For Batch 2016-17 Onwards
SCHEME OF EXAMINATION

for

BACHELOR OF VOCATION

In

(POWER DISTRIBUTION MANAGEMENT)

5th SEMESTER and 6th SEMESTER

Offered by

University School of Information, Communication & Technology

GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY

Guru Gobind Singh Indraprastha University
Dwarka, Delhi – 110078 [INDIA]
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The Scheme and Syllabus for B.Voc (Power Distribution Management)(3rd Year) has been approved in 45th BOS Meeting of USICT held on 16th March, 2017 and 43rd Academic Council Meeting held on 25th May, 2017. The Scheme and Syllabus is applicable for the batch admitted in the Academic Session 2016-17 onwards, w.e.f., 1st August, 2018.

NOMENCLATURE OF CODES GIVEN IN THE SCHEME OF B.VOC

1. **ET** stands for Engineering and Technology.
2. **V** stands for Vocation.
3. **MC** stands for Mobile Communication.
4. **SD** stands for Software Development.
5. **AE** stands for Automobile.
6. **CE** stands for Consumer Electronics.
7. **PT** stands for Printing Technology.
8. **CT** stands for Construction Technology.
9. **RA** stands for Refrigeration & Air-Conditioning.
10. **PD** stands for Power Distribution Management.
11. **ID** stands for Interior Design.
12. **AA** stands for Applied Arts.
13. **CS** stands for Computer Science.
14. **MS** stands for Management Studies.
15. **EN** stands for Environmental Engineering
16. **PH** stands for Physics
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 Practicals.
22. **S/D** stands for Drawing/Studio
23. **P/D** stands for Practical/Drawing

BACHELOR OF VOCATION
(POWER DISTRIBUTION MANAGEMENT)
FIFTH SEMESTER EXAMINATION
(LEVEL-VII)

Paper Code	Paper ID	Paper	L	T/P	Credits
THEORY PAPERS					
ETVHS-701		Technical English (Common to all disciplines)	3	0	3
ETVPD-701		Smart Grid	3	0	3
CORE ELECTIVE-II (Select any one)					
ETVPD-703		Economics of Power Distribution	3	0	3
ETVPD-705		Metering and Loss Reduction in Power Distribution	3	0	3
ETVPD-707		Rural Electrification	3	0	3
ETVPD-709		Restructured Power System	3	0	3
CORE ELECTIVE-III (Select any one)					
ETVPD-711		IT Applications in Power Distribution Sector	3	0	3
ETVPD-713		Disaster Management and Capacity Building in Power Distribution Sector	3	0	3
ETVPD-715		Management of Power Distribution	3	0	3
GENERAL ELECTIVE-II (Select any one)*					
ETVSS-751		NCC	0	2	1
ETVSS-753		NSS	0	2	1
ETVSS-755		Sports	0	2	1
ETVSS-757		Community Services	0	2	1
ETVSS-759		ECO Club	0	2	1
ETVSS-761		YOGA	0	2	1
PRACTICAL/VIVA VOCE (Select any one Lab based on CORE ELECTIVE-II)					
ETVPD-753		Economics of Power Distribution Lab	0	3	3
ETVPD-755		Metering and Loss Reduction in Power Distribution Lab	0	3	3
ETVPD-757		Rural Electrification Lab	0	3	3
ETVPD-759		Restructured Power System Lab	0	3	3
PRACTICAL/VIVA VOCE (Select any one Lab based on CORE ELECTIVE-III)					
ETVPD-761		IT Applications in Power Distribution Sector Lab	0	3	3
ETVPD-763		Disaster Management and Capacity Building in Power Distribution Sector Lab	0	3	3
ETVPD-765		Management of Power Distribution Lab	0	3	3
PRACTICAL/VIVA VOCE					
ETVHS-751		Language Lab (Common to all disciplines)	0	3	3
ETVPD-767		Minor Project	0	8	4
ETVPD-769		Industrial Training-IV	0	2	4
TOTAL			**12**	**21**	**30**

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.

***Non University Examination System (NUES)**

BACHELOR OF VOCATION
(POWER DISTRIBUTION MANAGEMENT)
SIXTH SEMESTER EXAMINATION
(LEVEL-VII)

Paper Code	Paper ID	Paper	L	T/P	Credits
THEORY PAPERS					
ETVPD-702		Power Quality	3	0	3
ETVPD-704		Talent Management	3	0	3
CORE ELECTIVE-IV (Select any one)					
ETVPD-706		Project Management and Contract Administration in Power Distribution Sector	3	0	3
ETVPD-708		Project Planning in Power Distribution Sector	3	0	3
ETVPD-710		Commercial Aspects in Power Distribution Sector	3	0	3
CORE ELECTIVE-V (Select any one)					
ETVPD-712		Regulatory Framework for Indian Power Sector and Legal Issues	3	0	3
ETVPD-714		Indian Power Sector and Challenges Ahead	3	0	3
ETVPD-716		Power Distribution Sector and Challenges Ahead	3	0	3
PRACTICAL/VIVA VOCE (Select any one Lab based on CORE ELECTIVE-IV)					
ETVPD-756		Project Management and Contract Administration in Power Distribution Sector Lab	0	3	3
ETVPD-758		Project Planning in Power Distribution Sector Lab	0	3	3
ETVPD-760		Commercial Aspects in Power Distribution Sector Lab	0	3	3
PRACTICAL/VIVA VOCE					
ETVPD-752		Power Quality Lab	0	2	2
ETVPD-762		Industrial Training-V	0	2	4
ETVPD-764		Major Project#*	0	24	12
TOTAL			**12**	**31**	**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.

#*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. Seminar related to major project should be delivered one month after staring of Semester. The progress will be monitored through seminars and progress reports. ***The students may be allowed to do Industrial Major Project on-site during 5 days in a week and class work should be completed in 2 working days in the respective institution. If in case, the classes are held during Saturday /Sunday then faculty should be given off in lieu of Saturday/Sunday.***

For Award of Diploma:

1. The total number of the credits of the Diploma (PDM) Programme = 65.
2. Student shall be required to appear in examinations of all courses. However, to award the Diploma (PDM) a student shall be required to earn a minimum of 60 credits.

For Award of Advanced Diploma:

1. The total number of the credits of the Advance Diploma (PDM) Programme = 129.
2. Student shall be required to appear in examinations of all courses. However, to award the Advanced Diploma (PDM) a student shall be required to earn a minimum of 120 credits.

For Award of B. Voc Degree:

1. The total number of the credits of the B. Voc. (PDM) Programme = 192.
2. Student shall be required to appear in examinations of all courses. However, to award the degree B.Voc (PDM) a student shall be required to earn a minimum of 180 credits.

TECHNICAL ENGLISH
(Common to all Disciplines)

	L	T/P	C
Paper Code: ETVHS-701			
Paper: Technical English	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **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:

- *To equip students to recognize, explain, and use the rhetorical strategies and the formal elements of specific genres of technical communication, such as technical abstracts, data based research reports, instructional manuals, technical descriptions etc.*
- *To help students understand the process of collection, analysis, documentation, and reporting of research clearly, concisely, logically, and ethically and understand the standards for legitimate interpretations of research data within scientific and technical communities.*
- *To initiate students into critical and creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information towards meaningful and effective communication*
- *To help students understand ethical considerations in technical and professional writing, realizing the consequences of various communication acts.*

Learning Outcomes: *Upon successful completion of the course the student shall be able to:*

- *Understand and demonstrate composing processes through invention, organization, drafting, revision, editing, and presentation as evidenced in satisfactory completion of all the written, visual, web-based, and oral discourses to be submitted in this course.*
- *To recognize and use the rhetorical and stylistic elements necessary for the successful practice of scientific and technical communication;*
- *Create various products most frequently used in scientific and technical communication.*
- *Develop ethical problem-solving communication skills in professional situations.*

UNIT-I

Technical Writing: Definition, Purpose and Characteristics of Technical Writing.
Technical Writing Skills: Methods and means of the Pre-writing stage, the Writing Stage and the Post-writing Stage.

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

UNIT-II

Formal Formatting: Arrangement of Formal Elements, Front Material, Format Devices in the Body of Formal Report-Heading, Pagination, End Material – Citations, References and Bibliography, Appendix.

[T1, T2][No. of Hrs. 10]

UNIT-III

Writing and Designing for Electronic Media: Use of Internet as a Writing tool; designing and writing for multimedia applications and the World Wide Web.

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

UNIT-IV

Research and Writing Ethics: Explaining Forms and Consequences of Plagiarism, Introduction to Intellectual Property Right and Copy Right Laws.

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

Text Book(s):

[T1] Sides, Charles H., "How to Write and Present Technical Information", Cambridge Univ. Press, 1999.
[T2] Basu, B. N., "Technical Writing", PHI Learning Pvt. Ltd., 2007.

Reference Book(s):

[R1] Beer, David F. and David A. McMurrey, "A Guide to Writing as an Engineer", New York: Wiley, 2005.
[R2] Gibaldi, Joseph, and Walter S. Achtert, "MLA Handbook for Writers of Research Papers, Thesis, and Dissertations", Modern Language Association, 1980.
[R3] Rubens, Philip, "Science and Technical Writing: A Manual of Style", Routledge, 2002.
[R4] Anderson, Marilyn, Pramod K. Nayar, and Madhucchandra Sen, "Critical Thinking, Academic Writing and Presentation Skills", Pearson. 2010.

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SMART GRID

Paper Code: ETVPD-701	**L**	**T/P**	**C**
Paper: Smart Grid	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **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 & Pre-requisite*: To learn Smart Grid technologies and advanced metering infrastructure. To familiarize the power quality management issues in Smart Grid. To familiarize the high performance computing for Smart Grid applications. Basic knowledge in Electrical Engineering, Networks, Power Electronics*

Learning Outcomes**:** Students should have understanding of smart grid technologies, advanced metering and power quality management in smart grids

UNIT-I

Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, Concept of Resilient & Self Healing Grid, Present development & International policies in Smart Grid, Diverse perspectives from experts and global Smart Grid initiatives.

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

UNIT-II

Smart grid technologies: Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation; Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control; Distribution systems: DMS, Volt/VAR control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV).

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

UNIT-III

Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit(PMU), Intelligent Electronic Devices(IED) & their application for monitoring & protection.

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

UNIT-IV

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring; high performance computing for smart grid applications: Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broadband over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing to make Smart Grids smarter

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

Text Book(s):

[T1] S. P. Mehar, "Fundamentals of Smart Grid Technology", S K Kataria and Sons, New Delhi, 2015

[T2] James Momoh, "Smart Grid: Fundamentals of Design and Analysis", Ist Edition, Wiley-IEEE Press, 2012

Reference Book(s):

[R1] Stuart Borlase, "Smart Grid: Infrastructure, Technology and Solutions", CRC Press 2012.

[R2] Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", Wiley.

ECONOMICS OF POWER DISTRIBUTION

Paper Code: ETVPD-703	**L**	**T/P**	**C**
Paper: Economics of Power Distribution	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **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 & Pre-requisite: *Learning costing, pricing, markets, tariff determination and subsidies in power distribution sector. Understanding of power distribution sector, functioning of power distribution utilities and basic economic concepts.*

Learning Outcome: *Development of basic understanding about learning costing, pricing, markets, tariff determination and subsidies in power distribution sector.*

UNIT-I

Macroscopic economic view of overall electric utility system; Generation costs as affected by investments in equipment vs. fuel; Cost considerations for supplying base, intermediate and peak loads; Economic effects on the system as a result of utility power purchases, sales and wheeling; Size and economic consequences of power losses in various parts of power system: Analysis of the distribution system by use of a microscopic economic model.

[R1, R2, R3][No. of Hrs. 11]

UNIT-II

Global power market structure: Monopoly model, Single buyer model, Third party or open access model, Power pool mode; design and structure of Indian Power Market: Direct Bilateral trading, Bilateral trading through intermediaries, Power exchanges, Balancing Market; Basic concept of Spot market, Forward contracts and forward markets, Future contracts and futures markets, Options, Contracts for difference, Managing the price risks, Market efficiency; Markets with Imperfect competition.

[R1, R2, R3][No. of Hrs. 11]

UNIT-III

Present Energy pricing Scenario in India and world, History of Energy pricing mechanism – India and World, Basic theory of energy pricing, Pricing under various environments, cost and supply analysis, historical perspective of tariff regulation, tariff regulation for generation, transmission and distribution of electricity, tariff through competitive bidding process, power purchase agreements (PPA); Emerging trends in power distribution sector and their economical impact (distributed generation, open access, expanding solar power).

[R1, R2, R3][No. of Hrs. 11]

UNIT-IV

Power subsidies: global scenario of power subsidies, measuring power subsidies, consequences of energy subsidies, power subsidy reforms, Tariff Types in Power distribution: Simple tariff: Flat rate tariff, Block rate tariff, two part tariff, Maximum demand tariff, power factor tariff, three part tariff.

[R1, R2, R3][No. of Hrs. 12]

Text/ Reference Book(s):

[R1] Niranjan Sahoo, "The Politics of Power Sector Reforms in India", Pentagon Press
[R2] Chandra Sekhar Y (2004). "Indian Power Sector Reforms - The Agenda. Delhi" : ICFAI
[R3] Kaushik P D, Joel Ruet; Privatizing Power Cuts? Ownership and Reform of State Electricity Boards in India; Academic Foundation 2005

METERING AND LOSS REDUCTION IN POWER DISTRIBUTION
(Core Elective-II)

Paper Code: ETVPD-705	**L**	**T/P**	**C**
Paper: Metering and Loss Reduction in Power Distribution	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **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 & Pre-requisite*: To make students understand the role, importance and intervention of information technology in power distribution sector. Basic understanding of power distribution system and losses in network.*

Learning Outcome: *Understanding of various metering technologies, standards, commercial losses, technical losses and loss reduction measures*

UNIT-I

Electromechanical meters, Hybrid meters, electronic meters, Demand meters, Multiple tariff meters/Time of Usage (TOU) meters, Prepaid meters, Automatic Meter Reading (AMR) and Remote Meter Reading (RMR); Metering Techniques: LT Metering: Single phase meters, 3-phase 4 wire meters, 3-phase 3 wire meters, CT Operated Meters, HT Metering: Trivector Meter, Bivector Meter, Summation Meters; Introduction to Smart, Meters, Advanced Metering infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit(PMU), Intelligent Electronic Devices(IED) & their application for monitoring & protection.

[R1][No. of Hrs. 11]

UNIT-II

Metering standards; calibration and testing of energy meters and meter laboratory; Meter Field Testing and Installation Practices: Energy Meters – Installation and Commissioning, Sealing Points**;** revenue protection and technology interventions in metering, billing and collection; reasons for commercial losses: Direct Tapping by Non-customers, Pilferage and Theft of Energy by Existing Customers, Defective Metering, Billing and Collection.

[T4][No. of Hrs. 11]

UNIT-III

Measures for commercial loss reduction: Measures for Controlling Direct Tapping by Non-customers and Customers, Measures for Reducing Defective Metering, Meter Installation, Measures for Improvement in Billing and Collection, Development of MIS, Energy Accounting and Auditing, Users' Associations, Panchayats and Franchisees in Billing and Collection. Provisions in Electricity Act, 2003 to prevent commercial loss.

[T3][No. of Hrs. 11]

UNIT-IV

Measures for technical loss reduction

Short term measures for technical loss reduction: Network Reconfiguration, Network Re-conductoring, Preventing Leakages at Insulators, Employing AVB (Automatic Voltage Booster), Better Management of Distribution Transformers, Load Balancing and Load Management, Capacitor Installation (Shunt or Series), Improving Joints and Connections, Laying Additional Link Lines, Increase in HT:LT Ratio, Adoption of High Voltage Distribution System (HVDS), Regular Maintenance of Distribution Network, Creation of Primary Substation

Long term planning for loss reduction and activities involved: Data collection regarding existing, loads, operating conditions, forecast of expected loads etc. from Grid substation up to consumer level, Mapping of existing system, Analysis of existing system. (Voltage regulation, T&D losses in existing system, Adequacy of backup system), Load forecast, Plan for upgrading the network, Technology options including integration of features for modernization of system, Evaluation of various alternatives for least cost optimal solution, Firming up of scope of works, Preparation of cost estimates, Phasing of works and their cost, Financial analysis, acceptable technical loss levels

[T2][No. of Hrs. 12]

Text Book(s):

[T1] Operation and Performance Management, IGNOU, Study material published for Power Distribution Management
[T2] Technical Loss Reduction, IGNOU, Study material published for Power Distribution Management
[T3] Commercial Loss Reduction, IGNOU, Study material published for Power Distribution Management
[T4] Metering and Billing System, IGNOU, Study material published for Power Distribution Management
[T5] Sreenivasan G, Power Theft, Prentice Hall India Learning Private Limited, Third edition (2014), Delhi

Reference Book(s):

[R1] Slawomir Tumanski**,** Principles of Electrical Measurement, Taylor and Francis (2006), Delhi
[R2] Central Electricity Authority, Functional requirements of advanced metering infrastructure (AMI) in India, Aug 2016: available at http://powermin.nic.in/sites/default/files/webform/notices/Strategy_for_Rollout_of_Advanced_metering_infrastructure_0.pdf
[R3] ST. (2015). Smart grid distribution and smart meters. Available at: http://www.st.com/content/ccc/resource/sales_and_marketing/promotional_material/brochure/eb/29/0b/3e/a3/7a/4b/7d/brmeter.pdf/files/brmeter.pdf/jcr:content/translations/en.brmeter.pdf. Last accessed Feb 2017.

RURAL ELECTRIFICATION
(Core Elective-II)

Paper Code: ETVPD-707	**L**	**T/P**	**C**
Paper: Rural Electrification	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **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 & Pre-requisite: Introducing basic concepts of options and technologies available for electrification in rural areas. Students should have basic understanding of energy sources, electrical engineering, networks and basic concepts of economics

Learning Outcome: Systematic understanding of options and technologies for rural electrification, economical aspects and regulatory support

UNIT-I

The Rural Energy Scenario: Effects of Bio fuel use in rural India, Pollution and health, Ecological damage, Energy efficiency, the transition to modern energy, Rural Electrification policy; Emerging practices and Policies, Avoiding unnecessary subsides, High Start-up Costs and Risks, decentralization.

[R1, R2, R3][No. of Hrs. 12]

UNIT-II

Option for Rural electrification: Cost Effectiveness and choice of options, Costs of Grid Supplies, Reducing initial investment costs by using appropriate design standards, Electricity Supplies from Renewable Energy Sources: Solar thermal power generation, utility scale photovoltaic (USPV) generation, Wind powered generation, Biomass based generation.

[R1, R2, R3][No. of Hrs. 12]

UNIT-III

Decentralized generation technologies; Costs and choice of technology, Demand and benefits, forecasting and program development, Principles of cost-benefit calculations, Economic and financial analysis of stand-alone electrification projects, Decentralized versus central station generation; DG Evaluation: Cost from past, present, and future, basic DG cost analysis, cost Evaluation and schedule of demand; the power grid; DG-Grid interconnection issues, Mini and Micro Grids, Economic considerations, Environmental Factors, Transmission and Regulations.

[R1, R2, R3][No. of Hrs. 12]

UNIT-IV

Regulatory and Price Reforms, Unbundling, and Privatization, Implications for Rural Electrification, Approaches to Distribution Franchisee & Entrepreneurship, Innovations in Rural Energy, Rural Electrification and World Bank, Different Programs of Rural Energy Development

Text/ Reference Book(s):

[R1] Annual report of Rural Electrification Corporation Limited for preceding year available at website http://www.recindia.nic.in.

[R2] Central Electricity Authority. (2016). Draft National Electricity Plan. Available: http://www.cea.nic.in/reports/committee/nep/nep_dec.pdf. Last accessed 20 feb 2017.

[R3] Rural Electrification Corporation. Rural Electrification in India. Available: http://www.ddugjy.gov.in/mis/portal/field_study/RE_for_IAS_Probationers.pdf. Last accessed 10 Feb 2017.

RESTRUCTURED POWER SYSTEM
(Core Elective-II)

Paper Code: ETVPD-709	**L**	**T/P**	**C**
Paper: Restructured Power System	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **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 & Pre-requisite: To introduce the restructuring of power industry and market models, congestion management, locational marginal pricing and financial transmission rights and ancillary service management. Basic knowledge in Electrical Engineering, Networks, basic concepts of economics

***Learning Outcomes*:** Basic understanding of restructuring of power industry and market models, congestion management, locational marginal pricing and financial transmission rights and ancillary service management

UNIT-I

Restructuring of Power Industry: Reasons for restructuring / deregulation of power industry, Understanding the restructuring process, Introduction to issues involved in deregulation, Reasons and objectives of deregulation of various power systems across the world.

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

UNIT-II

Congestion, reasons for transfer capability limitation, Importance of congestion management, Features of congestion management, Classification of congestion management methods, Calculation of ATC: Non-market methods, Market methods, Nodal pricing, Inter zonal and Intra zonal congestion management, Price area congestion management, Capacity alleviation method.

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

UNIT-III

Locational Marginal Prices, Financial Transmission rights, risk hedging functionality, Simultaneous feasibility test and revenue adequacy, FTR issuance process: FTR auction, FTR allocation, Treatment of revenue shortfall, Secondary trading of FTRs, Flow gate rights, FTR and market power, FTR and merchant transmission investment.

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

UNIT-IV

Ancillary service management, ancillary services, types of ancillary services, classification of Ancillary services, Load generation balancing related services- Voltage control and reactive power support devices, black start capability service, how to obtain ancillary service, Co-optimization of energy and reserve services, International comparison, Transmission pricing Principles, pricing of transmission network, transmission pricing methods – Marginal transmission pricing paradigm – Composite pricing paradigm – Merits and demerits of different paradigm.

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

Text Books:

[T1] S. A. Khaparde, A.R. Abhyankar, "Power System Restructuring And Deregulation Trading-Performance And Information Technology", 2016

[T2] Mohammad Shahidehpour, Hatim Yamin, Zuyi Li, "Market Operations in Electric Power Systems: Forecasting, Scheduling and Risk Management", Wiley India, Delhi, 2015.

References Book(s):

[R1] Sally Hunt, "Making competition work in electricity", John Willey and Sons Inc., 2002

[R2] Steven Stoft, "Power system economics: designing markets for electricity", John Wiley & Sons, 2002

[R3] Mohammad Shahidehpour, Muwaffaq Alomoush, Marcel Dekker, "Restructured Electrical Power Systems: Operation, Trading And Volatility", Pub., 2001

[R4] Kankar Bhattacharya, Jaap E. Daadler, Math H.J. Boolen, "Operation of Restructured Power Systems", Kluwer Academic Pub., 2001

IT APPLICATIONS IN POWER DISTRIBUTION SECTOR
(Core Elective-III)

	L	T/P	C
Paper Code: ETVPD-711			
Paper: Restructured Power System	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **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 & Pre-requisite*: To make students understand the role, importance and intervention of information technology in power distribution sector. Basic understanding of operations in a Power Distribution Company and information technology tools*

Learning Outcome: *Understanding of role, importance and intervention of information technology in various domains of power distribution sector*

UNIT-I

Overview of power distribution business and information technology: Distribution business and the need for information technology based interventions; key areas of it interventions in the distribution business, infrastructure for effective IT use in the distribution business, case studies of successful IT interventions by utilities.

Organizational change management for IT applications: business process re-engineering, top management commitment, step by step implementation and capacity building.

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

UNIT-II

IT Application in Metering, billing and collection: Hand Held Data (HHD) Recorder, Automated meter reading, Data acquisition, Data Analysis; Risks, mitigation and analysis of trouble shooting and remedial actions; Spot billing machine and technology, online payment, revenue realization monitoring;

High performance computing for smart grid applications: LAN, House Area Network (HAN), WAN, Broadband over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing to make Smart Grids smarter, Cyber Security for Smart Grid.

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

UNIT-III

IT for Asset Management and Financial Management: Introduction, System functionality requirement, software requirement, deliverables, Transformer information management system, meter information management system, Enterprise resource planning.

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

UNIT-IV

IT Application for customer information and satisfaction: IT Applications for customer benefit, Interactive website, Interactive voice response system, Customer care centers, Call Centers, Customer analysis tools;

GIS Applications in Power Distribution Sector: GIS for Distribution Network Management: Introduction to GIS, GIS Based Mapping of Electrical Network.

GIS Applications: Querying the GIS, Information Processing, Role of GIS in Distribution Reforms; Customer Indexing;

Software Based Distribution Network Planning and Analysis: Integration of GIS and Network Analysis Systems; GIS Based Growth Planning and Load Forecast Implications

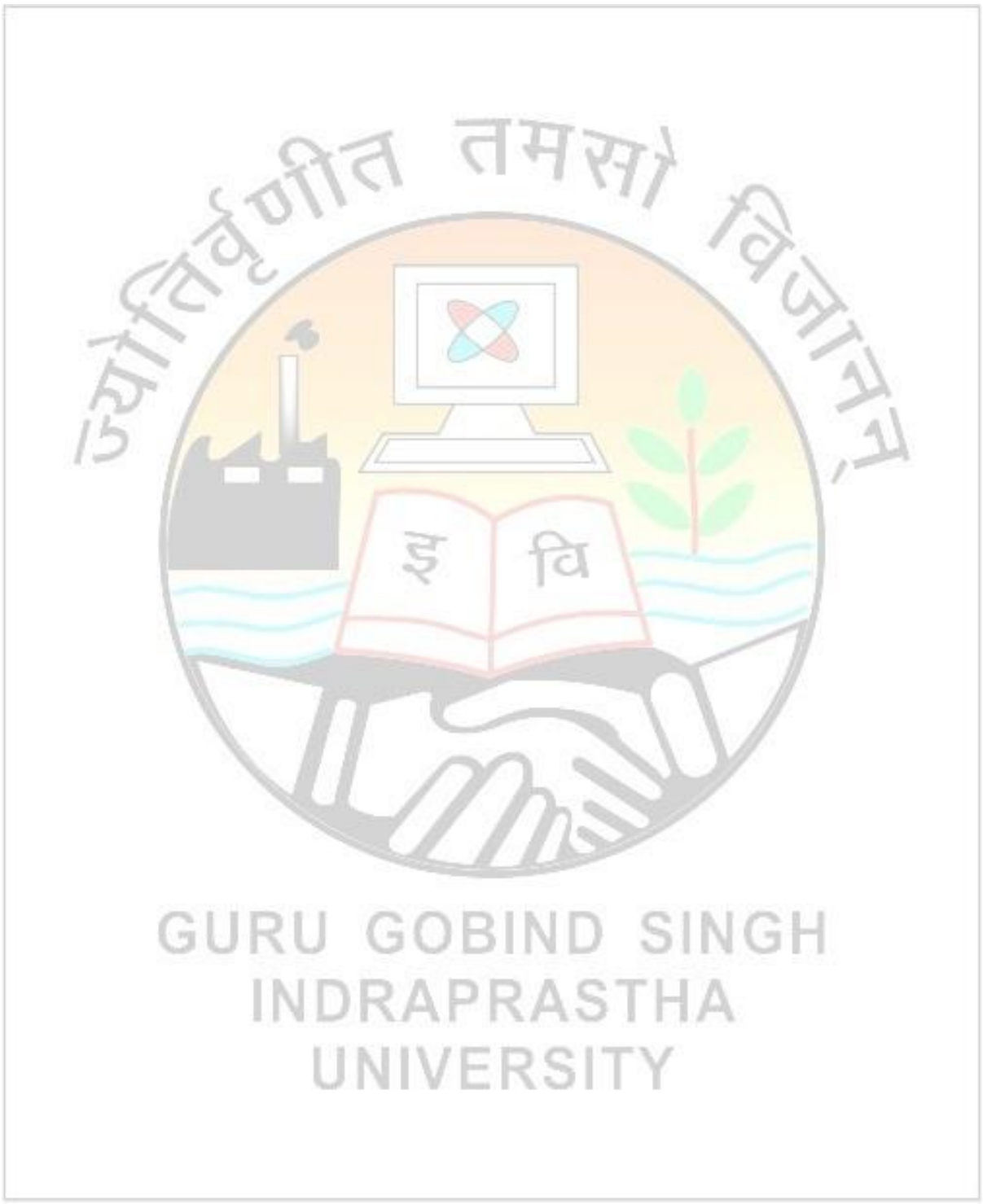
[T1, T2][No. of Hrs. 12]

Text Books:

[T1] Study material by IGNOU for Overview of Distribution Business and Information Technology
[T2] Study material by IGNOU for IT Application in metering
[T3] Study material by IGNOU for Use of IT for Billing and Collections
[T4] Study material by IGNOU for IT for Customer Information and Satisfaction
[T5] Study material by IGNOU for GIS Applications in the Power Distribution Sector

References Book(s):

[R1] Vebhav Gupta . (January 2012). Role of Information Technology in Power Sector - With Special Reference to Power Distribution in India. International Journal of Computing and Business Research (IJCBR). Volume 3 (Issue 1), available at http://www.researchmanuscripts.com/IJCBRJanuary2012/9.pdf



DISASTER MANAGEMENT AND CAPACITY BUILDING IN POWER DISTRIBUTION SECTOR
(Core Elective-III)

	L	T/P	C
Paper Code: ETVPD-713			
Paper: Disaster Management and Capacity Building in Power Distribution Sector	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **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 & Pre-requisite: *To make students understand the concept of disaster management, measures involved in managing disasters and capacity building in the field of power distribution management. Basic understanding of power distribution system, organizational structure in power distribution utilities and their functioning.*

Learning Outcome: *Understanding for concept of disaster management, measures involved in managing disasters and capacity building in the field of power distribution management.*

UNIT-I

Disasters due to natural calamities like earthquakes, cyclones, floods and their impact on power distribution networks; Disaster preparedness measures, Post disaster activities;

Disasters due to human actions: terrorism, Bomb explosion and bomb threats, security measures, strikes; Major equipment failure of electricity grid.

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

UNIT-II

Disaster management plan: Disaster zoning for natural calamities, objectives and scope of disaster management plan; Structure of disaster management system: Constitution of Disaster Management Groups, Plant Level Emergency Management Group.

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

UNIT-III

Measures for Quick Restoration of Power Supply: Restoration of transmission/distribution lines, restoration of substation, Facilities Required to Tackle Any Disaster.

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

UNIT-IV

Capacity, three levels of capacity, types of capacity, Capacity development process, capacity development actions, capacity development Vs capacity building, need of enabling environment for translating capacity into performance

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

Text Book(s):

[T1] Collins Larry R. and Schneid Thomas D., "Disaster Management and Preparedness Taylor and Francis", 2000.

[T2] Goel S.L. and Kumar Ram, "Disaster Management", Deep and Deep Publications, 2001

Reference Book(s):

[R1] Electrical Safety and Disaster Management, Study material for Advance Certificate course in Power Distribution Management Program, IGNOU, 2009

MANAGEMENT OF POWER DISTRIBUTION
(Core Elective-III)

Paper Code: ETVPD-715	**L**	**T/P**	**C**
Paper: Management of Power Distribution	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **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 & Pre-requisite: *Introducing basic concepts of management, customer relationship management and conflict management. Students should have first hand exposure to functioning of power distribution companies*

Learning Outcome: *Systematic understanding of management, organizational structure, various functional divisions, customer management and conflict management process*.

UNIT-I

Concept of management, management processes, work values, supply chain management, TQM and Project Management, performance management, Organizational structure and nature of management in power distribution companies, various divisions and their functions, MIS in power distribution

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

UNIT-II

Customer relationship management: Concepts and Elements, Customer Satisfaction Surveys and Customer Index for Effective CRM, Understanding the concept of customer value and customer satisfaction; Meaning, Nature and Types of Customer Involvement and participation, Mechanism underlying the Customer Involvement and participation process.

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

UNIT-III

Setting up Processes for Regular Communication with the Customers, Understanding and Tracking Customer Expectations, effective systems for handling customer requirements regarding connections, metering, regular supply, Effective Systems for Handling Customer Requirements Regarding Billing and Collection Procedures, Preventive and Corrective Maintenance to Ensure Effective and Regular Service, Ensuring Call Centre responsiveness.

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

UNIT-IV

Conflict Management: traditional, behavioral and interactionist view of conflict, types and level of conflict, sources of conflict, effect of conflict, conflict process, conflict management, Conflict prevention, Stimulating Productive Conflict, Resolving Interparty Conflict, Conflict-avoidance Strategies, Conflict-diffusion Strategies, Conflict-containment Strategies, Conflict-confrontation Strategies

Text Book(s):

[T1] P.C. Tripathi, P.N. Reddy, "Principles of Management", Fifth Edition, Tata McGraw-Hill Education Pvt. Ltd, Delhi

[T2] Jagdish N Sheth, Parvatiyar Atul, G Shainesh, "Customer Relationship Management: Emerging Concepts, Tools and Applications"

[T3] Eirene Leela Rout, Omiko Nelson "Corporate Conflict Management: Concepts and Skills", Prentice Hall India Learning Private Limited, Delhi, 2007

NCC/ NSS/ SPORTS/ COMMUNITY SERVICES/ ECO CLUB
(General Elective-II)

Paper Code: ETVSS-751/ 753/ 755/ 757/ 759	**L**	**T/P**	**C**
Paper: NCC/NSS/ Sports/ Community Services/ ECO Club	**0**	**2**	**1**

Students should actively participate in either of the above activities of the institute during academic session. Credits shall be awarded accordingly based on final assessment by internal institute committee constituted by the Principal/ Director of the respective institutes. Students are encouraged organize events and awards if any shall be distributed to students during annual day/ specific function day accordingly

YOGA
(General Elective-II)

Paper Code: ETVSS-761	**L**	**T/P**	**C**
Paper: Yoga	**0**	**2**	**1**

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.

Introduction: Yoga education in Schools/Colleges/ Institutions/ Organizations/Universities etc. can immensely contribute to health of children by disseminating knowledge and awareness about the value of health, inculcating and nurturing health promoting habits and life style.

The Paper on YOGA has been initiated by USET for the students in a new skill development programme known as B.Voc programme. Currently, launched in 09 Govt. Institutions affiliated to GGSIP University.

Aim and Objectives:

The aim of the Paper is to introduce Yoga. The specific objectives are:

- To impart Yoga education in schools/colleges/Institutions for prevention of disease and promotion of health;
- To train faculty members in Yogic principles and practices.
- To prepare and distribute standardized Yoga teaching and training materials with reference to institute health.

UNIT-I

- Brief introduction to origin of Yoga, Psychological aspects leading to origin of Yoga, Hindu Mythological concepts about origin of Yoga
- History and Development of Yoga
- Etymology and Definitions of Yoga, Aim and Objectives of Yoga, Misconceptions about Yoga, True Nature of Yoga
- General Introduction to Schools of Yoga
- Principles of Yoga, Yoga Practices for Health and Harmony

UNIT-II

Yoga Traditions and Classical Schools of Yoga.

- Yoga's Traditional Source
- Different's traditions of Yoga.
- Contemporary Yoga Practice.
- Concepts and Practices of Yoga in others religions.

UNIT-III

Experimental Study Yoga:

- Aasan, Surya Namaskar, Pranayam, Sukshm-Kriya, Dhyan-Mudra.Shatkarma

UNIT-IV

Yoga and You

- **Concept of Health-** Aahaar, Nidra, Bharmacharaya, Viyayaam.
- **Aarogya -** Prevention, Cure and Remedies.
- Life Management and Development.

Reference Book(s)

[R1] Singh S. P & Yogi Mukesh, "Foundation of Yoga", Standard Publication, New Delhi, 2010
[R2] Radhakrishnan S,"Indian Philosophy", (Vol. I & II) II Edition, Oxford University, UK, 2008.
[R3] Swami Devvarata, "Ashtang Yog", 119, Guttam Nagar.
[R4] Prof. Ram Harsh Singh, "Swasth Viritam"
[R5] Swami Prabhavanand, "Spiritual Heritage of India (English)", Sri Ramkrishna Math, Madras, 2004

YOGA PRACTICAL
I.A

I. RECITATION OF HYMNS & HASTA MUDRA

1.1 Recitation of Pratah-smaran and Shanti Mantras

1.2 Recitation of Pranava Japa and Soham Japa

1.3 Recitation of Hymns from Upanishad & Yoga Texts

1.4 Hasta Mudra: Chin, Jnana, Hridaya, Bhairav, Yoni

II. SHATKARMA

2.1 Dhauti (Kunjal, Vamana Dhauti, Vastra Dhauti)

2.2 Neti (Jalneti, Sutraneti)

2.3 Kapalbhati and its variants

2.4 Agnisara

III. BREATHING PRACTICES

3.1 Breath Awareness: Shwas-prashwas Sanyaman

3.2 Abdomen, Thoracic & Clavicular Breathing, Abdomen + Thoracic Breathing, Abdomen + Thoracic + Clavicular Breathing

3.3 Yogic Breathing: Pause Breathing (Viloma Pranayama), Spinal Passage Breathing (Sushumna Breathing)

3.4 Practice of Puraka, Rechaka & Kumbhaka (Antar & Bahya Kumbhaka)

YOGA PRACTICAL
I.B

YOGIC SUKSMA AND STHULA VYAYAMA, NABHI PAREEKSHA

1.1 YOGIC SUKSMA VYAYAMA

1. Uccharana-sthalatatha Vishudha-chakra-shuddhi (for throat and voice)
2. Prarthana (Prayer)
3. Buddhi-tatha-dhritishakti-vikasaka (for developing will power)
4. Smaranashakti-vikasaka (for improving the memory)
5. Medhashakti-vikasaka (for improving the intellect and memory)
6. Netrashakti-vikasaka (for the eyes)
7. Kapolashakti-vardhaka (for the cheeks)
8. Karnashakti-vardhaka (for the ears)
9. Grivashakti-vikasaka (for the Neck) (i) (A & B)
10. Grivashakti-vikasaka (for the Neck) (ii) (A & B)
11. Grivashakti-vikasaka (for the Neck) (iii)
12. Skandha-tatha-bahu-mulashakti-vikasaka (for the shoulders)
13. Bhuja-bandhashakti-vikasaka
14. Kohinishakti-vikasaka
15. Bhuja-vallishakti-vikasaka
16. Purna-bhujashakti-vikasaka (for the arms)
17. Mani-bandhashakti-vikasaka
18. Kara-prsthashakti-vikasaka
19. Kara-talashakti-vikasaka
20. Anguli-mulashakti-vikasaka (for the fingers) (A & B)
21. Anguli- shakti-vikasaka (for the fingers) (A & B)
22. Vaksa-sthalashakti-vikasaka (for the chest) (1)
23. Vaksa-sthalashakti-vikasaka (for the chest) (2)
24. Udarashakti-vikasaka (for the abdomen) (i)
25. Udarashakti-vikasaka (for the abdomen) (ii)
26. Udarasakti-vikasaka (for the abdomen) (iii)
27. Udarashakti-vikasaka (for the abdomen) (iv)
28. Udarashakti-vikasaka (for the abdomen) (v)
29. Udarashakti-vikasaka (for the abdomen) (vi)
30. Udarashakti-vikasaka (for the abdomen) (vii)
31. Udarashakti-vikasaka (for the abdomen) (viii)
32. Udarashakti-vikasaka (for the abdomen) (ix)
33. Udarashakti-vikasaka (for the abdomen) (x) (A, B & C)
34. Kati shakti-vikasaka (for the waist) (i)
35. Kati shakti-vikasaka (for the waist) (ii)
36. Kati shakti-vikasaka (for the waist) (iii)

37. Kati shakti-vikasaka (for the waist) (iv)
38. Kati shakti-vikasaka (for the waist) (v)
39. Muladhara-chakra-suddhi (for the rectum)
40. Upasthatatha-svadhisthana-chakra-suddhi (for the genital organs)
41. Kundalinishakti-vikasaka (for the kundalini)
42. Janghashakti-vikasaka (for the thighs) (i) (A & B)
43. Janghashakti-vikasaka (for the thighs) (ii) (A & B)
44. Janushakti-vikasaka (for the knees)
45. Pindalishakti-vikasaka (for the calves)
46. Pada-mulashakti-vikasaka (A & B)
47. Gulpha-pada-pristha-pada-tala-shakti-vikasaka (for the ankles and the feet)
48. Padangulishakti-vikasaka (for the toes)

1.2 YOGIC STHULA VYAYAMA

1. Rekha-gati (Walking in a Straight line)
2. Hrid-gati (Injanadaur – the Locomotive Exercise)
3. Utkurdana (Jumping Exercise)
4. Urdhva-gati (Upward Movement)
5. Sarvanga-pusti (Developing the Entire body) &

1.3 NABHI PAREEKSHA

II. SURYA NAMASKARA

III. YOGASANA (Standing Postures and body alignment)

3.1 Tadasana, Vrikshasana, Urdhva-Hastottanasana, Kati Chakrasana

3.2 ArdhaChakrasana, Paada Hastasana

3.3 Trikonasana, Parshva Konasana

3.4 Veerabhadrasan and its variations

YOGA PRACTICAL
II.A

I. SHATKARMA

1.1 Dhauti

1.2 Neti

1.3 Nauli Madhyama, Vama, Dakshina and Nauli Chalana

1.4 Trataka (Jatru and Jyoti)

II. PRANAYAMA

2.1 Nadi Shodhana (Technique 1: Same Nostril Breathing)

2.2 Nadi Shodhana (Technique 2: Alternate Nostril Breathing)

2.3 Nadi Shodhana (Technique 3: Alternate Nostril Breathing + Antar Kumbhak)

2.4 Nadi Shodhana (Puraka + Antar Kumbhak + Rechaka + Bahya Kumbhak) (1:4:2:2)

2.5 BHRAMARI PRANAYAMA

III. PRACTICES LEADING TO MEDITATION

3.1 Pranav and Soham Japa

3.2 Yoga Nidra (1, 2, 3)

3.3 Antarmauna

3.4 Ajapa Dharana (Stage 1, 2, 3)

YOGA PRACTICAL
II.B

I. YOGASANA (Sitting Postures)

1.1 Dandasana, Swastikasana, Padmasana,Vajrasana, Supta Vajrasana

1.2 Kagasana, Utkatasana, Gomukhasana,Ushtrasana, Shashankasana,

1.3 Janusirasana, Paschimottanasana, Bhramacharyasana, Mandukasana, Utthana Mandukasana

1.4 Vakrasana, Ardha Matsyendrasana, Marichayasana, Simhasana

II. YOGASANA (Supine lying Postures)

2.1 Pavanamuktasana

2.2 Utthana-padasana, Ardha Halasana,

2.3 Halasana

2.4 Setubandha Sarvangasana

2.5 Sarvangasana

2.6 Matsyasana

2.7 Chakrasana

2.8 Shavasana

III. YOGASANA (Prone lying Postures)

3.1 Makarasana

3.2 Bhujangasana

3.3 Shalabhasana

3.4 Dhanurasana

3.5 Kapotasana

3.6 Raja Kapotasana

YOGA PRACTICAL
III.A

I. BANDHA

- Jivha Bandha
- Jalandhara Bandha
- Uddiyana Bandha
- Mula Bandha
- Maha Bandha
- Tri Bandha

II PRANAYAMA (with Antar & Bahya Kumbhaka)

2.1 Surya-bhedi and Chandra-bhedi Pranayama

2.2 Ujjayi Pranayama

2.3 Sheetali Pranayama

2.4 Shitkari Pranayama

2.5 Bhastrika Pranayama

III. PRACTICES LEADING TO MEDITATION

3.1 Ajapa Dharana (Stage 4, 5, 6)

3.2 Yoga Nidra (4, 5)

3.3 Practices leading to Breath Meditation

3.4 Practices leading to Om Meditation

3.5 Practices leading to Vipassana Meditation

Practices leading to Preksha Meditation

YOGA PRACTICAL
III.B

I. YOGASANA

1.1 Siddhasana, Bhadrasana,

1.2 Baddha Padmasana, Uttitha Padmasana,

1.3 Bhunamanasana, Hanumanasana

1.4 Bakasana, Kukkutasana, Garbhasana

1.5 Matsyendrasana, Marjariasana,

1.6 Padangusthasana, Hastapadangusthasana

1.7 Garudasana, Vatayanasana, Natarajasana

1.8 Mayurasana, Padma Mayurasana

1.9 Sirshasana and its variations

1.10 Ekapada and Dwipada Kandarasana

II. MUDRAS

2.1 Yoga Mudra

2.2 Maha Mudra

2.3 Shanmukhi Mudra

2.4 Shambhavi Mudra

2.5 Kaki Mudra

2.6 Tadagi Mudra

2.7 Vipareet Karni Mudra

2.8 Simha Mudra

ECONOMICS OF POWER DISTRIBUTION LAB

	L	T/P	C
Paper Code: ETVPD-753			
Paper: Economics of Power Distribution 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 available reports from various credible sources and prepare a report on installed capacity and transmission network across the nation
2. Study available reports from various credible sources and prepare a report on cost of power generation with different types of fuel / sources
3. Study available reports from various credible sources and prepare a report on power demand pattern across whole day for any large city. This pattern should be assessed for each month of year separately, to give a rough estimate of varying power demand over the year.
4. With the help of credible sources, prepare a report to suggest the level of power loss at various stages of power transmission and distribution for a large power utility.
5. With the help of credible sources, prepare a report to suggest the level of power loss at various stages of power transmission and distribution for a large power utility.
6. Prepare a report on different types of products traded in Indian Power Market and their approximate volumes in preceding years
7. Prepare a report giving the quantum of power subsidies in Delhi during preceding ten years
8. Prepare a report on Indian power market, giving brief detail about institutions and important stakeholders

References:

Reports from Central Electricity Authority, Central Electricity Regulatory Commission, Various State Regulatory Commissions, Working Group on Power, Survey conducted by Central Government and State Governments, Various Research Institutions and from credible Journals can be used as source of secondary data towards preparing reports.

METERING AND LOSS REDUCTION IN POWER DISTRIBUTION LAB
(Core Elective-II)

	L	T/P	C
Paper Code: ETVPD-755			
Paper: Metering and Loss Reduction in Power Distribution 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. Identifying the points at which technical losses take place along with the level/quantum of loss in the distribution system of your utility and preparing a note on it
2. Study the available reports of preceding year and finding level of commercial loss in power distribution for power Distribution Company / utility in your area. Also try to identify reasons behind it.
3. Familiarizing with different types of energy meters currently in practice in power distribution company/ utility of your area and performing measurement in lab using each one of these (electromechanical, electronic, digital, smart metering, net metering and other meters with emerging technologies).
4. Accompanying an enforcement team on inspection to any suspected case of power theft and preparing a report on various activities/process undertaken such as removal of tempered meter/ preparing estimate etc.

Or

1. Study a case of power theft in residential/ commercial/ industrial area and prepare a report on various activities/process undertaken such as removal of tempered meter / preparing estimate etc.
2. Visiting a facility of meter testing /calibration, for energy meters found tempered during inspections/ to be tested on customer demand / about to be installed for new connection

Or

1. Performing calibration of energy meter in laboratory and prepare a report on it:
2. Studying the manuals/policies of your utility for selecting proper meter and metering technique for supply to a consumer. Write down important parameters which are used for deciding the type and capacity of meter
3. Study the metering code/metering regulations issued by your State Electricity Regulatory Commission and comment on status of compliance of various provisions of these regulations in your utility.
4. Study the metering practices distribution company / power utility in your area and identify various technological interventions applied for boosting revenue collections
5. Study various short term and long term measures undertaken by power distribution company / utility of your area to reduce the level of commercial losses

RURAL ELECTRIFICATION LAB
(Core Elective-II)

Paper Code: ETVPD-757	**L**	**T/P**	**C**
Paper: Rural Electrification 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 rural inhabitation and identifying difference in electrification scheme, process and technologies, in rural area as compared to urban localities.
2. Visiting a rural inhabitation and identifying difference in power consumption pattern as compared to urban localities.
3. Visiting a rural inhabitation and identifying the possibilities of use of renewable energy sources for meeting out local demand.
4. Studying reports available on the level of commercial losses taking place in rural areas of various states / specific location.
5. Studying reports available on the level of technical losses taking place in rural areas of various states / specific location.
6. Studying reports and identifying technological interventions made for reducing technical and commercial losses in rural areas.
7. Studying reports and finding out impact of deregulation / restructuring of power utilities on rural electrification.
8. Identifying various schemes / efforts by various stakeholders to enhance rural electrification and achievement over years.

RESTRUCTURED POWER SYSTEM LAB
(Core Elective-II)

Paper Code: ETVPD-759	**L**	**T/P**	**C**
Paper: Restructured Power System Lab	**0**	**3**	**3**

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

List of Experiments:

1. Studying factors in consideration for privatization / unbundling of any public sector power utility like Delhi Vidhyut Board and preparing a brief report on it
2. Study of power transmission system scenario at national level and preparing a brief report on challenges faced by it
3. Study of congestion management scenario at national level and preparing a brief report on it
4. Preparing a brief report identifying states with excess power generation and states with power generation deficiency
5. Preparing a brief report on types and level of losses taking place in transmission of power over long distance and current scenario at national level
6. Preparing a brief report on present status / emerging trends for transmission rights in Indian power market
7. Prepare a brief report on transmission pricing scenario in Indian power sector and various determinants of it

IT APPLICATIONS IN POWER DISTRIBUTION SECTOR LAB
(Core Elective-III)

Paper Code: ETVPD-761	**L**	**T/P**	**C**
Paper: IT Application in Power Distribution Sector 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. Studying the ERP/Asset Management software/system (used by any power distribution company / in practice in power distribution utilities) and salient features of it. Students should be made to practice it for managing various management processes in power distribution companies. Actual software can be decided as per relevance, acceptability and usability, as recommended by industry experts (Power Distribution Utilities).
2. Studying any customer relationship the ERP/Asset Management software/system (used by any power distribution company / in practice in power distribution utilities) and salient features of it. Students should be made to practice it for managing various management processes in power distribution companies. Actual software can be decided as per relevance, acceptability and usability, as recommended by industry experts (Power Distribution Utilities).
3. Studying the various modes of electronics payment system adopted by any power distribution company and important features of it
4. Studying the state of application of IT in real time metering by any power distribution company and preparing a short note on it
5. Studying the website of any power distribution company and the extent of information it provide to customer on various dimensions
6. Study of transformer information management system in practice in any power distribution company. Associated software used for transformer information management system by power distribution utilities can be demonstrated in laboratory making students familiar for the same.
7. Study of meter information management system in practice in any power distribution company

DISASTER MANAGEMENT AND CAPACITY BUILDING IN POWER DISTRIBUTION SECTORLAB
(Core Elective-III)

	L	T/P	C
Paper Code: ETVPD-763			
Paper: Disaster Management and Capacity Building in Power Distribution Sector 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 the disaster preparedness of power distribution company in your area / nearby area and list various activities undertaken by it to handle any possible natural disasters most likely to occur in your area
2. Study the disaster preparedness of power distribution company in your area / nearby area and evaluate the preparedness of your utility in the event of a disaster due to a bomb explosion, terrorist attack and strike
3. Study the disasters taken place in your area / nearby area and identify the reasons for the failure of electricity grid when a disaster strikes
4. Study the disaster preparedness of power Distribution Company in your area / nearby area and identify the zoning scheme in practice
5. Study the disaster preparedness of power Distribution Company in your area / nearby area and identify emergency management group at various levels and their responsibilities
6. Study the disaster preparedness of power Distribution Company in your area / nearby area and prepare a note on emergency restoration system maintained for quick restoration of supply in case of any disaster
7. Visit any fire station of your area and get acquainted with procedure / equipment required to fight fire incidences
8. Visit of any disaster management facility / institution, to get fist hand exposure of various tools / equipment / processes required in the case of disasters

MANAGEMENT OF POWER DISTRIBUTION LAB
(Core Elective-III)

Paper Code: ETVPD-765	**L**	**T/P**	**C**
Paper: Management of Power Distribution 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. Studying organizational structure any power distribution company and preparing a brief report on it
2. Studying state of MIS system on any power distribution company and preparing a brief report on it
3. Studying various measures undertaken towards communication with customer by any power distribution company
4. Studying state of customer satisfaction in any power distribution company and preparing a brief note on it
5. Studying state of grievances redressal mechanism in practice any power Distribution Company and preparing a brief note on it
6. Studying state of call center responsiveness of any power distribution company and preparing a brief note on it
7. Studying various practices / processes in place in any power distribution company adopted as Conflict-avoidance Strategies / Conflict-diffusion Strategies / Conflict-containment Strategies
8. Identify various departments in the power distribution utility in your area and the basis for creating these. Also discuss different levels of management and span of control at each level as well as reporting relationships
9. Briefly describe a situation in which you excelled as a leader. Which factors contributed the most to this performance?

LANGUAGE LAB
(Common to all Disciplines)

Paper Code: ETVHS-751	**L**	**T/P**	**C**
Paper: Language 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 Exercises:

1. **Fundamentals of Inter-personal Communication and Building Vocabulary**
   - Self introduction and introducing others
   - Situational Dialogues: Starting a dialogue and responding relevantly & appropriately
   - Role-Play-Expressions in various situations
   - Social and Professional Etiquette: greetings, apologies, requests etc
   - Telephone Etiquette.
2. **Non-verbal Communication**
   - Gesture, posture and body language
   - Facial Expressions.
   - Paralinguistic Skills
   - Proxemics
   - Eye Gaze.
   - Haptics
   - Appearance.
3. **Reading Comprehension and Listening Exercise**
   - General vs Local Comprehension
   - Skimming, Scanning
   - Inference drawing
   - Critical reading
   - Listening , Hearing
4. **Presentation Skills**
   - Oral presentation
   - Seminar/ conference Paper Presentation
   - PPTs and Written presentation through poster/projects/reports/e-mails/assignments etc
   - Camera ready presentation
5. **Group Discussion**
   - Dynamics of Group Discussion
   - Intervention
   - Summarizing
   - Body Language and Voice, Intonation
6. **Interview Skills**
   - Interview etiquette
   - Body posture and body language
   - Voice, intonation and modulation
   - Fluency and organization of ideas
   - Rubrics for evaluation: Concept and process, pre-interview planning, opening strategies, answering techniques,
   - Interview through tele-conferencing and video-conferencing
   - Mock interview
   - Campus placement interview
7. **Public and Professional Speaking**
   - Extempore
   - Public Speech
   - Professional speech/lecture
8. **Articulation and Management**
   - Time management
   - Articulation and expression
   - Assertiveness
   - Psychometrics
   - Stress management

MINOR PROJECT

Paper Code: ETVPD-753	**L**	**T/P**	**C**
Paper: Major Project	**0**	**8**	**4**

Students will identify a performance issue in power Distribution Company / power utility / associated establishment, and prepare model / detailed report /case study towards its analysis / solution

Power Distribution Sector is fast moving sector, where technology and processes changes at fast pace. Very few books text books are available on advances taking place and most of the information on state of the technology/process is available in the form of reports, manuals and technological advances provided by large companies / utilities / government and other reputed institutions. As the B Voc Program is skill based one, facilitating students the current information about state of the art technology and processes is must. To accomplish it, each student must be provided with

1. At-least 3 hours/week of time in project lab having computer with dedicated high speed internet facility to access online available data, technological updates, process details and necessary computation / designing / development work. Computers should be of reasonably advanced configuration, with antivirus software installed in all systems. Internet speed at each computer terminal should not be less than 1 MBPS. If required optical cable based internet connection line should be used to secure reasonably high speed.
2. Necessary software for power system analysis, Computer Aided Design and Drawing (CADD) / mathematical computation / power system modeling, project management and project planning should also be facilitated to students. Trained faculty and technical staff for assisting students in making them familiar for using these software tools should be made available.
3. Testing bench and associated tools / equipments for quality measurement, energy metering, switchgear & protection etc., and other necessary software should also be made available in project lab.

POWER QUALITY

Paper Code: ETVPD-702	**L**	**T/P**	**C**
Paper: Power Quality	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **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 & Pre-requisite*:* To study and understand, various power quality problems, their mitigation and measuring techniques. Basic knowledge in Electrical Engineering, Networks, Power Electronics

Learning Outcomes**:** After completion of the course the student should be able to know the various power quality problems like transients and harmonics etc, their mitigation and measuring techniques.

UNIT-I

Power Quality issues, Power Quality concerns, Power Quality standards, Power Quality monitoring, common power frequency disturbances, source of steady state disturbances, effect of steady state disturbance on loads, techniques to reduce disturbances, Types and Causes of Transients.

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

UNIT-II

Electrical grounding requirements, essentials of a grounded system, ground electrodes, earth resistance tests, earth-ground grid systems, power ground system, signal reference ground, Signal Reference Ground Methods, single point and multipoint grounding, ground loops, electrochemical reactions due to Ground Grids, examples of grounding anomalies or problems, electromagnetic interference, EMI Mitigation.

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

UNIT-III

Harmonics, harmonic number (h), odd and even order harmonics, harmonic phase rotation and phase angle relationship, causes of voltage and current harmonics, individual and total harmonic distortion, harmonic signatures, effect of harmonics on power system devices, guidelines for harmonic voltage and current limitation, harmonic current mitigation.

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

UNIT-IV

Power quality measurement devices and process, Dynamic Voltage Restorer (DVR), D-STATCOM, Unified Power Quality Conditioner (UPQC), Unified Power Quality Conditioner based on current source convert topology, Power Quality Audit; Uninterruptable Power Supplies (UPS).

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

Text Book(s):

[T1] C. Sankaran, "Power Quality", First Indian reprint, CRC press, 2009.
[T2] J. B Dixit, Amit Yadav, "Electric Power Quality", First Edition, Laxmi Publications Pvt. Ltd, 2010

TALENT MANAGEMENT

Paper Code: ETVPD-704	**L**	**T/P**	**C**
Paper: Talent Management	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **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 & Pre-requisite: *Learning about relationship between talent and organization to accelerate performance improvements by instituting talent management system that ensures identification, management, development of talent portfolio. Basic understanding of power distribution sector, functioning of power distribution utilities and organizational setup.*

Learning Outcome: *understanding about relationship between talent and organization to accelerate performance improvements, institutionalization of talent management system that ensures identification, management and development of talent portfolio*

UNIT-I

Talent: Engine of new economy, difference between talents and knowledge workers, leveraging talent, the talent value chain, element, of talent friendly organizations.

[R1, R2, R3, R4][No. of Hrs. 11]

UNIT-II

Talent Management System: Elements and benefits of Talent Management System; creating TMS, challenges of TMS; building blocks of talents management: competencies- performance management, evaluating employee potential.

[R1, R2, R3, R4][No. of Hrs. 11]

UNIT-III

Talent Planning: Succession management process; cross functional capabilities and fusion of talents; talent development budget, value driven cost structure; contingency plan for talent; building a reservoir of talent, leadership coaching.

[R1, R2, R3, R4][No. of Hrs. 11]

UNIT-IV

Return on Talent: ROT measurements, optimizing investment in talent; integrating compensation with talent management; developing talent management information system.

[R1, R2, R3, R4][No. of Hrs. 12]

Text/ Reference book(s):

[R1] Berger, Lance A and Dorothy Berger (Eds.), "The Talent Management Handbook", Tata McGraw Hill, New Delhi.
[R2] Chowdhary, Subir, "The Talent Era", Financial Times/ Prentice Hall International.
[R3] Chowdhary, Subir, "Organization 21C", Pearson Education, New Delhi.
[R4] Sanghi, Seema, "The Handbook of Competency Mapping", Response Books, New Delhi.

PROJECT MANAGEMENT AND CONTRACT ADMINISTRATION IN POWER DISTRIBUTION SECTOR
(Core Elective-IV)

Paper Code: ETVPD-706	**L**	**T/P**	**C**
Paper: Project Mgmt and Contract Administration in Power Distribution Sector	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **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 & Pre-requisite: *To familiarize students with concept, characteristics, types of projects in power distribution sector. Familiarization with project management and contract administration in power distribution sector. Basic understanding of power distribution sector, functioning of distribution utilities and economic concepts.*

Learning Outcome: *students should develop basic understanding of concept, characteristics, and types of projects in power distribution sector along with project management and contract administration in power distribution sector.*

UNIT-I

Concept of project and project management, Characteristics of project, Classification of Project, project selection process, Project life cycle, Project report, Project appraisal, Tools and techniques for project management, Project manager's roles and responsibilities; Capital expenditure decisions: capital budgeting decisions, Importance of capital budgeting decisions, Kinds of capital expenditure decisions, Capital expenditure budgeting process, Criteria of capital budgeting, Resource allocation framework.

[R1, R2, R3][No. of Hrs. 11]

UNIT-II

Market and demand analysis, sources of information, Market survey, Demand forecasting, Uncertainties in demand forecasting, coping with uncertainties; Technical analysis: Materials and inputs, Choice of technology, products mix, capacity, location and site, machinery and equipment, structures and civil works, project chart and layouts, work schedule; Financial analysis: Significance of financial analysis, Utility of financial and accounting statement; Analysis of project risk, market risk and firm risk.

[R1, R2, R3][No. of Hrs. 11]

UNIT-III

Need, procedure and features of social cost benefit analysis, main feature of social cost benefit analysis, public investment decision making; introduction to PERT/CPM, Development of Project Network, Time Analysis, time estimation, determination of critical path: calculate the earliest occurrence time (EOT) for each Event, calculate the latest occurrence time (LOT) for each Event, calculate the slack for each Event, obtain the critical and slack paths, calculate the Activity Floats, scheduling, variability in time estimates :PERT analysis, resource analysis and allocation, scheduling in view of resource constraints, project crashing and time-cost trade-offs: CPM Analysis.

[R1, R2, R3][No. of Hrs. 11]

UNIT-IV

Contract Administration: Process Inputs: Contract, contract management team, selected sellers, performance reports, approved change requests, work performance inputs; Contract administration process; contract administration tools and techniques: Contract change control system, Buyer conducted performance review, Inspections and audits, Performance reporting, Payment system, Claims administration, Records management system; Contract administration principles, do's and don'ts of contract administration, ethical decision making and contract administration; record retention and contract administration: good record keeping, setting up a contract file, record retention requirement.

[R1, R2, R3][No. of Hrs. 12]

Text/ Reference Book(s):

[R1] Gray, "Project Management: The Complete Guide For Every Manager", Tata McGraw Hill Education, Delhi, 2005
[R2] Sarma, K.V.S. "Law of Contract Administration and Tenders", Asia Law House, Delhi, 2015
[R3] R. N. Joshi, "Public Private Partnership in Infrastructure", Vision Books, Delhi, 2010

PROJECT PLANNING IN POWER DISTRIBUTION SECTOR
(Core Elective-IV)

Paper Code: ETVPD-708	**L**	**T/P**	**C**
Paper: Project Planning in Power Distribution Sector	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **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 & Pre-requisite: *To familiarize students with concept, characteristics, types of projects in power distribution sector. Familiarization with preparing project report, basics of contract and project financing concepts. Basic understanding of power distribution sector, functioning of distribution utilities and economic concepts*

Learning Outcome: *students should develop basic understanding of concept, characteristics, types of projects in power distribution sector, preparation of project report, basics of contract and project financing.*

UNIT-I

Project Development: Preparatory work required for developing projects/schemes that deliver reliable quality power within optimum fixed and operating costs: Considerations for Preparatory Work, recommended strategy, Scheme Formulation, framework for schemes development, project implementation tools, basic idea of creating a New Project on MS-Project.

[R1, R2][No. of Hrs. 11]

UNIT-II

Unit rate and turnkey contracts: Unit Rate Contracts, Turnkey Contracts, Comparison of Unit Rate and Turnkey Contracts, development of turnkey specifications, accountability (performance, timely execution and responsibility) of implementation agencies, project execution under turnkey contract system, case study of a typical project in power distribution sector.

[R1, R2][No. of Hrs. 11]

UNIT-III

Project Report Preparation and Appraisal: Factors in DPR preparation, field study, data collection, data analysis and application; cost component of DPR: basic equipment cost, Duties, Taxes and Freight, Freight and Transit Insurance, Civil Engineering Works, Erection, Engineering, Project Management, Supervision, Contingency, Interest During Construction, Project Investment, Pay Back Period and return on investment, DPR Preparation.

[R1, R2][No. of Hrs. 11]

UNIT-IV

Meaning and importance of project finance, means of finance and sources of project finance in India, Financial institution structure and financial assistance, Norms of finance and term loan procedure, SEBI guidelines, Sample financing plans, assessing the tax Burden: framework for deriving taxable income, important provisions relevant for deriving taxable income, set off, carry forward, and order of deduction for computing income from business.

[R1, R2][No. of Hrs. 12]

Text/ Reference Book(s):

[R1] Prasanna Chandra, "Projects: Planning, Analysis, Selection, Financing, Implementation, and Review", McGraw Hill Education, Delhi, 2014

[R2] B.C. Punmia, "Project Planning and Control with PERT and CPM", 4th Edition, Laxmi Publications, Delhi, 2016

COMMERCIAL ASPECTS IN POWER DISTRIBUTION SECTOR
(Core Elective-IV)

Paper Code: ETVPD-710	**L**	**T/P**	**C**
Paper: Commercial Aspects in Power Distribution Sector	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **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 & Pre-requisite: *To familiarize students with pricing, purchase and market structure and various power products in Indian power market. Basic understanding of power distribution sector, functioning of distribution utilities and economic concepts.*

Learning Outcome: *students are expected to develop basic understanding of pricing, purchase and market structure and various power products in Indian power market*

UNIT-I

Present Energy pricing Scenario in India and world, Coal Pricing, History of Energy pricing mechanism – India and World, Basic theory of energy pricing - Models, Pricing under various environments, cost and supply analysis, Long term, medium term and short term power market.

[R1, R2, R3, R4][No. of Hrs. 11]

UNIT-II

Taxation and Investment Framework, Financial Modeling of a Power Utility, Filing of ARR for a Distribution Utility, Tariff structure and tariff determination process.

[R1, R2, R3, R4][No. of Hrs. 11]

UNIT-III

Requirements of PPA, Risks and responsibilities in a power purchase agreement, Desirable Principles of power purchase agreements, Assessment of Tariff levels, Scope of the PPA, Articles and schedules of a model PPA, Definition and interpretation of terms of a model PPA, Negotiating Power purchase agreements, PPA - Financial and legal issues, Drafting of a model PPA, Study and Analysis of a sample PPA between a Generation and Distribution Utility.

[R1, R2, R3, R4][No. of Hrs. 11]

UNIT-IV

Power Trading: Introduction to Power Trading, Market Mechanisms, type of products, Financial and Technical Aspects of Power Trading, Emission Trading and Power Industry, Legal and Regulatory Framework.

[R1, R2, R3, R4][No. of Hrs. 12]

Text / Reference Book(s):

[R1] Central Electricity Regulatory Commission. (2016). Report on Short - term Power Market in India: 2015-16. Available: http://www.cercind.gov.in/2016/MMC/AnnualReport15-16.pdf

[R2] BSES. (2014). Delhi Distribution Business: What Determines Electricity Tariff. Available: http://www.bsesdelhi.com/docs/pdf/Delhi_Tariff_Economics.pdf

[R3] Mercados energy Market India Pvt. Ltd., (2014). Indian Power Market Journey so far and way forward. Available: https://www.iexindia.com/Uploads/Reports/14_01_2015IEX_India_IPM_Report.pdf.

[R4] World Bank. (2014). Understanding Power Purchase Agreements. Available: https://ppp.worldbank.org/public-private partnership/sites/ppp.worldbank.org/files/documents

REGULATORY FRAMEWORK FOR INDIAN POWER SECTOR AND LEGAL ISSUES
(Core Elective-V)

Paper Code: ETVPD-712	**L**	**T/P**	**C**
Paper: Regulatory Framework for Indian Power Sector and Legal Issues	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **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 & Pre-requisite: *To familiarize students with policies, governance and regulatory framework for Indian Power Distribution Sector. Basic understanding of power distribution sector, functioning of distribution utilities and basic economic considerations.*

Learning Outcome: *students should develop understanding of policies, governance and regulatory framework for Indian Power Distribution Sector.*

UNIT-I

Important regulatory provisions in Electricity Act 2003 regarding national electricity policy and plan, Licensing, transmission of electricity, distribution of electricity, tariff and Works of licensees.

[R1, R2][No. of Hrs. 11]

UNIT-II

Important regulatory provisions in Electricity Act 2003 regarding Constitution and functions of central electricity authority; regulations on constitution, powers and functions of state and central commission; regulations on Appellate Tribunal for Electricity, Investigation and enforcement, Offences and Penalties, Provisions related to special court.

[R1, R2][No. of Hrs. 11]

UNIT-III

National Electricity Policy, National Tariff Policy, Central Electricity authority and its function, Central Electricity authority and its regulations regarding transmission charges, transmission losses, grid code, open access, tariff determination, renewable energy sources etc.

[R1, R2][No. of Hrs. 11]

UNIT-IV

Delhi Electricity Reform Act, Delhi Electricity Regulatory Commissions' regulations: Electricity Supply Code and Performance Standards, Demand Side Management Regulations, Net Metering for Renewable Energy Regulations, Determination of Tariff Regulations, Determination of Tariff for Grid-connected Solar Photo Voltaic Project Regulations, Renewable Purchase Obligation and state grid code regulations.

[R1, R2][No. of Hrs. 12]

Text/ Reference Book(s):

[R1] Alok Kumar, Sushanta K. Chatterjee, "Electricity Sector in India: Policy and Regulation", Oxford University Press, 2012

[R2] Niranjan, R.S. (2004). "Guide to Electricity Laws in India: Based on the Electricity Act", Universal Law Publishing Co Ltd, Delhi, 2004

INDIAN POWER SECTOR AND CHALLENGES AHEAD
(Core Elective-V)

Paper Code: ETVPD-714	**L**	**T/P**	**C**
Paper: Indian Power Sector and Challenges Ahead	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **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 & Pre-requisite: *To familiarize students with present scenario of Indian power distribution sector and challenges present / likely to occur in future. Basic understanding of Indian Power Sector, various stakeholders and their interrelation.*

Learning Outcome: *students should develop a comprehensive view of Indian Power Sector as a whole and issues present / likely to occur.*

UNIT-I

Current scenario of Electricity Sector in India: Generation, transmission, distribution, consumption, demand trends, performance standards; stability and clarity of policies, regulatory and dispute redressal mechanism, financial health of Indian power sector, trained manpower for power sector.

[T1][No. of Hrs. 11]

UNIT-II

Under Performance in generation, transmission and distribution; quality fuel availability and fuel security, Problems of Coal Blocks, availability of Equipments and technology, Land Acquisition, Environment Clearance, climate change and its impacts, Global Environmental issues, sustainable development.

[T1, R1][No. of Hrs. 11]

UNIT-III

Inimical Financing Environment, limited capacity of power transmission, Policy Paralysis, shortage of skilled manpower, issues with power purchase agreements, Rural Electrification: Assessing Demand, Integrating various supply options, implication of rural electrification on quality of life and National economics.

[T1, R1][No. of Hrs. 11]

UNIT-IV

Emerging trends and challenges: Public private partnership, Open Access, smart grid initiatives, smart / NET metering, Advanced Metering Infrastructure (smart meters, communication network, meter data acquisition system, and meter data management system), increasing penetration of renewable energy, integration of renewable energy, national grid, technological up gradation in distribution.

[T1, R1][No. of Hrs. 12]

Text Book(s):

[T1] Pradhan, B K., Power Sector in India: Issues and Challenges; Alfa Publications (2008), Delhi

Reference Book(s):

[R1] Ministry of Power, Govt. of India, Report of the Working Group on Power for Twelfth Plan (2012-17)

POWER DISTRIBUTION SECTOR AND CHALLENGES AHEAD
(Core Elective-V)

Paper Code: ETVPD-716	**L**	**T/P**	**C**
Paper: Power Distribution Sector and Challenges Ahead	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTER: **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 & Pre-requisite: *To familiarize students with present scenario of power distribution sector and challenges present / likely to occur in future. Basic understanding of power distribution sector, functioning of distribution utilities and basic economic considerations.*

Learning Outcome: *students should develop a comprehensive view of power distribution sector as a whole and issues present / likely to occur.*

UNIT-I

Implementing Sector Reforms, distribution sector reforms Index, Sector Outcomes Index, Relationship between Implementation of Reforms and Sector Outcomes, The Role of Governance and Institutional Factors; Vertical Restructuring: Unbundling State Electricity Boards. Corporate Governance, More Power to India Regulatory Governance, Central Mandates and schemes, Poor Management of Distribution Utilities.

[R1, R2][No. of Hrs. 11]

UNIT-II

Deterioration of Distribution Finances, Power distribution sector operating environment and its contribution in DISCOM financial difficulties, Non-remunerative tariff structure, Theft and Pilferage of Electricity, Deficiencies in revenue collection of utilities, State Subsidies to the Sector Impose a Heavy Opportunity Cost, Rising Power Sector Debt Has Escalated the Risk of Financial Contagion, The Central Government's Response to the Risk of Contagion, promoting responsible lending to the power sector, Tariff Performance on Equity, Projected Sector Finances in near future.

[R1, R2][No. of Hrs. 11]

UNIT-III

Inefficiencies in Distribution, Inefficient Billing, Inadequate Revenue Collection, Decomposition of Utility Losses, technology up-gradation of distribution network, Agriculture and rural consumption segregation, Assessing Demand, Integrating various supply options, Rural Electrification, implication of rural electrification on quality of life and National economics.

[R1, R2][No. of Hrs. 11]

UNIT-IV

Ageing Infrastructure, up-gradation of distribution network, adoption of smart grid technologies, Shortage of Power, Barriers in Integrating Renewable Energy into the Electricity Grid, low customer satisfaction, Benchmarking Utilities on Financial and Operational Indicators, Poor Quality Power, Application of Information Technology, poor governance and over staffing, poor change management, Efficient and Effective Service Delivery, Separation of Carriage and Content in Distribution.

[R1, R2][No. of Hrs. 12]

Text/ Reference Book(s):

[R1] Ministry of Power, Govt. of India, Report of the Working Group on Power for Twelfth Plan (2012-17)

[R2] Mahua Mukherjee, Private Participation in the Indian Power Sector: Lessons from Two Decades of Experience (Directions in Development - Energy and Mining); 2014; World Bank; available at Amazon

PROJECT MANAGEMENT AND CONTRACT ADMINISTRATION IN POWER DISTRIBUTION SECTOR LAB
(Core Elective-IV)

Paper Code: ETVPD-756	**L**	**T/P**	**C**
Paper: Project Mgmt & Contract Administration in Power Distribution Sector 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 the functioning of power distribution utility of your area and list the services outsourced to external agencies
2. Study of a contract document of power distribution utility of your area, executed to get work/services for operations/maintenance/up-gradation or any other power distribution related work / service
3. Study detailed project report of any ongoing project related to work/services for operations/maintenance/up-gradation or any other power distribution related work/service in power distribution utility of your area
4. Study of a contract document of power distribution utility of your area, executed to get work/services for operations/maintenance/up-gradation or any other power distribution related work/service and prepare a note for penal clauses on various count
5. Study details of a project undertaken by power distribution utility of your area, which got delayed in its execution. Prepare a brief note on various negative outcome, arising out of this delay in execution of the project
6. With the help of project management software, model a sample project and analyze it on various counts making student comfortable in using project management software in project planning and management.

PROJECT PLANNING IN POWER DISTRIBUTION SECTOR LAB
(Core Elective-IV)

Paper Code: ETVPD-758	**L**	**T/P**	**C**
Paper: Project Planning in Power Distribution Sector 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 of a contract document of power distribution utility of your area, executed to get work/services for operations/maintenance/up-gradation or any other power distribution related work / service
2. Study detailed project report of any ongoing project related to work/services for operations/maintenance/up-gradation or any other power distribution related work/service in power distribution utility of your area
3. Study of a contract document of power distribution utility of your area, executed to get work/services for operations/maintenance/up-gradation or any other power distribution related work/service and prepare a note for penal clauses on various count
4. Prepare a note on steps taken by power distribution utility towards change management during the process of technological up-gradation in
5. Prepare a note on specific features of project planning for the projects undertaken by power distribution companies in the area of upgrading existing power distribution infrastructure like technology up-gradation /capacity enhancement
6. With the help of project management software, model a sample project and analyze it on various count making student comfortable in using project management software in project planning and its management.

COMMERCIAL ASPECTS IN POWER DISTRIBUTION SECTOR LAB
(Core Elective-IV)

Paper Code: ETVPD-760	**L**	**T/P**	**C**
Paper: Commercial Aspects in Power Distribution Sector 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. Prepare a report of electricity prices in select counties and draw comparison with Indian counterparts
2. Prepare a report of electricity prices in various states of the country and list important observations
3. Prepare a brief report on power pricing mechanism adopted in power distribution utility of your area
4. Prepare a report on tariff determination process adopted in your area in preceding years
5. Study an existing PPA of any power distribution utility and write a short note on its salient features
6. Study balance sheet of power distribution utility for preceding year and prepare a summary note of it
7. Prepare a report on emission trading in Indian power sector

POWER QUALITY LAB

	L	T/P	C
Paper Code: ETVPD-752			
Paper: Power Quality 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:

1. Detailed study of a report about quality of power supplied by any power distribution company in any urban locality and practices adopted in utility to monitor it.
2. Identifying power quality issues in your locality with the help of primary / secondary sources of information
3. Familiarizing with use of power quality analyzer and using it for power quality measurement / analysis for various parameters
4. Visiting a facility / laboratory of power quality checking and familiarizing about various equipments used
5. Visiting a facility / laboratory of power quality checking and familiarizing about practices / processes to check power quality
6. To obtain the current harmonics drawn by power electronics interface.
7. Familiarization with any simulation tool (like PSCAD etc.), for analyzing power systems transients
8. Familiarization with any computing / plotting tool (like MATLAB etc.), used for simulating / plotting functions
9. Demonstration of power quality issues like transients study on any software being used for power quality analysis in power distribution companies in current times. Students should be made to practice use of this software to study various power quality issue including transient analysis and frequency disturbances.

INDUSTRIAL TRAINING-V

Paper Code: ETVPD-762	**L**	**T/P**	**C**
Paper: Industrial Training-V	**0**	**2**	**4**

Students will undergo industrial training in relevant industrial establishment for period (2 weeks to 4 weeks), as specified by the University / Institute.

MAJOR PROJECT

Paper Code: ETVPD-764	**L**	**T/P**	**C**
Paper: Major Project	**0**	**24**	**12**

Objective & Pre-requisite: *Application of knowledge and skill acquired during the program in perceiving, analyzing and contributing positively towards solution of an issue existing / likely to occur, in power distribution sector. Presentation skills (oral and written), familiarity with state of the information technology tools used in Power Distribution sector and confidence to connect with inter-state/trans-national power utilities/entities. Good understanding of technologies, processes and functioning in power distribution sector*

Learning Outcome: *students should be able to able to apply/integrate the knowledge and skill acquired during the program with real time functioning of power distribution companies. Presentation skills (oral and written), familiarity with state of the information technology tools used in Power Distribution sector and confidence to connect with inter-state/trans-national power utilities/entities.*

1. Students will be asked to identify an (existing/likely to occur) issue/problem in power distribution sector/power distribution utility at local area/city/state/national/global level. Issues in the domain of capacity building, disaster management, distribution sector finances, organizational issues and many more, affecting functioning/performance of power distribution utilities directly/indirectly can also be taken up for project work.
2. Student will work towards investigating/analyzing/designing a possible solution to it. Students will remain in regular interaction with expert from industry and guide allotted for the purpose.
3. Evaluation of the work done will be strictly on the basis of application of knowledge acquired during program, quality & originality of work, wholistic approach, presentation skill (oral & written) and students ability to connect with prevailing scenario on the issue concerned at national/global level.
4. The project work may be developing a physical prototype, investigating an issue, preparing report, application of technology, process improvement, software design or any other work advised / approved by guide.
   Power Distribution Sector is fast moving sector, where technology and processes changes at fast pace. Very few books text books are available on advances taking place and most of the information on state of the technology/process is available in the form of reports, manuals and technological advances provided by large companies / utilities / government and other reputed institutions. As the B Voc Program is skill based one, facilitating students the current information about state of the art technology and processes is must. To accomplish it, each student must be provided with
5. At-least 12 hours/week of time in project lab having computer with dedicated high speed internet facility to access online available data, technological updates, process details and necessary computation / designing / development work. Computers should be of reasonably advanced configuration, with antivirus software installed in all systems. Internet speed at each computer terminal should not be less than 1 MBPS. If required optical cable based internet connection line should be used to secure reasonably high speed.
6. Necessary software for power system analysis, Computer Aided Design and Drawing (CADD) / mathematical computation / power system modeling, project management and project planning should also be facilitated to students. Trained faculty and technical staff for assisting students in making them familiar for using these software tools should be made available.
7. Testing bench and associated tools / equipments for quality measurement, energy metering, switchgear & protection etc., and other necessary software should also be made available in project lab.