIRCUIT THEORY

Paper Code: ETVPD-501
Paper: Electrical Circuit Theory

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 12.5marks.

Objectives & Pre-requisites: Understanding of basic concepts of electrical elements, electrical networks, phasor diagram, alternating current quantities and mathematics of metric level.

Learning Objective: Power distribution systems involve flow of current in various conditions (including under fault conditions). All electrical engineering personnel, either at supervisory or at managerial level, must be at good understanding of analytical skill in current and power flow. As power distribution systems involves, single as well as three phase power circuits, analysis of these from circuit theory point of view is a necessity. In complex situation, network analysis is done through software, which employs graph theory in many cases. So basic understanding of graph theory is also required.

UNIT- I

Basic Concepts: Current, e.m.f, potential difference, resistance, inductance, capacitance, resistivity, electric flux, flux density, field intensity, electric potential, work power & energy –Ohm’s law, Kirchhoff’s law, relationship between voltage, charge & capacitance

Sinusoidal Source, Phasor representation of sinusoidal functions, Steady state response of circuits to sinusoidal functions, resonance in AC Circuits, Star-Delta connections

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

UNIT- II

Network Theorems: Circuit Theorems: Mesh equation, Nodal equation, concept of star / delta transformation; Introduction to Superposition theorem, Maximum power transfer, Thevenin’s theorem, Norton’s theorem

Single Phase Circuits-Definition of instantaneous value, peak value, RMS value, average value, Reactance, impedance, conductance, susceptance, admittance, Phase angle

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

UNIT-III

Power factor - calculate the instantaneous value of current & voltage, frequency of the sinusoidal alternating quantity from instantaneous value of current & voltage, frequency of the sinusoidal alternating quantity from instantaneous value, current in both branches of a two branches parallel circuit, total current, power and power factor of a parallel circuit. Rectangular and polar co-ordinates, sinusoidal voltage and current, pure resistive, inductive and capacitive circuits;

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

UNIT-IV

Polyphase Circuits - advantages of 3 phase system over single phase system, Three phase systems, different types of three phase connections, three phase supply, power in three phase circuits, balanced and Un-balanced star and delta connected load, Calculate line current, phase current, phase voltage and power for star and delta connected loads; Two wattmeter method of power measurement.

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

Text Books:

- [T1] Van Vakenburg, “Network Analysis”, Prentice Hall of India
 [T2] D R Choudhary, “Network and Systems”, New Age International

ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS**Paper Code: ETVPD-503****L T/P C****Paper: Electrical Measurement & Measuring Instruments****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 12.5marks.

Objectives & Pre-requisites: Basic understanding of electrical engineering concepts likes voltage, current, power, power factor, elementary electrical circuits and basic electronics.

Learning Objectives: Measurement of power flow is a very important activity at various stages of power distribution. It is required not only for technical reasons such as load flow analysis and fault finding, but for commercial aspects also. Effective energy metering is very much required to keep losses at various stages of power distribution under control. Concepts of power and energy metering, procedures associated and instruments used are introduced to students in this course.

UNIT-I

Electrical Measurements: True value, accuracy, precision errors, correction, sensitivity, resolution, instrument efficiency; Standards of Measurement & Errors; Indicating and Integrating instruments; Voltmeter, Ammeter, Wattmeter, Multi-meter and Energy meter; Extension of instrument ranges..

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

Measurement of Resistance, Inductance and Capacitance: Measurement of low, medium and high resistances; Insulation resistance measurement; AC bridges for inductance and capacitance measurement.

Instrument Transformers: Current and Potential transfers, applications, ratio and phase angle errors.

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

Electronic Measurements: Concept of digital measurement, block diagram Study of digital voltmeter, Electronic Multi-meter; Concept of digital measurement, Electronic Voltmeter; Electronic Wattmeter & Electronic Energy Meter; Time, Frequency and phase angle measurements using CRO; Digital Counter, Frequency Meter, Voltmeter, Application of Cathode Ray Oscilloscope

[T1][No. of Hrs. 12]**UNIT-IV**

Instrumentation: Transducers, classification & selection of transducers; Strain gauges, inductive & capacitive transducers; Piezoelectric and Hall-effect Transducers; Thermistors and Thermocouples; Photo-diodes & Photo-transistors; Encoder type digital transducers; Signal conditioning and telemetry; Basic concepts of smart sensors and application; Data Acquisition Systems.

[T1][No. of Hrs. 11]**Text Books:**

[T1] A.K.Sawhney; "A Course in Electrical and Electronic Measurements and Instrumentation" Dhanpat Rai & Co.

Reference Books:

[R1] W.D. Cooper, "Modern Electronics Instrumentation & Measurement Technique"; PHI

INSTALLATIONS, COMMISSIONING AND MAINTENANCE OF ELECTRICAL EQUIPMENTS

Paper Code: ETVPD-505	L	T/P	C
Paper: Installations, Commissioning and Maintenance of Electrical Equipments	2	0	2

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 12.5marks.

Objectives & Pre-Requisites: Students should be familiar with basic concepts of electrical engineering. Understanding of tools and equipments in mechanical workshop will be helpful as installation as well as maintenance requires these.

Learning Outcomes: Electrical installations are well regulated by Indian Electricity Rules, so good understanding of these is very much required for power distribution personnel. Distribution lines, transformers, sub-stations, domestic installations, industrial installations, fire fighting equipments and batteries are core constituent of any power distribution systems. A good understanding of installation, commissioning and maintenance of all these are must for any technical personnel in the field of power distribution. This subject is aimed at imparting knowledge in this domain to students.

UNIT – I

Introduction to Indian electricity rules, causes and prevention of accidents, procedure on occurrence of accidents, first aid, artificial respiration, investigation and management of accident, workmen's safety devices and periodical inspection of safety devices.

Maintenance concepts, types of maintenance, maintenance schedules, maintenance management, history cards and job cards.

[T1][No. of Hrs. 07]**UNIT-II**

Transmission and Distribution System: Caution notice, Authorized persons, danger notice, permit to work, arranging of shutdowns personally and telephonically, foreign voltages and lines in the vicinity, Patrolling and Inspection of line- patrol books and line maintenance registers, frequency and schedule of patrolling points to be noted during patrolling from ground: special inspections: night inspections: emergency inspection support – head inspections, measurement of clearance of overhead lines, location of underground cables faults and rectifying the same; Open or loose neutral connection and non – provision of fuses on service lines and their effects on system

Transformer maintenance register, schedule of maintenance, LT switch, cross arms, gang operating switch, conductors/earth wire, guys, earthing, foundations etc. checking of earth resistance, transformer oil level and BDV test due to higher earth resistance, improvement of earth resistance, balancing of phases, dangerous situations due to higher earth resistance, improvement of earth resistance value, grounded neutral.

Grid Substations: - Checking and maintenance of bus – bars, isolating switches, voltage and current transformers, lightning arrestors, control and relay panels, shunt capacitors, HT/LT circuit breakers, LT switches, power transformers and their dehydration oil tests, earthing system and batteries.

[T1][No. of Hrs. 08]**UNIT-III**

Domestic Installation: - Introduction, testing of electrical installation of a building, testing of insulation resistance to earth, testing of insulation and resistance between conductors continuity or open circuit test, short circuit testing of earthing continuity, polarity test, localization of faults

Industrial Installations: Installation, testing and commissioning of electrical installations in a big industry including high voltage transformers and its connected equipment in the switch yard, medium voltage distribution panels, power control centres, motor control centres, lighting arrangement; Causes of fire, precautions to avoid fire,

[T1][No. of Hrs. 07]

UNIT-IV

Batteries: Construction, working and application of lead acid battery, alkaline (Ni-Fe and Ni-Cd) battery, methods of charging, specification of battery, factors affecting battery life.

Fire-fighting system: types of fire-fighting equipment and their uses. Fire detectors;

Water supply system: - Selection of pump sets and types of pump sets.

[T1][No. of Hrs. 08]

Text Books:

[T1] Installation, Commissioning & Maintenance Of Electrical Equipment by P P Gupta, Dhanpat Rai Publications, New Delhi



COMMUNICATION SKILLS
(Common to All Disciplines)

Paper Code: ETVHS-519
Paper: Communication Skills

L	T/P	C
2	1	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 and Pre-requisites: Students should have studied General English up to secondary level and the subject aims at developing communication skills in writing, speaking as well as body language.

Learning Outcomes: The students should be able to communicate effectively to his/her superiors as well as juniors at work place in his/her professional field.

UNIT-I

Recognizing and Understanding Communication Styles: What is Communication?, Passive Communication, Aggressive Communication, Passive-Aggressive Communication, Assertive Communication, Verbal and Non Verbal Communication, Barriers and Gateways to Communication.

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

UNIT-II

Listening Skills: Types of Listening (theory /definition), Tips for Effective Listening Academic Listening- (lecturing), Listening to Talks and Presentations, Basics of Telephone communication

Writing Skills: Standard Business letter, Report writing, Email drafting and Etiquettes, Preparing Agenda and writing minutes for meetings, Making notes on Business conversations, Effective use of SMS, Case writing and Documentation.

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

UNIT-III

Soft Skills: Empathy (Understanding of someone else point of view), Intrapersonal skills, Interpersonal skills, Negotiation skills, Cultural Aspects of Communication.

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

UNIT-IV

Group Communication: The Basics of Group Dynamics, Group Interaction and Communication, How to Be Effective in Groups, Handling Miscommunication, Handling Disagreements and Conflicts, Constructive Criticism.

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

Text Book(s):

[T1] Mckay, M., Davis, M. & Fanning, P.(2008). Messages: The Communication Skills Book, New Harbinger Publications

[T2] Perkins, P.S., & Brown, L. (2008). The Art and Science of Communication: Tools for effective communication in the workplace, John Wiley and Sons

Reference Books:

[R1] Krizan et al (2010). Effective Business Communication, Cengage Learning.

[R2] Scot, O. (2009). Contemporary Business Communication, Biztantra, New Delhi.

[R3] Chaney & Martin (2009). Intercultural Business Communication, Pearson Education

[R4] Penrose et al (2009). Business Communication for Managers, Cengage Learning.

APPLIED MATHEMATICS
(Open Elective-I)

Paper Code: ETVAS-507
Paper: Applied Mathematics

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.

Objective: The objective of the paper is to facilitate the student with the basics of Applied Mathematics that are required for an engineering student.

UNIT- I

Successive differentiation: Leibnitz theorem for n^{th} derivative (without proof). Infinite series: Convergence and divergence of infinite series, positive terms infinite series, necessary condition, comparison test (Limit test), D'Alembert ratio test, Integral Test, Cauchy's root test, Raabe's test and Logarithmic test (without proof). Alternating series, Leibnitz test, conditional and absolutely convergence. Taylor's and Maclaurin's expansion (without proof) of function (e^x , $\log(1+x)$, $\cos x$, $\sin x$) with remainder terms, Taylor's and Maclaurin's series, Error and approximation.

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

UNIT- II

Asymptotes to Cartesian curves. Radius of curvature and curve tracing for Cartesian, parametric and polar

curves. Integration: integration using reduction formula for $\int_0^{\pi/2} \sin^n \theta d\theta$, $\int_0^{\pi/2} \cos^n \theta d\theta$, $\int_0^{\pi/2} \sin^n \theta \cos^m \theta d\theta$. Application of integration : Area under the curve, length of the curve, volumes and surface area of solids of revolution about axis only. Gamma and Beta functions.

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

UNIT- III

Matrices: Orthogonal matrix, Hermitian matrix, Skew-Hermitian matrix and Unitary matrix. Inverse of matrix by Gauss-Jordan Method (without proof). Rank of matrix by echelon and Normal (canonical) form. Linear dependence and linear independence of vectors. Consistency and inconsistency of linear system of homogeneous and non homogeneous equations. Eigen values and Eigen vectors. Properties of Eigen values (without proof). Cayley-Hamilton theorem (without proof). Diagonalization of matrix. Quadratic form, reduction of quadratic form to canonical form.

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

UNIT-IV

Ordinary differential equations: First order linear differential equations, Leibnitz and Bernoulli's equation. Exact differential equations, Equations reducible to exact differential equations. Linear differential equation of higher order with constant coefficients, Homogeneous and non homogeneous differential equations reducible to linear differential equations with constant coefficients. Method of variation of parameters. Bessel's and Legendre's equations (without series solutions), Bessel's and Legendre's functions and their properties.

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

Text:

- [T1] B. S. Grewal, "Higher Engineering Mathematics", Khanna Publications.
[T2] R. K. Jain and S.R. K. Iyengar, "Advanced Engineering Mathematics", Narosa Publications.

References:

- [R1] E. Kresyzig, "Advance Engineering Mathematics", Wiley publications
[R2] G. Hadley, "Linear Algebra", Narosa Publication
[R3] N.M. Kapoor, "A Text Book of Differential Equations", Pitambar Publication.
[R4] Wylie R, "Advance Engineering Mathematics", Tata McGraw-Hill
[R5] Schaum's Outline on Linear Algebra, Tata McGraw-Hill
[R6] Polking and Arnold, "Ordinary Differential Equation using MATLAB", Pearson.

Scheme and Syllabi for B. Voc. (Power Distribution Management), 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.

APTITUDE & LOGICAL REASONING
(Open Elective-I)

Paper Code: ETVAS-511
Paper: Aptitude & Logical Reasoning

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 and Pre-requisites:** At the end of the course the students will be able to (a) Interpret different data, (b) Establish relationship between numbers & (c) Solve different logical. To impart students with logical skills to solve problems easily.*

UNIT-I

Data sufficiency, Measurement, Time and distance, Arithmetic, Relationship between numbers.

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

UNIT-II

Basic mathematical relations and formula, Computation, Data interpretation.

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

UNIT-III

Differences, Discrimination, Decision-making, Judgment, Problem-solving, Analogies, Analysis.

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

UNIT-IV

Arithmetic reasoning, Relationship concept, Arithmetic number series, Similarities, Verbal and figure classification, Space visualization, Observation.

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

Text Books:

[T1] Arun Sharma, "How to prepare for Logical Reasoning for the CAT".

[T2] A.K. Gupta, "Logical and Analytical Reasoning".

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HUMAN VALUES AND PROFESSIONAL ETHICS
(General Elective-I)

Paper Code: ETVHS-513

Paper : Human Values and Professional Ethics

L	T/P	C
2	0	2

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: *This introductory course input is intended*

- a. *To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.*
- b. *To facilitate the development of a holistic perspective among students towards life, profession and happiness, based on the correct understanding of the Human reality and the rest of the Existence. Such a Holistic perspective forms the basis of value-based living in a natural way.*
- c. *To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behaviour and mutually enriching interaction with Nature.*

UNIT-1: Introduction to Value Education

1. Understanding the need, basic guidelines, content and process for value education.
2. Basic Human Aspirations: Prosperity and happiness
3. Methods to fulfil the human aspirations – understanding and living in harmony at various levels.
4. Practice Session – 1.

[T1], [R1], [R4][No. of Hrs. 07]

UNIT-2: Harmony in the Human Being

1. Co-existence of the sentient "I" and the material body–understanding their needs–Happiness & Conveniences.
2. Understanding the Harmony of "I" with the body–Correct appraisal of physical needs and the meaning of prosperity.
3. Programme to ensure harmony of "I" and Body-Mental and Physical health and happiness.
4. Harmony in family and society: Understanding Human-human relationship in terms of mutual trust and respect.
5. Understanding society and nation as extensions of family and society respectively.
6. Practice Session – 02

[T2], [R1],[R2][No. of Hrs. 08]

UNIT-3: Basics of Professional Ethics

1. **Ethical Human Conduct** – based on acceptance of basic human values.
2. **Humanistic Constitution and universal human order** – skills, sincerity and fidelity.
3. **To identify the scope and characteristics of people** – friendly and eco-friendly production system, Technologies and management systems.
4. Practice Session – 03.

[T1],[R4]][No. of Hrs. 07]

UNIT-4: Professional Ethics in practice

1. **Profession and Professionalism** – Professional Accountability, Roles of a professional, Ethics and image of profession.
2. **Engineering Profession and Ethics** - Technology and society, Ethical obligations of Engineering professionals, Roles of Engineers in industry, society, nation and the world.
3. **Professional Responsibilities** – Collegiality, Loyalty, Confidentiality, Conflict of Interest, Whistle Blowing
4. Practice Session – 04

[T1], [T2], [T3], [R3][No. of Hrs. 08]

Text Books:

- [T1] Professional Ethics, R. Subramanian, Oxford University Press.
 [T2] Professional Ethics & Human Values: Subhash Bhalchandra Gogate, Vikas publication
 [T3] Professional Ethics & Human Values: Prof. D.R. Kiran, TATA Mc Graw Hill Education.

[T4] Professional Ethics & Human Values: S.B. Srivasthva, SciTech Publications (India) Pvt. Ltd. New Delhi.

References:

- [R1] Success Secrets for Engineering Students: Prof. K.V. SubbaRaju, Ph.D., Published by SMART student.
 [R2] Ethics in Engineering Mike W. Martin, Department of Philosophy, Chapman University and Roland Schinzinger, School of Engineering, University of California, Irvine.
 [R3] Human Values: A. N. Tripathy (2003, New Age International Publishers)
 [R4] Value Education website, <http://www.universalhumanvalues.info>[16]
 [R5] Fundamentals of Ethics, Edmond G. Seebauer & Robert L. Barry, Oxford University Press.
 [R6] Human Values and Professional Ethics: R. R. Gaur, R. Sangal and G. P. Bagaria, Eecel Books (2010, New Delhi). Also, the Teachers' Manual by the same author.

***PRACTICAL SESSIONS OF 14 HOME ASSIGNMENTS** will be followed by the students pursuing this paper. (Ref: Professional Ethics & Human Values: S.B. Srivastava, SciTech Publications (India) Pvt. Ltd. New Delhi.)

CONTENT OF PRACTICE SESSION

Module 1: Course Introduction – Needs, Basic Guidelines, Content and Process of Value Education

PS-1: Imagine yourself in detail. What are the goals of your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your achievements and shortcoming in your life? Observe and analyze them.

Expected Outcome:

The students start exploring themselves; get comfortable to each other and to the teacher and start finding the need and relevance for the course.

PS-2: Now a days there is lot of voice about techno-genie maladies such as energy and natural resource depletion, environmental Pollution, Global Warming, Ozone depletion, Deforestation, etc. – all these scenes are man-made problems threatening the survival of life on the earth – what is root cause of these maladies and what is the way out in your opinion?

On the other hand there is rapidly growing danger because of nuclear proliferation, arm race, terrorism, criminalization of politics, large scale corruption, scams, breakdown of relationships, generation gap, depression and suicidal attempts, etc - what do you think the root cause of these threats to human happiness and peace – what could be the way out in your opinion?

Expected Outcome:

The students start finding out that technical education with study of human values can generate more solutions than problems They also start feeling that lack of understanding of human values is the root cause of all the problems and the sustained solution could emerge only through understanding of human values and value based living. Any solutions brought out through fear, temptation or dogma will not be sustainable.

PS-3: 1. Observe that each one of us has Natural Acceptance, based on which one can verify right or not right for him. Verify this in case of following:

- a) What is naturally acceptable to you in relationship – feeling of respect or disrespect?
- b) What is naturally acceptable to you - to nurture or to exploit others? Is your living the same as your natural acceptance or different?

2. Out of three basic requirements for fulfillment of your aspirations, right understanding, relationship and physical facilities, observe how the problems in your family are related to each. Also observe how much time and efforts you devote for each in your daily routine.

Expected Outcome:

1. The students are able to see that verification on the basis of natural acceptance and experiential validation through living is the only way to verify the right or wrong, and referring to any external source life text or instrument or any other person cannot enable them to verify with authenticity, it will only develop assumptions.
2. The students are able to see that their practice in living is not in harmony with their natural acceptance at most of the time, and all they need to do is to refer to their natural acceptance to remove this disharmony.

Scheme and Syllabi for B. Voc. (Power Distribution Management), 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.

- The students are able to see that lack of right understanding leading to lack of relationship is the major cause of the problems in their family and the lack of physical facilities in most of the cases; while they have given higher priority to earning of physical facilities in their life ignoring relationship and not being aware that right understanding is the most important requirement for any human being.

Module 2: Understanding harmony in human being – Harmony in myself!

PS-4: Prepare the list of your desires. Observe whether the desires are related with self “I” or body. If it appears to be related with the both, see which part of it is related to self “I” and which part is related to body.

Expected Outcome:

The students are able to see that they can enlist their desires and the desires are not vague, also they are able to relate their desires to “I” and “body” distinctly. If, any desire appears to be related with both, they are able to see that feeling is related to “I” while the physical facility is related to the body. They are also able to see that “I” and “body” are two realities, and most of their desires are related to “I” and not with the “Body”; while their efforts are mostly connected on the fulfillment of the need of the body assuming that it will meet the needs of “I” too.

PS-5:

- Observe that any physical facilities you use, follows the given sequence with time; Necessary and tasteful – unnecessary & tasteful – unnecessary & tasteless.
 - In contrast, observe that any feelings in you are either naturally acceptable or not acceptable at all. If, naturally acceptable, you want it continuously and if not acceptable, you do not want it at any moment.
- List Down all your activities. Observe whether the activity is of “I” or of “body” or with the participation both “I” and “body”.
- Observe the activities with “I”. Identify the object of your attention for different moments (over a period say 5 to 10 minute) and draw a line diagram connecting these points. Try to observe the link between any two nodes.

Expected Outcome:

- The students are able to see that all physical facilities they use are required for limited time in a limited quantity. Also they are able to see that cause of feeling, they want continuity of the naturally acceptable feelings and they do not want feelings which are not naturally acceptable eve for a single moment.
- The students are able to see that activities like understanding, desires, thoughts and selection are the activities of “I” only; the activities like breathing, palpitation of different parts of the body are fully the activities of the body. With the acceptance of “I”, while activities they do with their sense organs like hearing through ears, seeing through eyes, sensing through touch, tasting through tongue and smelling through nose or the activities they do with their work organs like hands, legs, etc. are such activities that require the participation of both “I” and “body”
- The students become aware of their activities of “I” and start finding their focus of attention at different moments. Also they are able see that most of their desires are coming from outsides (through preconditioning or sensation) and are not based on their natural acceptance.

- PS-6:**
- Chalk out the program to ensure that you are responsible to your body – for the nurturing, protection and right utilization of the body.
 - Find out the plants and shrubs growing in and your campus. Find out their use for curing different diseases.

Expected Outcome:

The students are able to list down activities related to a proper upkeep of the body and practice them in their daily routine. They are also able to appreciate the plants wildly growing in and around the campus which can be beneficial in curing the different diseases.

Module 3: Understanding harmony in the family and society - Harmony in Human – Human relationship

PS-7: Form small groups in the class and in that group initiate the dialogue and ask the eight questions related to trust. The eight questions are-

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S.No.	Intention (Natural Acceptance)	S.No.	Competence
1.a.	Do I want to make myself happy?	1.b.	Am I liable to make myself always Happy?
2.a.	Do I want to make the other happy?	2.b.	Am I liable to make the other always happy?
3.a.	Does the other want to make him happy?	3.b.	Is the other able to make him always happy?
4.a.	Does the other want to make me happy? What is answer?	4.b.	Is the other able to make me always happy? What is answer?

Let each student answer the question for himself and everyone else. Discuss the difference between intention and competence.

Expected Outcome:

The students are able to see that the first four questions are related to our natural acceptance i.e. intention and the next four to our competence. They are able to note that the intention is always correct, only competence is lacking. We generally evaluate ourselves on the basis of our intention and other on the basis of their competence. We seldom look at our competence and other's intention as a result we conclude that I am a good person and other is a bad person.

PS-8:

1. Observe that on how many occasions you are respecting your related ones (by doing the right evaluation) and on how many occasion you are disrespecting by way of under evaluation, over evaluation or otherwise evaluation.
2. Also observe whether your feeling of respect is based on treating the other as yourself or on differentiations based on body, physical facilities or beliefs.

Expected Outcome:

The students are able to see that respect is right evaluation and only right evaluation leads to fulfilment of relationship. Many present problems in the society are an outcome of differentiation (lack of understanding of respect) like gender biasness, generation gap, caste conflicts, class struggle, and domination through poor play, communal violence, and clash of isms and so on so forth.

All these problems can be solved by realizing that the other is like me as he has the same natural acceptance, potential and program to ensure a happy and prosperous life for him and for others though he may have different body, physical facilities or beliefs.

PS-9:

1. Write a note in the form of a story, poem, skit, essay, narration, dialogue, to educate a child.
Evaluate it in a group.
2. Develop three chapters to introduce "social science", its needs, scope and content in the primary education of children.

Expected Outcome:

The students are able to use their creativity for educating children. The students are able to see that they can play a role in providing value education for children. They are able to put in simple words the issues that are essential to understand for children and comprehensible to them. The students are able to develop an outline of holistic model for social science and compare it with the existing model.

Module 4: Understanding harmony in the nature and existence – Whole existence as Co – existence -

PS-10: Prepare the list of units (things) around you. Classify them into four orders. Observe and explain the mutual fulfilment of each unit with other orders.

Expected Outcome:

The students are able to differentiate between the characteristics and activities of different orders and study the mutual fulfilment among them. They are also able to see that human beings are not fulfilling to their orders today and need to take appropriate steps to ensure right participation (in term of nurturing, protection and right utilization) in the nature.

PS-11:

1. Make a chart for the whole existence. List down different courses of studies and relate them to different or levels in the existence.
2. Choose any one subject being taught today. Evaluate and suggest suitable modifications to make it appropriate and holistic.

Expected Outcome:

The students are confident that they can understand the whole existence; nothing is a mystery in this existence. They are also able to see the interconnectedness in the nature, and point out how different courses of study relate to the different units and levels. Also they are liable to make out how these courses can be made appropriate and holistic.

Module 5: Implication of the above Holistic Understanding of Harmony at all Levels of Existence.

PS-12: Choose any two current problem of different kind in the society and suggest how they can be solved on the basis of the natural acceptance of human values. Suggest the steps you will take in present conditions.

Expected Outcome:

The students are liable to present sustainable solutions to the problem in society and nature. They are also able to see that these solutions are practicable and draw road maps to achieve them.

PS-13:

1. Suggest ways in which you can use your knowledge of engineering / technology / management for universal human order from your family to world family.
2. Suggest one format of humanistic constitution at the level of nation from your side.

Expected Outcome:

The students are able to grasp the right utilization of their knowledge in their streams of technology / engineering / management to ensure mutually enriching and recyclable production systems.

PS-14: The course is going to be over now. Evaluate your state before and after the course in terms of-

- Thoughts
- Behaviour
- Work and
- Realization

Do you have any plan to participate in the transition of the society after graduating from the institute? Write a brief note on it.

Expected Outcome:

The students are able to sincerely evaluate the course and share with their friends. They are also able to suggest measures to make the course more effective and relevant. They are also able to make use of their understanding in the course for happy and prosperous society.

PERSONALITY DEVELOPMENT & BEHAVIOURAL SCIENCE
(General Elective-I)

Paper Code: ETVHS-517	L	T/P	C
Paper: Personality Development & Behavioural Science	2	0	2

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 and Pre-requisites:** Students should have studied subjects such as General languages, social studies and Moral education at school level. The objective of this subject is to prepare the students to become a good citizen and a professional useful to the society.*

***Learning Outcomes:** The knowledge of this subject will give the student a value system which will help him in taking decisions in professional and social life for the benefit of society at large.*

UNIT-I

Definition and Basics of Personality, Understanding Traits and Types of Personality, Analyzing strength and weakness (SW), Body Language

[T1, T2][No. of Hrs. 07]**UNIT-II**

Business Etiquettes and Public Speaking: Business Manners. Body Language Gestures, Email and Net Etiquettes, Etiquette of the Written Word, Etiquettes on the Telephone, Handling Business Meetings; Introducing Characteristic, Model Speeches, Role Play on Selected Topics with Case Analysis and Real Life Experiences.

[T1, T2][No. of Hrs. 08]**UNIT-III**

How to Make a Presentation, the Various Presentation Tools, along with Guidelines of Effective Presentation, Boredom Factors in Presentation and How to Overcome them, Interactive Presentation & Presentation as Part of a Job Interview, Art of Effective Listening.

Resume Writing Skills, Guidelines for a Good Resume, How to Face an Interview Board, Proper Body Posture, Importance of Gestures and Steps to Succeed in Interviews. Practice Mock Interview in Classrooms with Presentations on Self; Self Introduction – Highlighting Positive and Negative Traits and Dealing with People with Face to Face.

[T1, T2][No. of Hrs. 08]**UNIT-IV**

Coping Management, Working on Attitudes: Aggressive, Assertive and Submissive Coping with Emotions, Coping with Stress

[T1, T2][No. of Hrs. 07]**Text Books:**

- [T1] McGraw, S. J., (2008), “Basic Managerial Skills for All, Eighth Edition”, Prentice Hall of India.
[T2] The Results-Driven Manager (2005). Business Etiquette for the New Workplace: The Results-Driven Manager Series (Harvard Results Driven Manager)

Reference Books:

- [R1] Pease, A. & Pease, B. (2006)., “The Definitive Book of Body Language”, Bantam Books.
[R2] Scannell, E. & Rickenbacher, C. (2010)., “The Big Book of People Skills Games: Quick, Effective Activities for Making Great Impressions, Boosting Problem-Solving Skills and Improving Customer Service”, McGraw Hill Education

APPLIED MATHEMATICS LAB

Paper Code: ETVAS-557
Paper: Applied Mathematics 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. Curve fitting using Method of Least squares.
2. Solution of algebraic and transcendental equation using Gauss- Seidal's iteration method.
3. Solution of algebraic and transcendental equation using Finite difference method.
4. Numerical integration using Trapezoidal Rule & Simpson's one third rule.
5. Solution of ordinary differential equations using Runge-Kutta method.
6. Calculation of probability using probability distributions.
7. Calculation of correlation coefficient.
8. Calculation of Numerical measures such as mean, variance, Skewness & Kurtosis.
9. Estimation of mean & variance using sampling & Hypothesis.
10. Calculation of Rank Correlation.
11. Analysis of samples using ANOVA.



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APTITUDE & LOGICAL REASONING LAB
(Open Elective-I)

Paper Code: ETVAS-555

Paper: Aptitude & Logical Reasoning 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:

Subject teacher has to proforma at least eight experiments based on the topic mentioned in the theory paper by using software packages.



ELECTRICAL CIRCUIT THEORY LAB**Paper Code: ETVPD-551****Paper: Electrical Circuit Theory 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. Familiarization with various electrical equipments
2. Verification of Kirchoff's laws.
3. To find the equivalent value of resistors connected in parallel.
4. To find the equivalent value of capacitors connected in series.
5. Verifications of Network Theorem- Thevenin Theorems.
6. Verifications of Network Theorem- Superposition Theorems.
7. Power Measurement by Two Wattmeter method to prove sum of two wattmeter reading equals total power.
8. Power measurement by 3 ammeters and 3 voltmeters.
9. Study of resonance.
10. Study of unbalanced circuits using symmetrical components.

Learning Outcome

After doing the course student should have good understanding of current flow and voltage in single phase circuits and associated concepts such as instantaneous voltage, current, waveforms etc. three phase circuits and associated concepts such as line current, phase current, balanced and unbalanced load should be clear to students. Basic understanding of graph theory is also expected.

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ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS LAB**Paper Code: ETVPD-553****L T/P C****Paper: Electrical Measurement & Measuring Instruments 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:

Experiment 1:

Errors in Measurement and Basic Statistical Sampling**OBJECTIVES:**

- a) To investigate sources of error in measurements
- b) To observe the value of statistical analysis

EQUIPMENT & COMPONENTS

- a) 30 composition resistors of the same color-coded value
- b) Digital Multi-meter

Experiment 2

DC Current and Voltage Measurement**OBJECTIVES**

- a) To learn how to measure DC voltages and current through the circuit
- b) To learn how to use multi-meter properly

EQUIPMENT & COMPONENTS

- a) Digital Multi-meter
- b) Analog Multi-meter
- c) DC Power Supply (12 V)
- d) Resistors (100 Ω , 1k Ω , 10k Ω)

Experiment 3

Resistor Characteristics and Ohms Law**OBJECTIVES**

- a) To study characteristics of resistance
- To learn how to use Ohm's Law in circuit analysis.

EQUIPMENT & COMPONENTS

- b) Digital Multimeter
- c) Adjustable DC Power Supply
- d) Potentiometer
- e) Resistors

Experiment 4

Oscilloscope**OBJECTIVES**

- a) To learn how to use oscilloscope properly,
- b) To measure amplitude, frequency and phase angle by using oscilloscope

EQUIPMENT & COMPONENTS

- a) Dual Trace Oscilloscope
- b) Digital Multi-meter
- c) Signal Generator
- d) Resistors
- e) Capacitor

Experiment 5

AC Voltage Measurement**OBJECTIVES**

- a) To learn how to measure AC voltages,
- b) To become familiar with the use of AC voltmeters

EQUIPMENT & COMPONENTS

- a) Dual Trace Oscilloscope
- b) Digital Multi-meter
- c) Analog Multi-meter
- d) Signal Generator

Experiment 6

Measurement Using DC Bridges**OBJECTIVES**

- a) To study resistance measurement techniques using DC Bridge circuits

EQUIPMENT & COMPONENTS

- b) Digital Multi-meter
- c) 12V DC power supply
- d) Potentiometer
- e) Resistors

Experiment 7

Measurement Using AC Bridges**OBJECTIVES**

- a) To study impedance measurement techniques using AC Bridge circuits

EQUIPMENT & COMPONENTS

- a) Digital Multimeter
- b) Signal Generator
- c) Potentiometers
- d) Resistors, Capacitors and Inductors

Experiment 8

Measurement of Semiconductor Devices with Multi-meter**OBJECTIVES**

- a) To learn how to test semiconductor devices by using the multi-meter

EQUIPMENT & COMPONENTS

- a) 1 analog multi-meter
- b) One Digital Multi-meter
- c) 1 P/N Junction diode, 1 NPN BJT

Experiment 9

Thermistor Characteristics and Temperature Controlled Circuits**OBJECTIVES**

- a) To understand the characteristics of a thermistor,
- b) To construct a temperature-controlled switch circuit by using a thermistor

EQUIPMENT & COMPONENTS

- a) Set of thermistor
- b) 1 soldering iron

Experiment 10

Connection and use of Electronic and digital type energy meter in 1-Phase and 3-Phase circuits

Learning Objectives: Students should have developed a good understanding of

1. Concepts of measurement and possible errors
2. Measurement of values for basic electrical elements such as resistance, capacitance and inductance
3. Use of current and potential transformer for measurement purpose
4. Power and energy measurement in electrical circuits.
5. Electronic measurement instruments including use of oscilloscope
6. Various transducers used for measuring non-electrical quantities

INSTALLATION COMMISSIONING AND MAINTENANCE OF ELECTRICAL EQUIPMENT LAB

Paper Code: ETVPD-555	L	T/P	C
Paper: Installation Commissioning and Maintenance of Electrical Equipment 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. Study and handling of tools and accessories for installing heavy equipment's.
2. Testing of electric equipment's before commissioning.
3. Study of commissioning of electrical equipment's.
4. Testing of industrial wiring.
5. Measurement of earth resistance.
6. Testing and maintenance of Batteries.
7. Battery charging by constant current and constant voltage methods.
8. Overhauling of electrical machines/Gadgets.
9. Repair and maintenance of domestic electrical appliances e.g. electric iron, fan, gysar, heat convector, washing machine, room cooler etc.
10. Connection of single phase and three phase motors through appropriate starter and to change their direction on rotation.
11. Study of fire fighting system at VVIP buildings / Projects.

Learning Outcome:

After going through this course, students are expected to have developed a good understanding of installation, commissioning and maintenance related precautions & procedures for Distribution lines, transformers, sub-stations, domestic installations, industrial installations, fire fighting equipments and batteries are core constituent of any power distribution systems. Besides that pupils are also expected to have become familiar with regulatory framework for electrical installations.

Text Books:

[T1] P.P Gupta, "Installation, Commissioning & Maintenance of Electrical Equipment", Dhanpat Rai Publications, New Delhi

**GURU GOBIND SINGH
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VOCATION WORKSHOP-I
(Discipline Specific)

Paper Code: ETVPD-557
Paper: Vocation Workshop-I

L	T/P	C
0	3	3

Pre-requisite: Students should have gone through basic concepts of electrical engineering such as wires, simple electrical circuits and safety procedures to be followed in workshop.

Learning Objectives: Students should have firsthand experience of tools and equipments and procedures practiced in electrical wiring. A good understanding of joints, distribution circuits and domestic wiring should also be imparted. Students are also to be made familiar with fault finding in wiring systems.

UNIT – 1

Introduction of Electrical Accessories & wiring materials used in workshop, Introduction of tools used in electrical workshop, Unsheathing of wire baring & bending ears of solid wires, Study of safety & shock treatments, Soldering of thimbles to standard wiring, Crimping of thimbles.

UNIT – 2

Wire Jointing: Straight married joint, T – joint, Western union joint, Britannia joint, Twist sleeve joint, Botled type joint
Type of wiring & to make different lamp control circuits in following wiring system: Cleat-wiring, Batten wiring, Conduit wiring

UNIT - 3

To make a main distribution board with four outgoing circuits for light & fan loads including main switch & fuses, To make a switch board containing at list two switches for fan regulator & socket, To make an extension board with two 5A sockets & one 15A socket controlled by their respective switches Also to provide a fuse and an indicators

UNIT - 4

Testing of domestic wiring circuit with the help of Meggar, Fault finding and repair of a tube light circuit & CFL, Wiring & testing of alarm and indicating circuits using relay, push button & button & Balls, (Simple single phase circuits)

Learning Objectives: After going through this course in electrical workshop, students should be able to make distribution boards and simple electrical wiring circuits used in electrical installations. Students should be able to make joints and trouble shoot faults in domestic electric installations.

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BASIC PROGRAMMING LAB
(Common to all Disciplines except MC, SD, PT, CT)

Paper Code: ETVCS-559	L	T/P	C
Paper: Basic Programming Lab	0	2	2

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:

Objectives: In order to enable the student's use of computer effectively in problem solving, this course offers the model programming language along with exposure to various application of computer. The knowledge of C language will be reinforced by the practical exercises.

Pre-requisites: Basic understanding about using Computers, using computers.

UNIT-I

Introduction of "C" language- Structure of a "C" program, some simple "C" programs, procedure to execute a "C" program. Data type, constants and variables Character sets, Identifiers and keywords, Date type constants, variables, expression, statement, symbolic constants. Operators and expressions, Arithmetic operators, Relational and logical operators, Unary Operators, Assignment operators, Conditional operators.

[T1, T2][No. of Hrs. 08]

UNIT-II

Data Input and output, Library functions, unformatted input output-getchar, putchar, gets, puts, getch and getche. Formatted input output-Scanf, printf, Control statements and loop structure,

Branching: The if-else statement,

Looping: while, do-while for. Nested control structure. Switch statement. Break. Continue, exit. Comma operator.

Jumping: go to statement,

Function: Inductions to function, need of functions, function definition, function declaration and prototype, passing arguments to function. Passing arguments by value, recursion, Arrays-Introduction to Arrays. array declaration, single and multidimensional array Examples: array order reversal, removal of duplicates from an ordered array, binary search, matrix multiplication.

[T1, T2][No. of Hrs. 08]

UNIT-III

Strings: Introduction to strings, string constants, variables, input, output of string date, standard library string function strlen (), strcat () strcpy () strcmp (),Pointers-Introduction to pointers, address operator and indirection operator, declaring and initialize pointers, pointers in parameter passing, call by reference, pointers and one dimensional array, operation on pointers and one dimensional arrays, dynamic memory location malloc, calloc, structure and unions-Introduction to structure, declaration of structure, accessing structure, members initialization Arrays of structure, user defined data type (typedef), Introduction to unions.

[T1, T2][No. of Hrs. 08]

UNIT-IV

Files-Introduction to file handling-fopen, fclose, fscanf, fprintf, getc, putc Additional feature of c: Enumerations, macro, c pre-processor.

[T1, T2][No. of Hrs. 06]

Text Book(s):

- [T1] Byron C. Gottfried, "Programming with C", McGraw-Hill Education
- [T2] Yashwant Kanetkar, "Let us C", Infinity Science Press, 2008
- [T3] Moolish Cooper, "Sprit of C", Jaico Publishing House
- [T4] Herbert Schildt, "Teach yourself C", Tata Mc Graw hill

Reference Books:

- [R1] Stephen G. Kochan, "Programming in C", Pearson Education
- [R2] Kerning & Ritchie, "C Programming Language", Prentice Hall; 2nd Edition
- [R3] Balaguruswamy, "Ansi C", Tata Mc Graw Hill

Scheme and Syllabi for B. Voc. (Power Distribution Management), 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.

List of Experiments:

1. Programming exercises on executing and editing c programs.
2. Programming exercises on defining variables and assigning values to variables.
3. Programming exercises on arithmetical, relational operators.
4. Programming exercises on arithmetic expression and their evaluation.
5. Programming exercises on formatting input/out using printf and scanf.
6. Programming exercises using if-statement.
7. Programming exercises using if-else statement.
8. Programming exercises on switch statement.
9. Programming exercises on do-while statement.
10. Programming exercises on for statement.
11. Programs on 1 dimensional array.
12. Programs on 2 dimensional arrays.
13. Program on strings (Copying, Concatenation, Compare, Character frequency, string Length Count etc).
14. Simple programs using pointers.
15. Simple programs using structures.
16. Simple programs using files.



**GURU GOBIND SINGH
INDRAPRASTHA
UNIVERSITY**

POWER DISTRIBUTION SYSTEMS

Paper Code: ETVPD-502
Paper: Power Distribution 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 12.5 marks.

Objectives and Pre-requisites:: understanding of electrical circuit theory and electromagnetism

Learning Objectives: This is the one of the core subject for power distribution system, detailing types of power supply arrangements, switchgear & protective circuitry and energy metering. Though this subject does not cover the power distribution at length and depth, but gives enough idea of transformer, power distribution arrangements, distribution lines, switchgears, protections systems, faults and metering in brief.

UNIT – I**Transformer**

(Brief and qualitative study, simple numerical can be given)

Single phase transformers:

Principle of operation, constructional details, operation on no load, Transformer losses, Methods of cooling, Testing of transformers, polarity test, OC test, SC test, efficiency, voltage regulation, effect of load and load power factor, all day efficiency, parallel operation of transformers, Auto transformers, dry type transformers

3-phase transformers

3-phase transformer connections, choice of transformer connections, oscillating neutral, 3-phase bank of single-phase transformers, Parallel operation of 3- phase transformers, Tap changing transformers, no load tap changing, on load tap changing

[T1, T2][No. of Hrs. 11]**UNIT – II****Various Distribution Systems – Configuration**

(Only brief and qualitative study)

DC 2 wire system, DC 3 wire system, AC single phase 2 wire system, AC three phase 3 wire and 4 wire systems, Primary and secondary distribution, Feeder loading, voltage drop in feeder lines, Ring and radial system, voltage drop with underground cable system, power loss estimation in distribution systems, power factor improvement using capacitors, optimum power factor for distribution systems.

[T1, T2][No. of Hrs. 11]**UNIT – III****Distribution system – Construction**

(Only brief and qualitative study, no numerical)

Layout of HT and LT distribution system: Constructional feature of distribution lines and their erection. LT feeder, distribution and service mains, AC distributor fed at one end and determination of size of conductor Construction of LT and HT underground power cable laying of cables, different methods, comparison of overhead and underground distribution systems

Estimation of LT and HT overhead distribution lines

Substations:

Brief idea of substations; grid sub-station 220/132KV, outdoor power substations, indoor and pole mounted substations

Layout of 33/11 KV distributions substation and various accessories and equipment's

Estimation of 11 KV/440 V pole mounted substation

[T1, T2][No. of Hrs. 11]**UNIT – IV****Switchgear and protection in distribution system**

Circuit Breakers, Fuses, Relays, Relaying schemes, installation, operation & Maintenance, auxiliaries

Faults: Common type of faults in lines, Location and testing of faults in underground cables

Power Factor: Causes and disadvantages of low power factor, Economics of power factor improvements, Methods of improving power factor

\Distribution Metering & Efficient Energy Management : Various components of tariff , Brief introduction to various types of energy meters, Detection of theft/tempering, unauthorized loads, IE rules & DERC norms regarding distribution system performance.

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

Learning Outcome:

After going through this course, students should have understanding of transformer, power distribution arrangements, distribution lines, switchgears, protections systems, faults and metering in brief.

Text Books:

- [T1] “Electric Power Distribution system, Engineering” – by Turan Gonen, Mc Graw-Hill Book Company
 [T2] ‘Electric Power Distribution’ by Amarjit Singh Pabla; McGraw Hill Education (India) Private Limited, New Delhi

Reference Book:

- [R1] ‘Electrical Distribution Systems’ by Dale R Patrick & Stephen W Fardo; Special Indian Edition, CRC Press, Taylor & Francis Group
 [R2] Electrical Power Distribution and Automation by S.Sivanagaraju, V.Sankar, Dhanpat Rai & Co, 2006
 [R3] Electrical Power Distribution Systems by V.Kamaraju, Right Publishers



INDUSTRIAL ELECTRONICS

Paper Code: ETVPD-504
Paper: Industrial Electronics

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.

***Pre-Requisite:** Understanding of basic semiconductor physics*

***Learning Objectives:** Power distribution involves use of inverters and converters at many stages of power distribution. So understanding functioning of inverters and converters becomes very much required for technical personnel in power distribution companies. It is not only in load flow but in utilities also, that inverters and converters are used now-a-days. This course is designed with details of converters and inverters functioning.*

UNIT-I

PN Junction, Diode, V- I characteristics of P-N junction diode, Need of rectifier, Types of rectifier, half wave rectifier, Full wave rectifier (Bridge and Centre tapped), IP /OP waveforms for voltage and current, concept of filters; PNP & NPN junction transistors, Transistor as a switch; Introduction to FET, MOSFET, IGBT, SCR, Voltage regulating ICs and , DC power supply block.

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

Phase-Controlled Converters: Conversion of 1-Phase and 3-Phase power to DC, Basic concept of 2-pulse, 3-pulse and 6-pulse converters

DC To DC Converter: Working principle and circuit diagram of Step-down & step-up choppers, Time ratio control and current limit control, Basic concept of SMPS

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

Inverters: Working principle and circuit diagram of Single phase and three phase inverters, PWM technique, Sinusoidal PWM

AC To AC Converters: Working principle and circuit diagram of Single phase AC voltage controllers. Working principle and circuit diagram of Single and Three Phase Cyclo-Converters

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

Number systems; Binary and Hexadecimal number, Decimal to binary and vice versa; Basic concept of logic gates, Boolean algebra and K map; Definition of SSI, MSI, LSI, VLSI, Basics of DTL, TTL, C-MOS

Introduction to latches, Flip Flops, register and counters, Idea of volatile and non – volatile memories, Basic concept of RAM, ROM, PROM, EROM and EPROM, Brief idea of A/D and D/A converters and their applications, Basic idea of Microprocessor. (Only introductory concepts are to taught in brief)

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

- [T1] S.K. Bhattacharya, S Chatterjee; “Industrial Electronics and Control”, Tata McGraw Hill Education Private Limited, New Delhi

POWER DISTRIBUTION SYSTEMS AUTOMATION**Paper Code: ETVPD-506****L T/P C****Paper: Power Distribution Systems Automation****2 0 2****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.

*Pre-Requisite: Basic knowledge of electrical power distribution systems***Learning Objectives:**

- ❖ To gain the awareness of the problems and challenges of the existing distribution system
- ❖ To understand the need for Distribution Automation (DA) and appreciate its role in overcoming existing problems of distribution system
- ❖ To gain the knowledge of various aspects of Distribution Automation (SCADA, Substation/ Feeder Automation, Remote Metering)
- ❖ To attain the knowledge of Demand Side Management and appreciate its role in improving performance of Demand Side Management.

UNIT-I

Distribution System Planning And Automation: Basic Distribution Systems, Short-Term Load Forecasting, Long-Term Energy Forecasting, Technological Forecasting, Problems of existing Distribution System, Need for Distribution Automation, Characteristics of Distribution System, Distribution Automation (Objectives, Functions, Benefits), Feeder Automation, Communication Requirements for DA, Remote Terminal Unit (RTU), Communication Technologies for DA.

[T1, T2][No. of Hrs. 08]**UNIT-II**

SCADA System: Introduction, Block Diagram, Components of SCADA, Functions of SCADA, SCADA applied to Distribution Automation, Advantages of DA through SCADA, Requirements and Feasibility, DA Integration Mechanisms, Communication Protocols in SCADA Systems.

[T1, T2][No. of Hrs. 07]**UNIT-III**

Substation Automation: Introduction, Definition of Substation Automation, Functions of Substation Automation System, State and Trends of Substation Automation, Intelligent Affordable Substation Monitoring and Control, Advantages of an EEM (Enterprise Energy Management) Substation Automation Solution.

[T1, T2][No. of Hrs. 08]**UNIT-IV**

Feeder Automation: Losses in Distribution Systems, System Losses and Loss Reduction, Network Reconfiguration, Improvement in Voltage Profile, Capacitor Placement in Distribution System for Reactive Power Compensation

[T1, T2][No. of Hrs. 07]**Learning Outcomes:**

- ❖ To be able to select appropriate Communication Technology for DA
- ❖ To be able to reduce loss and improve voltage profile using DA
- ❖ To be able to implement DSM

Text Books:

- [T1] Dr M K Khedkar and Dr G M Dhole, "A Textbook of Electric Power Distribution Automation", University Science Press (Laxmi Publications Pvt. Ltd.), 2011
- [T2] James Northcote-Green, Robert Wilson, "Control and Automation of Electrical Power Distribution Systems" CRC Press, Taylor and Francis Group, 607

References Books:

- [R1] D. Bassett, K. Clinard, J. Grainger, S. Purucker, and D. Ward, "Tutorial Course: Distribution Automation", IEEE Tutorial Publication 88EH0280-8-PWR, 1988.

ENVIRONMENTAL SCIENCE
(Common To All Disciplines)

Paper Code: ETVEN-502
Paper: Environmental Science

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 this course is to make students environment conscious. They will be exposed through the fundamental concepts of environment and ecosystem so that they can appreciate the importance of individual and collective efforts to preserve and protect our environment. This course must raise various questions in student's mind that how our environment is inter dependent on various factors and how human being must care for their natural surroundings.*

UNIT-I

Environmental Studies: Ecosystems, Bio-diversity and its Conservation

(i) The Multidisciplinary Nature of Environmental Studies

Definition, scope and importance of Environmental Studies, Biotic and a biotic component of environment, need for environmental awareness.

(ii) Ecosystems

Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in the ecosystem, ecological succession, food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structures and function of the following ecosystem:

- (a) Forest ecosystem
- (b) Grassland ecosystem
- (c) Desert ecosystem
- (d) Aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries).

(iii) Bio-diversity and its Conservation

Introduction to biodiversity - definition: genetic, species and ecosystem diversity, Bio-geographical classification of India, Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, national and local levels, India as a mega-diversity nation, Hot-spots of biodiversity, Threats to biodiversity : Habitat loss, Poaching of wildlife, man-wildlife conflicts, rare endangered and threatened species (RET) endemic species of India, method of biodiversity conservation: *In-situ* and *ex-situ* conservation.

[T1], [R3] [No. of hrs. 11]

UNIT-II

Natural Resources: problems and prospects

Renewable and Non-renewable Natural Resources; Concept and definition of Natural Resources and need for their management

- *Forest resources:* Use and over-exploitation, deforestation, case studies, timber extraction, mining, dams and their effects on forests and tribal people.
- *Water resources:* Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems, Water conservation, rain water harvesting, watershed management.
- *Mineral resources:* Uses are exploitation, environmental effects of extracting and using mineral resources, case studies.
- *Food resources:* World food problems, changes causes by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- *Energy resources:* Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Urban problems related to energy, case studies.
- *Land resources:* Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

[T1], [R3] [No. of hrs. 11]

UNIT-III**Environmental Chemistry and Pollution Control****(i) Chemistry of Environment**

(a) *Green Technology*: Principles of Green technology, Zero Waste Technology, Green Chemistry & Its basic principles, Atom Economy, Green Methodologies, clean development mechanisms (CDM), concept of environmental impact assessment,

(b) *Eco-Friendly polymers*: Environmental degradation of polymers, Biodegradable, Photo-biodegradable polymers, Hydrolysis & Hydrobiodegradable, Biopolymers & Bioplastics: polylactic acid, polyhydroxybutyrate, polycaprolactone,. Concept of bioremediation.

(ii) Environmental Pollution

Definition, types, causes, effects and control measures of (a) Air pollution, (b) Water pollution, (c) Soil pollution, (d) Marine pollution, (e) Noise pollution, (f) Thermal pollution, (g) Nuclear hazards. Pollution case studies. Solid waste and its management: causes, effects and control measures of urban and industrial waste.

Chemical toxicology-Terms related to toxicity, impact of chemicals (Hg, As, Cd, Cr, Pb) on environment.

[T1], [R3] [No. of hrs. 11]

UNIT-IV**Disaster Management, Social Issues, Human Population and the Environment****(i) Disaster Management**

Disaster management: floods, earthquake, cyclone and land-slides, nuclear accidents and holocaust, *case studies*.

(ii) Social Issues, Human Population and the Environment

Sustainable development, Climate change, global warming, acid rain, ozone layer depletion, Environmental ethics: Issues and possible solutions, Consumerism and waste products, Wasteland reclamation. Population growth, problems of urbanization, Environment Protection Act, 1986; Air (Prevention and Control of Pollution) Act, 1981; Water (Prevention and

Control of Pollution) Act, 1974; Wildlife Protection Act, 1972; Forest Conservation Act, 1980; Environmental management, system standards-ISO 14000 series.

[T1] [No. of hrs. 12]

Text Book(s):

[T1] E. Barucha, Textbook of Environmental Studies for Undergraduate Courses, Universities Press (India) Pvt. Ltd., 2005.

[T2] S. Chawla, A Textbook of Environmental Studies, McGraw Hill Education Private Limited, 2012

References Books:

[R1] G. T. Miller, Environmental Science, Thomas Learning, 2012

[R2] W. Cunningham and M. A. Cunningham, Principles of Environment Science: Enquiry and Applications, Tata McGraw Hill Publication, N. Delhi, 2003.

[R3] R. Rajagopalan, Environmental Studies: From Crisis to Cure, 2nd Edition, Oxford University Press, 2011.

[R4] A.K. De, Environmental Chemistry, New Age Int. Publ. 2012,.,

[R5] A. Kaushik and C.P. Kaushik, Perspectives in Environment Studies, 4th Edition, New Age International Publishers, 2013

[R6] Environmental Engineering by Gerard Kiely, Tata McGraw-Hill Publishing Company Ltd. New Delhi, 2010.

ELECTRICAL ENGINEERING MATERIALS**Paper Code: ETVPD-508****Paper: Electrical Engineering Materials**

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.

Pre-Requisite: Basic concepts of matter, molecules, atomic structure along with electrostatics and electromagnetism

Learning Objective: Technical personnel in Power Distribution Companies have to deal with conductors, insulators and semiconductors on regular basis, as electrical installations consist of these at large. Fire fighting equipments and die-electrics are also used frequently in substations. Understanding various properties of these materials becomes necessary for technical personnel in supervisory and managerial level. This course is aimed at making students understand properties of these materials.

UNIT – I

Classification of electrical engineering materials, Properties of conductors, characteristics of a good conductor material, commonly used conductor materials, Electrical and mechanical properties of conductor materials for O/H lines and U/G cable – Trade names of conductors used for O/H lines. Conductor materials used for electric machine winding, Properties and applications of important resistor materials, Super conductivity

[T1, T2][No. of Hrs. 11]**UNIT – II**

Semiconductors, Types of semi conductors commonly used, Application of semiconductor materials, Simple idea and applications of thermistors, photoconductive cells, photovoltaic cells, varistors, LCD, LDR and strain-gauges, Merits of semiconductor materials used in Electrical Industry, Working principle and applications of Hall-Effect Generators and Piezo-electric materials

[T1, T2][No. of Hrs. 11]**UNIT – III****Magnetic materials:**

Soft and hard magnetic materials, Classification of magnetic materials according to relative permeability, Magnetization curve, Hysteresis and hysteresis loop – hysteresis loss, magnetostriction, Effects of impurities on Ferromagnetic materials, Low carbon electrical steel;

Special purpose materials:

- i. Properties and uses of materials for fuse, soldering, Contacts, fluorescence, carbon brushes, graphite brushes
- ii. Galvanization, Annealing, Vulcanizing and stranding

III. Dielectric Materials:**[T1, T2][No. of Hrs. 11].****UNIT – IV**

Insulating Materials: General properties of insulating materials, Effects of various factors on insulation resistance, Table of General classification of insulating materials: Fibrous Insulating materials - Impregnating, coating, filling and bonding materials, Broad classification of ceramics used in electrical engineering, Porcelain, Factors affecting ceramics, Applications of Mica products and glass in electrical engineering.

Insulating Resins, Coolants (Hydrogen cooling) in Electrical machinery, Properties and applications of Hydrogen, SF₆ and mineral oils in Electrical machines

[T1, T2][No. of Hrs. 12].**Learning Outcome:**

After going through this course, students should be able to answer various properties of

1. Electrical conducting material
2. Electrical insulating material
3. Semiconductor materials
4. Die-electrics materials
5. Materials used for fire-fighting
6. Magnetic materials

Text Book(s):

- [T1] Electrical and Electronics Engineering Materials and Components by S.K. Bhattacharya, Khanna Publishers, New delhi
- [T2] R K Shukla, Archana Singh, "Electrical Engineering Material", Tata McGraw Hill Education Private Limited, New Delhi

Reference Book(s):

- [R1] C S Indulkar & S Thiruvengadam, "Introduction to Electrical Engineering Material", S Chand & Co., India
- [R2] A J Dekker, "Electrical Engineering Material", Prentice Hall of India
- [R3] L Solymar & D Walsh, "Electrical Properties of Materials", South Asia Edition, Oxford University Press



BASIC ELECTRONICS
(Open Elective-II)

Paper Code: ETVEC-506
Paper: Basic Electronics

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: Objective of the paper is to facilitate the student with the basics of electronic aspects that are required for his understanding and applications in their respective field of study. The pre-requisites are, to have a basic understanding of Applied Physics and Mathematics.

UNIT-I

Evaluation of Electronics: Introduction & Application Of Electronics, Energy Band Theory Of Crystals, Energy Band Structures In Metals, Semiconductors And Insulators, Theory Of Semiconductors: Classification Of Semiconductors, Conductivity Of Semiconductors, Carrier Concentration In Intrinsic & Extrinsic Semiconductors, Properties Of Intrinsic And Extrinsic Semiconductors, Variation In Semiconductors Parameters With Temperature, Fermi-Dirac Function, Fermi Level In A Semiconductor Having Impurities, Band Structure Of Open-Circuited P-N Junction, Drift And Diffusion Currents, Carrier Life Time, Continuity Equation (Elementary Treatment Only).

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

UNIT-II

Theory of p-n Junction Diode: Diode Current Equation, Diode Resistance, Transition Capacitance, Diffusion Capacitance, (Elementary treatment only), Effect of Temperature on p-n Junction Diode, Switching Characteristics, Piecewise Linear Model,

Special Diodes: Zener Diode, Varactor Diode, Tunnel Diode, Photodiode, Light Emitting Diodes, Schottky Barrier Diode,

Applications of Diodes: Half-Wave Diode Rectifier, Full-Wave Rectifier, Clippers and Clampers (Elementary treatment only).

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

UNIT-III

Bipolar Junction Transistor: Introduction of transistor, construction, transistor operations, BJT characteristics, load line, operating point, leakage currents, saturation and cut off mode of operations, Eber-moll's model.

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

UNIT-IV

Application of BJT: CB, CE, CC configurations, hybrid model for transistor at low frequencies, Introduction to FETs and MOSFETs.

Fundamentals of Digital Electronics: Digital and analog signals, number systems, Boolean algebra, logic gates with simple applications, logic gates, karnaugh maps.

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

Text Book(s):

- [T1] S. Salivahanan, N. Suresh Kr. & A. Vallavaraj, "Electronic Devices & Circuit", Tata McGraw Hill, 2008
- [T2] Millman, Halkias and Jit, "Electronic Devices and Circuits" McGraw Hill
- [T3] Boylestad & Nashelsky, "Electronic Devices & Circuits", Pearson Education, 10th Edition.

Reference Book(s):

- [R1] Sedra & Smith, "Micro Electronic Circuits" Oxford University Press, VIth Edition
- [R2] Robert T. Paynter, "Introducing Electronic Devices & Circuits", Pearson Education, VIIth Edition, 2006

POWER DISTRIBUTION SYSTEMS LAB**Paper Code: ETVPD-552****L T/P C****Paper: Power Distribution Systems 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. Visiting a three phase distribution transformer installed in residential/commercial/industrial establishment. Identifying various components, specifications and cooling method, mounting and protection system for it.
2. Prepare a report on various counts (voltage level, conductor, overhead/underground, protection system etc.) for distribution system in practice by visiting
 - i. A residential area
 - ii. Commercial establishment
 - iii. Railway / Metro Rail network
 - iv. Industrial establishment
3. Preparing a report on various counts for LT substation supplying power in a residential locality
4. Power Factor Considerations
 - a. Making calculations for economic consideration towards low power factor at consumer end
 - b. Visiting a arrangement of power factor improvement in any commercial/institutional/industrial establishment
5. Connecting energy meter in the circuit and performing measurement
 - a. Electromechanical type energy meter
 - b. Electronic type energy meter
 - c. Digital display type energy meter
6. To Study various types of protective relays in lab / substations during visit
[IDMT Over current relay, Percentage Differential Relay, Instantaneous relay, Thermal Relay & Fuse, Earth fault relay or over current relay, Over Voltage Relay and Under Voltage Relay, other relays currently in practice in power distribution systems)
7. To study various circuit breakers (mainly SF6 Type) in lab / substation during visit / other electrical installations
8. To study various protective systems for distribution transformers in lab / substation during visit / other electrical installations

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UNIVERSITY

INDUSTRIAL ELECTRONICS LAB

Paper Code: ETVPD-554
Paper: Industrial Electronics 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. Familiarization with Diode and plotting basic characteristics of it.
2. Making of basic rectifier circuit and observing output using CRO
3. Familiarization with BJT and using NPN transistor with basic biasing circuit
4. Familiarization with MOSFET and IGBT and studying its operation, characteristics and safety precaution while using it
5. Study of Cyclo-Converters and its applications
6. Study of inverters and its applications in power distribution sector
7. Study of converters and its application in Power Distribution sector
8. Study of SMPS and its application as power supply in control circuits

Learning Outcome:

Students should have developed good understanding of circuit diagram, functioning and applications of inverters, converters, cyclo-converters as well as choppers.



**GURU GOBIND SINGH
 INDRAPRASTHA
 UNIVERSITY**

ENVIRONMENTAL SCIENCE LAB/ FIELD WORK
(Common to All Disciplines)

Paper Code: ETVEN-552	L	T/P	C
Paper: Environmental Science Lab/ Field Work	0	2	2

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. Determination of pH, conductivity and turbidity in drinking water sample.
2. Determination of pH and conductivity of soil/sludge samples.
3. Determination of moisture content of soil sample.
4. Determination of Total Dissolved Solids (TDS) of water sample.
5. Determination of dissolved oxygen (DO) in the water sample.
6. Determination of Biological oxygen demand (BOD) in the water sample.
7. Determination of Chemical oxygen demand (COD) in the water sample.
8. Determination of Residual Chlorine in the water sample.
9. Determination of ammonia in the water sample.
10. Determination of carbon dioxide in the water sample.
11. Determination of nitrate ions or sulphate ions in water using spectrophotometer.
12. Determination of the molecular weight of polystyrene sample using viscometer method.
13. Base catalyzed aldol condensation by Green Methodology.
14. Acetylation of primary amines using eco-friendly method.
15. To determine the concentration of particulate matter in the ambient air using High Volume Sampler.

P.S.: For better understanding of various aspects of environment visits to local areas, depending upon easy access and importance may be planned to any nearby river, forest, grassland, hills and students should write a report based on their observations.

Suggested Books:

- [T1] [A. I. Vogel, G. H. Jeffery](#), *Vogel's Text Book of Quantitative Chemical Analysis*, Published by Longman Scientific & Technical, 5th Edition, 1989.
- [T2] dst.gov.in/green-chem.pdf (monograph of green chemistry laboratory experiments).
- [T3] S. Chawla, *Essentials of Experimental Engineering Chemistry*, Dhanpat Rai & Co., 3rd Edition, 2008.
- [T4] S. Rattan, *Experiments in Applied Chemistry*, Published by S.K.Kataria & Sons, 2nd Edition, 2003.
- [T5] W. Cunningham and M. A. Cunningham, *Principles of Environment Science: Enquiry and Applications*, Tata McGraw Hill Publication, N. Delhi, 2003.
- [T6] A. Kaushik and C. P. Kaushik, *Perspectives in Environment Studies*, 4th Edition, New Age International Publishers, 2013.

Note:- Any 10-12 Experiments out of the list may be chosen.

CADD (ELECTRICAL) LAB

Paper Code: ETVPD-556
Paper: CADD (Electrical) Lab

L	T/P	C
0	2	2

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:

Pre-Requisite: understanding of basic concepts of electrical engineering elements and circuits.

Learning Objective: Power distribution companies have to expand their distribution network, which involves creating new substations, distribution lines and other electrical installations. CADD software is extensively used for designing and drawing electrical installations now days. This course is aimed at grooming trainees with basic CADD capabilities.

UNIT – I**10 Periods**

CADD: Introduction to Electrical CAD interface, Electrical Components and Wires, Design Methodologies, Project Files, Accessing Project Files, Add a Drawing to a Project File, Managing Drawings in Projects, Project Manager Drawing List

Schematics I: Single Wires/Components, Referencing, Ladders, Insert Wires, Edit Wires, 3- Phase Components, Source & Destination Signal Arrows, Insert Component, Parent/Child Components

Schematics II: Multi-wire and Circuits, Dashed Link Lines, 3-Phase Ladders

UNIT – II**06 Periods**

Circuits and Cables: Cable Markers, Fan In/Out, Insert Saved Circuits, Save Circuits to Icon Menu, Circuit Clipboard, Circuit Builder, Copy Component, Align, Delete Component, Attribute Editing Commands

UNIT – III**10 Periods**

Panels: Panel Drawings, Insert Footprint (Icon Menu), Insert Footprint (Schematic List), Insert Component (Panel List), Edit Footprint, Assign Item Numbers, Insert Jumpers, Terminal Strip Editor, PLC Symbols, Insert PLC (Parametric), Insert PLC (Full Units), Insert Individual PLC I/O Points

UNIT – IV**14 periods**

Wiring: Point-to-Point Wiring Drawings, Insert Connectors, Edit Connectors, Schematic Symbols, Naming Convention, Icon Menu Wizard

Database and Plotting: AutoCAD Electrical Databases, Project Database, Catalogue Database, Footprint Lookup Database, PLC Database, Plot Project, Export to Spreadsheet, Update from Spreadsheet, Copy Project, Verify Drawings.

Learning Outcome: trainees should develop reasonably good understanding of drawing electrical circuit schematic using CADD software and basic concepts of electrical installations' design

VOCATION WORKSHOP-II**Paper Code: ETVPD-562****Paper: Vocation Workshop-II**

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:

Pre-Requisite: Basic understanding of mechanical workshop practices and electrical engineering concepts

Learning Objectives:

Star-Delta starters and Contactor control circuits are used very frequently in power distribution systems. Earthing of electrical installations is also a mandatory requirement for electrical installations. Power Cable Jointing and fault finding in power distribution systems are frequently occurring incidence. This course is designed to give first hand experience to pupils in these topics.

UNIT 1:

Wiring, Testing & Faults – detecting of the following contractor control circuits operating on 3-phase supply, Remote control circuits, Time delay circuits, Inter locking circuits, Sequential operation control circuits

UNIT 2: - To carry Out – Pipe Earthing for a small house or a small 3 – phase motor, Installation -of a 3-phase motor with main switch & starter; dismantling, assembling & repair of DOL starter & star delta starter

UNIT 3

Fault Finding- in single phase & three phase circuits, use of various types of motors & their rectification, fault finding in service line, connecting and reading electronic type energy meters.

UNIT 4

Power cable – jointing (Demonstration, if Kit not available), Laying of-under-ground cable (Demonstration), testing of power cables (Demonstration)

Learning Objectives:

After going through this course students should be able to

1. Construct Star-Delta starters, their wiring and fault finding.
2. Construct various types of Contactor control circuits
3. Make Earthing of electrical installations
4. Practice Power Cable Jointing and fault finding in power distribution systems