NOTIFICATION

No. 195/2023 Dated : 23/11/2023

Subject : Implementation of new syllabus of Semester I to IV of the Course M.E. Electrical Engineering (Electronics & Power) as per CBCS Pattern from the Session 2023-2024 onwards.

It is notified for general information of all concerned that the authorities of the University have accepted to implement the new syllabus of Semester I to IV of the Course **M.E. Electrical Engineering (Electronics & Power)** as per Choice Based Credit System Pattern from the Session 2023-2024 onwards as mentioned below:

Sd/-
(Dr.T.R.Deshmukh)
Registrar

Syllabus Prescribed For
Two Year Post Graduate Course In Master Of Engineering (Full Time & CBCS))

M.E. Electrical Engineering (Electronics & Power)

SEMESTER I

1EPS01 / 1EEP01 GENERATION SCHEDULING AND LOAD DISPATCH

Unit-I:
Overview of Power Generation: Thermal, Hydro and Nuclear power generation systems, Fossil fuels. Power system reforms, deregulation of electric utilities, energy management & conservation.Chronological Load Curves, Power duration curve, Integrated duration curve, Hydrography, Flowduration curve, Mass curve for Hydro Power generations.

Unit-II:
Co-ordination of steam, Hydro and Nuclear power stations, Optimum Generation allocation--Line lossesneglected and including the effect of transmission losses for thermal power generations. Long range and short-range Hydro generation scheduling, short term and long term Hydro-thermal scheduling of generation.

Unit-III:
Classification of loads –Load forecasting methodology-Energy forecasting peak demand forecasting- Weather sensitive and non-weather sensitive forecasting - Total forecast -Annual and Monthly peak demand forecast.

Unit-IV:
Generation System Cost analysis -capacity cost, production cost, depreciation cost. Production analysis, production analysis involving nuclear unit, production analysis involving hydro unit.Fuel inventories- energy transaction and off-peak energy utilization.

Unit-V:
Generation System Reliability Analysis: probabilistic generating Unit-Model and Load model, effective load-Reliability analysis for isolated system, interconnected system, Reliability analysis of interconnected system.

Unit-VI:
Load dispatch & System Communication: Consideration for centralized control of system operations. Requirements of the central load dispatch centre.
Telemetry- Remote control and data transmission etc.

Text Books:

1. R.L. Sullivan,"Power System Planning " byTataMcGraw Hill.
2. KirchmayersL.K., "Economic Control of Interconnected System"byJohn Wiley and Sons, NewYork.
3. B.R. Gupta , " Generation of Electrical Energy "by Euresia Publishing House Pvt., Ltd., NewDelhi.

Reference Books:

1. Loi Lei Lai , " Power System Restructuring and Deregulation " by John Wiley and sons Ltd
2. Mohammad ShahidehpourMuwaffaqAlomoush, " Restructured Electrical Power Systems " byCRC Press.
3. Jack Duckworth , " Power to the People : Electric Power Deregulation: An Expose " byexpertsystems programs and consulting incorporated 2001.
4. A.J. Wood and B.F. Wollenberg, " Power Generation, Operation and Control " by John Wiley1996.

1EEP02 DIGITAL SIGNAL PROCESSING

Unit-I:
Review of Discrete time systems, LTI systems, Impulse response and frequency response. Discrete convolution. Discrete Fourier Transform and Fast Fourier Transforms, Inverse DFT, Algorithms for efficient computation of DFT and FFT. Fast convolution. Correlation.

Unit-II:

Implementation of DSP algorithms, Block diagram and signal flow graph representations, Basic IIR and FIR filter structures, Cascaded, parallel and lattice realizations, computational complexity. Finite word length effects and quantization errors.

Unit-III:

Digital filter design. FIR and IIR filters, linear phase filters, design techniques for IIR filters using analog filter transformation methods, design techniques for FIR filters using windowing method. Analysis of finite word length effects.

Unit-IV:

Estimation of Auto-correlation and Power Spectra of random signals. Nonparametric methods – averaging periodgrams, Welch method, Blackman and Tukey method, Parametric methods, AR, MA andARMA models, Yule Walker method, Levinson-Durbin algorithm.

Unit-V: Multi-rate digital signal processing. Poly-phase decomposition, multistage decimators and interpolators, Digital filter banks. Adaptive filtering, minimum mean square error criterion, Wiener filter, LMS adaptive algorithm.

Unit-VI :
General purpose DSP processors, Implementation of DSP algorithms on General purpose processors: issues, advantages & disadvantages. Special purpose DSP processors –Hardware digital filters and FFT processors.

Text Book: Proakis and Manolakis, "Digital Signal Processing: Principles, Algorithms and Applications " by Prentice Hall (3rdEdition)

Reference Books :
1. S.Mitra, " Digital Signal Processing: A Computer Based Approach" by Tata McGraw Hill
2. Oppenheim & Schafer, " Discrete Time Signal Processing" by PHI.
3. Defatta, " Digital Signal Processing" by Wiley Inter-Science.
4. Ifeachor& Jervis, " Digital Signal Processing" by Pearson Education.

1EPS03 / 1EEP03 – PROGRAM ELECTIVE I(i) ADVANCED CONTROL SYSTEM

Unit I: Compensation Techniques (Analog Systems) :Introduction, preliminary consideration of classical design. Lead compensator, Lag compensator, Lead-Lag compensator, cascade compensation in time domain, cascade compensation in frequency domain, Feedback compensation in frequency domain.

UNIT -II:

State Space Technique -I (Analog Systems) :State,state space and state variables,SISO /MIMO linear systems state Variable models- differential equations, transfer functions,block diagrams and state diagrams. Transfer function decomposition –Phase variable Forms,canonicalforms and Jordan canonical forms, STM computation, L.T, Canonical transformation, and Cayley Hamilton theorem. Time Response –SISO systems.

Unit -III:

State Space Technique -II :(Analog Systems) Concept-controllability and observability, SISO/ MIMO linear Systems Gilbert's method and Kalman'stest , SISO controllable Systems design–state feedback.

UNIT -IV :

Sampled Data Control Systems: Representation transform Sampler and hold, ZOH, Open loop and closed loop SDCS, Z transfer Function, difference equation, solution, Pulse transfer function, StabilityAnalysis, S and Z domain relationship, Jury's test and bilinear Transformation. Root locus method.

Unit -V : State Variable Analysis of Digital Control Systems:

State descriptions of Digital Processors, State Description of Sampled Continuous-Time Plants, State Description of Systems with Dead-Time, Solution of State Difference Equations, Controllability and Observability, Multivariable Systems.

Unit -VI:

Implementation of Digital Controllers:Tunable PID Controllers, Digital Temperature Control System, Digital Position Control System, Stepping Motors, and their Control.

Text Books:
1. M. Gopal, " Digital Control and State Variable Techniques" by TMH.
2. Nagrath and Gopal, " Control system Engineering " by Wiley Eastern Ltd, New Delhi.
3. Ogata, " Modern Control Theory by Prentice Hall ofIndia Pvt Ltd, New Delhi.

Reference Books:
1. Katsuhiko Ogata , " Digital Control Engineering "by PHI.
2. Kuo B. C. , " Digital Control Systems " by Wiley & Sons
3. M. Sami Fadali, Antonio Visioli, "Digital Control Engineering: Analysis and Design " by AP.

1EPS03/1EEP03 – PROGRAM ELECTIVE I (ii) ADVANCED ELECTRIC DRIVES

Unit I: Introduction: Definition of electric drive, types of load; Speed torque characteristic of driven unit/loads, motors, steady state and transient stability of drives; Classification and components of load torque; Selection of motor power capacity for different duty cycles.

Unit -II:
Methods of DC motor control, non-regenerative controlled rectifiers, fully controlled converters, field control, Switching systems for DC motors, chopper regulators, aspects of analysis, performance and stability of variable speed DC drives.

Unit -III:
Induction motor control systems, AC regulators and static switches, control of effective rotor resistance, recovery of slip energy, variable frequency control of AC motors.

Unit -IV:
Current source inverter fed Induction motor drive, forced commutated inverter fed drives, self-controlled synchronous motor drives and traction drives, Slip Power Controlled AC Drives: Static rotor resistance control, static Kramer drive.

Unit -V:
Analysis, performance, and stability of synchronous and asynchronous drives, Solar and battery powereddrives.

Unit VI: Inverter fed AC Drives: Constant V/f-controlled induction motors, controlled current andcontrolled slip operations; variable frequency-controlled induction motor drives; PWM inverter drives.

Text Books :
1. W. Leonhard, " Control of Electric Drives" by Springer Verlag, 1985
2. S. K. Pillai, "A First Course on Electrical Drives" by New Age International Publishing Co.Ltd.

Reference Books :
1. Peter Vas,"Vector Control of AC Machines" by Clarendon press, 1990
2. S.K.Pillai, "Analysis of Thyristor Power Conditioned Motors" by University Press, 1992
3. Gopal. K. Dubey," Fundamentals of Electrical Drives" by CRC Press
4. G. K. Dubey, " Power Semiconductor Controlled Drives" by Prentice Hall
5. VedamSubrahmanyam, " Electric Drives: Concepts & Applications " by Tata Mc Graw HillPublishing Co Ltd
6. Austin Hughes and Bill Drury, " Electric Motor and Drives: Fundamentals, Types and Applications",Newnes, Oxford.

1EEP03 PROGRAM ELECTIVE I (iii) DIGITAL IMAGE PROCESSING

Unit I: Image processing fundamental: Basic image processing Steps, Digital image representation, Image acquisition, sampling and quantization, basic relationship between pixels, distance measures, point operations, Human visual system, Image types, zooming operation.

Unit- II: Image enhancement in spatial domain: Basic Gray level transformations, Histogram processing, Arithmetic and logic operations, spatial domain filtering, bit-plane slicing, median filter, colour image processing fundamentals and colour models.

Unit –III: Image Transforms: 2D DFT, Walsh transform, Hadamard transform, Slant transform, Discrete transform, KL transform, Radon transform and Multiresolution wavelet transform.

Unit –IV: Image enhancement in the frequency domain: Filtering in frequency domain, Homomorphic filter, Image Restoration and Denoising, Image degradation models, Types of image blur, image restoration model, linear image restoration, nonlinear image restoration techniques, blind deconvolution and classification technique, imagedenoising, noise in image.

Unit –V: Image segmentation: Detection of discontinuities, edge-based segmentation, edge detection, edge linking, Hough transform, Thresholding, region-based segmentation, watershed transformation, shape representation and classification, Morphological techniques, Object & pattern recognition & interpretation method.

Unit –VI: Image Compression: Lossy block truncation & vector quantization, lossless Huffman coding, run length coding & block coding, transform coding. Image processing standards.

Text Books:
1. S Jayaraman, S Esakkirajan, T Veera Kumar ," Digital Image Processing " by Tata Mc Graw Hill.
2. R.C Gonzales &Woods ," Digital Image Processing " by Addison Wesley (3rd Edition)

Reference Books :
1. A.K.Jain, " Fundamental Digital Image Processing"byPrentice Hall Inc.
2.W.K Pratt," Digital Image Processing" by John Wiley (3rdedition)
3. B Chanda and D. Mujumdar ," Digital Image Processing and Analysis" by PHI New Delhi.

1EPS04/ 1EEP04 – PROGRAM ELECT. II (i) HIGH VOLTAGE TRANSMISSION SYSTEM

Unit I: Introduction to HVDC Transmission, Comparison of HVAC and HVDC transmission systems, Applications of DC transmission, Types of HVDC links, Layout of HVDC Transmission System, Planning for HVDC transmission, Modern trends in HVDC technology, DC breakers, Applications ofHVDClines,Introduction to Multiterminal HVDC.

Unit -II: Line commutated converter, Analysis of Graetz circuit with and without overlap, Pulse number, Choice of converter configuration, Converter bridge characteristics, Analysis of 12 pulse converters, Analysis ofVSC topologies and firing schemes**.**

Unit -III: Principles of DC link control, Converter control characteristics, System control hierarchy, Firing angle control, Current and extinction angle control, Starting and stopping of DC link, Power control, Higher level controllers, Control of VSC based HVDC link**.**

Unit -IV: Introduction of EHV-AC transmission, Standard Transmission Voltages, Tower configuration, Thermal ratings of lines, circuit breakers, insulators for A.C. transmission, Resistance, Inductance and Capacitance of Conductors, Bundled Conductors, Design of EHV lines based upon steady state limits, Introduction to Gas Insulated Substations (GIS).

Unit -V: Corona Phenomenon, Power loss due to corona, audible noise and radio interference due to corona, factors affecting corona, advantages and disadvantages of corona, methods to reduce the effect of corona, electrostatic field of EHV lines, voltage gradient of conductors, Electric Shock and Threshold Currents**.**

Unit -VI: Lightning Phenomena and its effects on Transmission Line, Lightning Mechanism and Strokes, Lighting and switching over voltage protection, Shielding of Transmission Line, Lightning Arresters and Protective Characteristics, Insulation Coordination, Grounding of transmission towers and substations.

Text Books:

1. K.R. Padiyar, " HVDC Power Transmission Systems" by New Age International Publishers, (3rd Edition) New Delhi, 2017.
2. Begamudre R.D., " Extra High Voltage AC Transmission Engineering" New Age International Publishers(4thEdition) , New Delhi, 2011.

Reference Books:

1. Edward Wilson Kimbark, Direct Current Transmission‖, Vol. I, Wiley Inter-science, New York,London, Sydney, 1971.
2. Colin Adamson and Hingorani N G, "High Voltage Direct Current Power Transmission" byGarraway Limited, London, 1960.
3. M. G. Dwek, "EHV Transmission" by Elsevier , 1991.

1 EEP04 – PROGRAM ELECTIVE II: (ii) ANALYSIS &MODELLING OF ELECTRICAL MACHINES

Unit I: Basic principle for Electrical Machine Analysis: Introduction, magnetically coupled circuits, electromechanical energy conversion, Machine Windings & Airgap MMF, Winding Inductances & Voltage Equations. Economic dispatch of Thermal Units and methods of solutions – problem considering and neglecting transmission losses.

Unit -II:

Linear transformation–Phase transformation (a, b, c to α, β, o) – Active transformation (α. β,o to d, q). Circuit model of a 3-phase Induction motor – Linear transformation – Phase Transformation– Transformation to a Reference frame – Two axis models for induction motor-d-q model based DOL starting of Induction Motors.

Unit -III:

Reference frame theory: Introduction, equations of transformation-change of variables, Stationary circuit variables transformed to the arbitrary reference frame, commonly used reference frames and transformation between reference frames, transformation of a balanced set, Balanced steady state phasor relationships and voltage equations, Variables observed from various frames of reference.

Unit- IV:

Symmetrical Induction machines: Voltage and torque equations in machine variables, Equation of transformation for rotor circuits, Voltage & torque equations in arbitrary reference frame variables, Per unit system, Analysis of steady state equations, Free acceleration characteristics viewed from various reference frames, Dynamic model and analysis for sudden change in load torque, Dynamic model & analysis during three phase fault at the machine terminals, Unbalanced operation at symmetrical Induction Machines, Symmetrical component theory and analysis of unbalanced stator voltages, Analysisof steady state operation with unbalanced rotor conditions.

Unit -V:

Synchronous machines: Voltage & torque equations in machine variables, Stator voltage equations in arbitraryReference frame variables, Voltage equations in rotor reference frame variables-ParkEquation, Torque equation, rotor angle and angle between rotors, Per unit system, analysisof steady state operation, Dynamic performance during a sudden change in input torque.

Unit -VI: Special Machines:

Permanent magnet synchronous machine. Surface permanent magnet (square and sinusoidal back emf type) and interior permanent magnet machines. Analysis of Switch Reluctance Motors.Brushless D.C. Motor modelling and analysis.

Text Books:

1. P. S. Bimbhra, " Generalized Machine Theory" by Khanna Publishers.
2. Oleg Wasynczuk, Paul C. Krause, Scott D. Sudhoff, Steven D. Pekarek, "Analysis of Electric Machinery and Drives Systems" by Wiley.

Reference Books :

1. Paul C. Krause, Oleg Wasynczuk and Scott D. Sudhoff, "Analysis of Electric Machinery and DriveSystems" by John Wiley & Sons, New York, 2004.
2. Charles Kingsle,Jr., A.E. Fitzgerald, Stephen D.Umans, "Electric Machinery" by Tata McGraw Hill
3. R. Krishnan, "Electric Motor & Drives: Modelling, Analysis and Control" by Prentice Hall of India
4. Miller, T.J.E., "Brushless Permanent Magnet and Reluctance Motor Drives" by Clarendon Press
5. Chee-Mun, " Dynamic Simulation of Electric Machinery using MATLAB" by Prentice Hall
6. K. R. Padiyar, "Power System Dynamics Stability and Control" by B S Publications
7. P. Kundur, "Power System Stability & Control" by Tata McGraw hill.

1EPS04 / 1EEP04 – PROGRAM ELECTIVE II (iii) SMART GRID TECHNOLOGY

Unit I: Introduction to Smart Grid: Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, National and International Initiatives in Smart Grid.

UNIT –II:

Smart Meters and Advanced Metering Infrastructure: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) and their application for monitoring & protection.

UNIT –III:

DistributionGenerationTechnologies:IntroductiontoDistribution Energy Sources, Renewable Energy Technologies Microgrids Storage Technologies Electric Vehicles and plug in hybrids EnvironmentalimpactandClimateChangeEconomicIssues.

UNIT –IV:

Tools and Techniques for Smart Grid:Computational Techniques, Static andDynamic Optimization Techniques for power applications such as Economic load dispatch, Computational Intelligence Techniques, Evolutionary Algorithms in power system, Artificial Intelligence techniques and applications in power system.

UNIT -V

Demand side management of Smart Grid: Demand response analysis of Smart Grid, Pricing and Energy Consumption Scheduling, Controllable Load Models, Dynamics and Challenges, Electric Vehicles and Vehicle-to-Grid Systems, Demand Side Ancillary Services Energy Management, Practical study of Smart Grid.

UNIT -VI

Power Quality Management in Smart Grid: 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, Power Quality Audit.

Text Books:

1. S. Borlase, "Smart Grids, Infrastructure, Technology and Solutions" by CRC Press, 2013, (1st Edition)
2. G. Masters, "Renewable and Efficient Electric Power System" by Wiley–IEEE Press, 2013 (2nd Edition)

Reference Books:

1. A.G. Phadke and J.S.Thorp," SynchronizedPhasorMeasurementsandtheirApplications" by Springer,2017 (2ndEdition)
2. T.Ackermann,Hoboken,N.J. "WindPowerinPowersystems" by JohnWiley,2012 (2ndEdition)
3. JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications" by Wiley 2012.
4. VehbiC. Gungor, DilanSahin, TaskinKocak, SalihErgut, ConcettinaBuccella, CarloCecati and Gerhard P. Hancke, "Smart Grid Technologies: CommunicationTechnologies and Standards" by IEEE Transactions on Industrial Informatics, Vol. 7, No. 4,November 2011.
5. Xi Fang, SatyajayantMisra, GuoliangXue, and DejunYang , " Smart Grid – The New andImproved Power Grid: A Survey"byIEEE Transaction on Smart Grids, vol. 14, 2012.

1EPS05 / 1EEP05 RESEARCH METHODOLOGY AND IPR

Unit -I:
Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem.Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.

Unit -II:
Effective literature studies approaches, analysis, Plagiarism, Research ethics.

Unit -III :
Effective technical writing, how to write report, Paper , Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

Unit -IV:
Nature of Intellectual Property: Patents, Designs, Trade and Copyright; Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Unit -V :
Patent Rights: Scope of Patent Rights ,Licensing and transfer of technology , Patent information anddatabases; Geographical Indications.

Unit -VI:
New Developments in IPR: Administration of Patent System, New developments in IPR ,IPR ofBiological Systems, Computer Software etc.

Text Books:

1. Stuart Melville and Wayne Goddard, " Research methodology: An introduction for science & engineering students by Juta and company Ltd
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"byJuta andcompany ltd
3. Ranjit Kumar, " Research Methodology: A Step by Step Guide for beginners " by SAGE publication(2ndEdition)

Reference Books:

1. Halbert, "Resisting Intellectual Property" by Taylor & Francis Ltd, 2007.
2. Mayall, "Industrial Design" by McGraw Hill, 1992.
3. Niebel, "Product Design" by McGraw Hill, 1974.

1EPS06 / 1EEP06 –AUDIT – I

(i) ENGLISH FOR RESEARCH PAPER WRITING

Unit I: Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs andSentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

Unit -II:
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing andPlagiarism, Sections of a Paper, Abstracts. Introduction.

Unit-III: Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

Unit -IV:

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills areneeded when writing an Introduction, skills needed when writing a Review of the Literature

Unit -V:

Skills are needed when writing the Methods, skills needed when writing the Results, skills are neededwhen writing the Discussion, skills are needed when writing the Conclusions

Unit -VI:

Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

Text Books:

1. Goldbort R,“ Writing for Science by Yale University Press (2006)
2. Day R , “ How to Write and Publish a Scientific Paper” by Cambridge University Press (2006)

Reference Books:

1. HighmanN ,“Handbook of Writing for the Mathematical Sciences” SIAM. Highman’s book (1998)
2. Adrian Wallwork ,“ English for Writing Research Papers” by Springer New York Dordrecht Heidelberg London.(2011)

1EPS06 / 1EEP06 –AUDIT – I (ii) DISASTER MANAGEMENT

Unit -I: Introduction: Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude

Unit -II:
Repercussions Of Disasters and Hazards. Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts

Unit -III:
Disaster Prone Areas in India. Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone To Cyclonic and Coastal Hazards With Special Reference to Tsunami; Post-Disaster Diseases and Epidemics.

Unit -IV:
Disaster Preparedness and Management Preparedness: Monitoring of Phenomena Triggering A Disasteror Hazard; Evaluation of Risk: Application Of Remote Sensing, Data From Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness

Unit -V:
Risk Assessment Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-operation in Risk Assessment and Warning, People’s Participation in Risk Assessment. Strategies for Survival

Unit -VI :
Disaster Mitigation Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs of Disaster Mitigation in India

Text Books:

1. R. Nishith, Singh AK, “ Disaster Management in India: Perspectives, issues and strategies” byNew Royal book Company.
2. Sahni, PardeepEt.Al. (Eds.), “ Disaster Mitigation Experiences and Reflections ”by Prentice Hallof India, New Delhi.

Reference Book:

1. Goel S. L., “ Disaster Administration and Management Text and Case Studies” by DeepPublication Pvt. Ltd., New Delhi.

1EPS06 / 1EEP06 –AUDIT – I (iii) CONSTITUTION OF INDIA

Unit –I: History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working)
Unit –II: Philosophy of the Indian Constitution: Preamble Salient Features

Unit -III:
Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

Unit -IV:
Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Minister, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

Unit -V:
Local Administration: District's Administration head: Role and Importance; Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation;Panchayat raj: Introduction, PRI: ZilaPanchayat; Elected officials and their roles, CEO ZilaPanchayat: Position and role; Block level: Organizational Hierarchy (Different departments); Village level: Role of Elected and Appointed officials;Importance of grass root democracy

Unit -VI:
Election Commission: Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women

Text Books:

1. Dr. S. N. Busi, " Dr. B. R. Ambedkar framing of Indian Constitution" 2015 (1st Edition)
2. M. P. Jain, " Indian Constitution Law " by Lexis Nexis, 2014 (7th Edition)

Reference Books:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. D.D. Basu, "Introduction to the Constitution of India" by Lexis Nexis, 2015.

1EPS06 / 1EEP06 –AUDIT – I (iv) STRESS MANAGEMENT BY YOGA

Unit I: Definitions of Eight parts of yog (Ashtanga).

Unit -II :
Yam and Niyam.
Do`s and Don't's in life.
i) Ahinsa, satya, astheya, bramhacharya and aparigraha
ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Unit -III :
Asan and Pranayam

i) Various yog poses and their benefits for mind & body
ii) Regularization of breathing techniques and its effects-Types of pranayam

Reference Books:
1. " YogicAsanas for Group Training-Part-I" by Janardan Swami YogabhyasiMandal, Nagpur
2. "RajaYoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama, Kolkata.

SEMESTER II

2EPS01 / 2EEP01 - ADVANCED PROTECTION OF POWER SYSTEMS

Unit I: Review of Principles of Power System Protection: General philosophy of protection, Instrument Transformer for Relaying, Relay terminology, Review of Relay characteristics, Classification of Relays, Circuit Breakers. Auto reclosure.

Unit II: Static & Numerical relays: Static Relay: General block diagram of static relay, merits & demerits of static relay, static over-current, directional, differential and distance relay.
Numerical relay: Numerical relaying fundamentals, block diagram, sampling theorem, correlation with a reference wave, least error squared (LES) technique, digital filtering, merits & demerits of numerical relay.

Unit III: Relay setting and co-ordination:
Directional instantaneous IDMT over current relay, directional multi-zone distance relay, distance relay setting, co-ordination of distance relays, co-ordination of over current relays.

Unit IV: Protection of transmission Line Fault statistics, Protection scheme of transmission line using distance relays, digital protection scheme based upon fundamental signal, digital protection of EHV/UHV transmission line, new relaying scheme using amplitude comparison.

Unit V: Protection of Synchronous Generator:
Faults in synchronous generator, protection schemes for synchronous generator, digital protection of synchronous generator against various abnormal conditions.

Unit VI: Protection of transformer:
Faults in a transformer, various protection schemes used for power transformer protection, digital protection of transformer.

Text Book: L. P. Singh ,“ Digital Protection by New Age International (P) Limited.

Reference Books:
1. Paithankar Y.G , “ Fundamentals of Power System Protection” by PHI, 2010 (2nd Edition)
2. Paithankar, “ Transmission Network Protection” by Marcel and Dekker, New York
3. A.T.Johns and S.K.Salman, “ Digital Protection for Power Systems” by IEE Power Series.

2EPS02 / 2 EEP02 - POWER SYSTEM DYNAMICS

Unit -I:
Reliable electrical power service, Stability of Synchronous machines, Tie- line oscillations, Method of simulation. Synchronous Machines: Review of synchronous machine equations, parameters, equations in a-b-c phase co-ordinates and Park’s co-ordinates.

Unit -II:
Representation of external system, Low and High order state models, choice of state variables. Initial stateequivalent circuit, Phasor diagram, per unit reactance. System Response to Large Disturbances: System ofone machine against infinite bus. Mechanical and electrical torques, critical clearing angle and time, Pre- calculated Swing curves and their use.

Unit -III:
System Response to Small Disturbances: Two machine system with negligible losses, Clarke diagram for two machine series reactance system, Extension of Clarke diagram to cover any reactance network, Equation for steady State Stability limit, Two- Machine system with losses

Unit -IV:
Effect of inertia. Effect of governor, action, conservative criterion for stability, Effect of saliency, saturation, and short circuit ratio on steady state power limits.Regulated Synchronous Machines: Demagnetizing effect of armature reaction and effect of small speed changes.

Unit -V:
Modes of oscillations of unregulated multimachine system.Voltage regulator with delay distribution of power impacts.Effect of Excitation on Stability: Effect of excitation on generator power limits, transients and dynamic stability.

Unit -VI: Examination of dynamic stability by Routh’s criterion, Root locus analysis of a regulated machine connected to an infinite bus. Approximate System representation, Supplementary Stabilising Signals, Linear analysis of stabilised generator.

Text Books:
1. E.W.Kimbark, “ Power System Stability ”by Dover Publication, Vol.3
2. Anderson ,“Power System Control & Stability ” by Galgotia Publication.

Reference Books :
1. K.R.Padiyar,“ Power System Dynamics, Stability & Control, Interline Publishers, Bangalore, 1996.
2. P.Sauer&M.A.Pai, “ Power System Dynamics & Stability ” by Prentice Hall, 1997.
3. P.Kundur, “ Power System Stability and Control” by McGraw Hill Inc, New York, 1995.
4. C. Concordia, “Synchronous Machines” by John Wiley & Sons.
5. S.B. Crary, “ Power System Stability ” by John Wiley & Sons.

2EPS03 / 2 EEP03- Program Elective III

(i) POWER QUALITY PROBLEMS & MITIGATIONS

UNIT – I:
Significance of power quality, Classification of Power quality problems: Transients, Long-duration voltage variations, Short duration voltage variations, Voltage imbalance, Waveform distortion, Voltage fluctuation; CBEMA and ITI curves; Causes of power quality problems; Effects of power quality problems on users.

UNIT – II:
Voltage Sags and Interruptions: Sources of Sags, Voltage Sag Standards, Effects of Voltage Sag, Sourcesof Interruptions, SAIFI, SAIDI, CAIDI, Effects of Interruptions, Solution to Voltage Sag andInterruptions – Ferroresonant Transformers, UPS, Motor-Generator Sets, Flywheel Energy Storage, Superconducting Magnetic Energy Storage(SMES).

UNIT – III:
Transients: Types of Transients, Characteristics of Transients, Sources of Transient Over voltages, Effect of Transients, Principle of Transient Overvoltage Protection, Solution to Transient Over voltages ,Surge Arrestors, Transient Voltage Surge Suppressors, Isolation Transformers, Capacitor SwitchingTimes, Pre-insertion Resistors.

UNIT – IV:
Fundamentals of Harmonics: Voltage and Current Harmonics, Harmonic Indices, Harmonic Standards, Harmonic phase sequence, Triplen harmonics, Sources of Harmonics, Effect of harmonics on static power plant – transmission lines, transformers, capacitor banks, Effect of harmonics on measuring instruments, Harmonic interference with ripple control systems, Harmonic interference with power system protection.

UNIT – V:
Passive Filters: Types of passive filters, single tuned and high pass filters, filter design criteria, double tuned filters, damped filters Active Power Filters: Compensation principle, Classification of active filters by objective, System configuration, Control Schemes for Active Filter - constant frequency control, constant tolerance band control, variable tolerance band control.

UNIT – VI:
Power Quality Conditioners: Dynamic Voltage Restorer (DVR): Introduction, Principle of operation, Configurations. Shunt Active Power Filter: Introduction, Principle of operation. Unified Power Quality Conditioner (UPQC): Introduction, Principle of operation, Three-phase three wire and three-phase four-wire UPQC topologies. Hybrid filters: Concept, principle of operation, Configuration.

Text Books:
1. Electrical Power Systems Quality, Roger C. Dugan, Mark F. McGranaghan, Surya Santoso and H.Wayne Beaty, McGrawHill.
2. Understanding power quality problems, Math H.J. Bollen, Wiley-IEEEPress.

Reference Books:
1. Power System Harmonic Analysis, Arrillaga J., Smith B. C., Watson N. R. and Wood A. R., Wiley,India.
2. Power System Harmonics, Arrillaga J., Braedlley D. A. and Bodger P. S., John Wiley and Sons.

2EPS03 / 2 EEP03- PROGRAM ELECTIVE III

(ii) POWER SYSTEM ECONOMICS & MANAGEMENT

Unit-I:
Introduction to various institutions in Indian Power sector such as CEA, Planning Commissions, PGCIL, PFC, Ministry of Power, state and central governments, REC, utilities and their roles. Critical issues / challenges before the Indian power sector, Salient features of Electricity act 2003,various national policies, Energy policy and guidelines under this act latest amendments in Indian Power Sector. Need of regulation and deregulation of power industry. Conditions favoring deregulation in power sector.

Unit -II:
Typical cost components and cost structure of the power sector, Different methods of comparing investment options, Concept of life cycle cost, annual rate of return, methods of calculations of Internal Rate of Return(IRR) and Net Present Value(NPV) of project, Short term and long term marginal costs, Different financing options for the power sector . Role of regulation and evolution of regulatory commission in India, Regulatory process in India, stages of tariff determination. Economic regulations – cost plus, performance based, incentive, Price and Revenue cap, Rate of return, sliding scaleregulation. Key performance parameters.

Unit-III:
Tariff, Desirable characteristics of tariff, Types of tariff, Different tariff principles (marginal cost, cost to serve, average cost), objectives and components of tariff. Consumer tariff structures and considerations, different consumer categories, telescopic tariff, fixed and variable charges, time of day, interruptible tariff,power factor tariff, different tariff-based penalties and incentives etc., tariff linked to quality of supply and service. Multi year tariff, levelized tariff. Subsidy and cross subsidy, life line tariff. Comparison of differenttariff structures for different load patterns.

Unit -IV:
Different industry structures (vertically integrated, regulated and deregulated), key market entities ISO, Genco, Transco, Disco, Retail co. Competition in the electricity sector- conditions, barriers, different types, benefits and challenges. Different market trading models, single buyer model, Wholesale competition, retail completion model. Models based on contractual arrangement – pool model, bilateral/multilateral model, pool and bilateral contracts.

Unit-V:
Electricity price basics, Demand and price elasticity. Types of power and energy markets- spot market, day ahead, hour ahead market, forward contract future contract, option contract, contract fordifferences, ancillary market. Market operation market clearing price, market efficiency, effect gate closure, settlement process. Market Clearing price (MCP), Zonal and locational MCPs. Dynamic/spot pricing, Market power and exercising market power.

Unit-VI: :
Transmission planning, Different methods of transmission pricing, Different transmission services,Congestion issues and management, Transmission cost allocation methods, Locational marginal price, firm transmission right. Transmission ownership and control, Transmission pricing model in India, Availability based tariff, role of load dispatch centres (LDCs), concept of arbitrage in Electricity markets, game theory methods in Power System, security constrained unit commitment. Power purchase agreements.

Text Books:
1. D.S. Kirschen and G. Strbac, "Fundamentals of Power System Economics" by John Wiley &sons.
2. G. Rothwell and T Gomez, " Electricity Economics Regulation and Deregulation" by Wiley Inter Science
3.Sally Hunt, "Making Competition Work in Electricity", 2002, John Wiley Inc
4. Edward Kahn, "Electric Utility Planning and Regulation by American Council for Energy EfficientEconomy

Reference Books:

1. Know Your Power, A citizens Primer On the Electricity Sector, Prayas Energy Group, Pune.
2. Steven Stoft, " Power System Economics Designing markets for Electricity" by Wiley- inter Science.
3. M. Shahidepour, Hatimyamin, Zuyi Li, "Market Operations in Electric Power Systems, Forecasting, scheduling and Risk Managemen" by Wiley Inter Science.
4. Deregulation in Power Industry, course hand outs by S.A. Khaparde.

Other References:

1. Regulation in infrastructure Services: Progress and the way forward - TERI, 2001
2. Maharashtra Electricity Regulatory Commission Regulations and Orders - www.mercindia.com.

2EPS03 / 2 EEP03- Program Elective III

(iii) COMPUTER AIDED POWER SYSTEM ANALYSIS

Unit-I :
Modelling of Power System Components, Basic Concepts: Single Phase, Three Phase Models, Matrix Representation of Networks, Bus Admittance Matrix, Bus Impedance Matrix, Graph Theory.

Unit-II:
Load Flow Analysis, Formulation of Load Flow Problem, Solution Techniques, Newton-Raphson Method, Decoupled, Fast De-coupled Methods, Short Circuit Analysis, Effect of Short Circuits

Unit-III:
Types of Faults, Symmetrical Components, Sequence Networks, Balance and Unbalanced Fault Analysis,Computer Programming Aspects: Considerations for Large System Analysis, Sparse Matrix Techniques, Optimal Ordering of Nodes

Unit-IV:
State Estimation in Power System, Maximum Likelihood Concepts, Weighted Least-Squares, State Estimation Technique, Detection and Identification of Bad Measurements, Network Observability

Unit-V: Reactive Power Allocation and Scheduling: Sources of reactive power, reactive power capability curve, FACT devices for Reactive power control;,modelling of reactive power allocation problem, solution techniques

Unit-VI:
Concept of Load frequency control and its applications., Concept of Optimal hydrothermal scheduling and its applications, Artificial Intelligence applications, Concepts of parallel computing

Text Book: O.I.Elgerd, " Electric Energy Systems Theory" by McGraw Hill, 1971.

Reference Books:
1. J. J. Grainger and W.D. Stevenson, " Power System Analysis" by McGraw Hill, 1994
2. G.W. Stagg and A. H. EI-Abiad, " Computer methods in Power System Analysis" by McGraw Hill1968
3. I.J. Nagrath and D.P.Kothari, " Modern Power System Analysis" by Tata McGraw Hill, 1980.

2EPS04 / 2EEP04 – PROGRAM ELECTIVE IV

(i) ARTIFICIAL NEURAL NETWORK

Unit -I: Introduction to Biological Neurons and their artificial models, introduction to neural computing Components of neuron, input and output weights, threshold, weight factors, transfer (activation) Functions, concepts of supervised, unsupervised learning and reinforcement learning.

Unit -II: Supervised Learning: Single Layer network: Architecture, Perceptron, Training algorithm Linear Separability and limitations Multilayer Network: Architecture of feed forward network, learning rule, generalized Delta rule, learningfunction. Back propagation algorithm, Concept of learning rate, momentum coefficient, sequential andbatch mode of training, Generalization capacity, cross validation, Limitation of Back-propagation algorithm.

Unit -III: Unsupervised Learning: Introduction, Hebbian learning rule, Winner Takes All learning rule, methods of Determining the winner,Korhonen's self-organizing maps Counter propagation networks, Hopfield's networks.

Unit -IV: Associative Memory Networks: Introduction, Hebb Rule and Delta Rule for Pattern Association, types of associative memories, theirarchitectures and training algorithms.

Unit -V: Special Neural Networks: Probabilistic Neural Networks: Architecture, Training and application Algorithm. Boltzmann Machine: Architecture and Application Algorithm. Support Vector Machine: Need for SVM, Architecture and SVMclassifier

Unit -VI: Applications of Neural networks in Power System: Understanding of various applications of ANN in power system areas such as forecasting, classification,planning, operation, control and protection.

Text Books:

1. Simon Haykin, "Neural Networks: A Comprehensive Foundation"byPearson Education(2nd Edition)
2. J.M. Zurada, " Introduction to Artificial Neural Network" by Jaico Publishing House

Reference Books:

1. S. N. Sivanandam, S. Sumathi, S. N. Deepa, "Introduction to Neural Network Using MATLAB6.0" by Tata McGraw Hill
2. Kevin Warwick, Arthur Ekwue and Raj Aggarwal, "Artificial Intelligence Techniques in PowerSystems" by IEE Power Engineering Series, UK, 1997.

2EPS04 / 2EEP04 – PROGRAM ELECTIVE IV
(ii) FUZZY SYSTEMS & CONTROLS

Unit I: Introduction to Fuzzy Set:
Uncertainty in information, Overview of Classical Set Theory, Basic concepts of Fuzzy sets, properties offuzzy sets, operations on fuzzy sets. Fuzzy relations: operations, properties, value assignments.

Unit II: Membership Functions:
Features, Types of Membership Functions, fuzzification, membership value assignments, Defuzzification: Lambda-cuts for Fuzzy sets and Fuzzy relations, Defuzzification methods

Unit III: Fuzzy Logic and Systems:
Overview of Classical Logic, Fuzzy Logic, Approximate Reasoning, Introduction to Fuzzy Systems, Natural Language, Linguistic Hedges, Rule Based Systems Graphical Technique of Inference

Unit IV: Development of Membership Functions:
Membership Value Assignment, Intuition, Inference, Rank Ordering, Neural Networks, Genetic Algorithm and Inductive Reasoning.

Unit V: Fuzzy Control System:
Control System Design Problem, Control (Decision) Surface, Assumptions in Fuzzy Control System Design, Simple Fuzzy Logic Controllers, Fuzzy Engineering Process Control, Classical Feedback Control, Fuzzy Control.

Unit VI: Applications of Fuzzy in Power System:
Understanding of various applications of Fuzzy in power system areas such as - Load frequency control –Single area system and two area systems - Reactive power control - Speed control of DC and AC Motors.

Text Books:

1 T.J.Ross, "Fuzzy Logic with Engineering Applications" by Wiley Publications(3rd Edition)
2 G.J. Khir and T.A. Folger, " Fuzzy sets, Uncertainty and Information"byPHI

Reference Books:

1 S. Rajsekaram, G. A. VijayalaxmiPai, "Neural Networks, Fuzzy Logic & Genetic AlgorithmsSynthesis & Applications" byPractice Hall India

2 Kevin Warwick, Arthur Ekwue and Raj Aggarwal, "Artificial Intelligence Techniques in Power Systems"by IEE Power Engineering Series, UK, 1997.

2EPS04 / 2EEP04 – PROGRAM ELECTIVE IV (iii) ADVANCED OPTIMIZATION TECHNIQUES

Unit I: Introduction, engineering applications of optimization, statement of an optimization problem, optimization techniques, classical optimization problem. Classical optimization techniques - single and multi-variable optimization with and without constraints.

Unit II :
Linear programming I: solution of system of linear simultaneous equations, revised simplex method duality, theorems on duality, dual simplex method, decomposition principle, sensitivity analysis.

Unit-III :
Nonlinear programming: uni-modal function, Fibonacci search method and golden section method, Steepest descent method, conjugate gradient method, unconstraint optimization, direct search method.

Unit –IV:
Dynamic programming: multistage decision processes, principle of optimality, sub optimization, calculusand tabular method of solution, conversion of final value problem into initial value problem, solution of linear programming. Continuous dynamic programming.

Unit-V:
Genetic Algorithm (GA): Differences and similarities between conventional and evolutionary algorithms, working principle, Genetic Operators- reproduction, crossover, mutation An overview of JAI Algorithm, Harris Hawk Optimization and Path Finder Algorithm. Introduction to Multi – Objective optimization – Classical methods- Pareto Optimality – Use of evolutionary algorithms for solving Multi Objective optimization problems.

Unit-VI:
Applications to Power system: Economic Load Dispatch in thermal and Hydro-thermal system using GA and classical optimization techniques, Unit commitment problem, reactive power optimization. optimal power flow, LPP and NLP techniques to Optimal flow problems.

Text Books:

1. S.S.Rao, "Optimization - Theory and Applications" by Wiley-EasternLimited.
2. David G.Luenberger, " Introduction of Linear and Non-Linear Programming " by WesleyPublishing Company
3. Polak, "Computational methods in Optimization" by Academic Press

Reference Books:

1. Pierre D.A., "Optimization Theory with Applications" by WileyPublications
2. Kalyanmoydeb,"Optimization for Engineering Design: Algorithms and Examples" by PHIPublication
3. D.E. Goldberg ,"Genetic Algorithm in Search Optimization and Machine Learning" by Wesley Publication, 1989
4. L.P. Singh ,"Advanced Power System Analysis and Dynamics " by Wiley Eastern Limited.

2EPS05 / 2EEP05–AUDIT II

(i) SANSKRIT FOR TECHNICAL KNOWLEDGE

Unit I : Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences.
Unit-II: Order, Introduction of roots, Technical information about Sanskrit Literature.
Unit -III: Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics.

Text Books:

1. Dr.Vishwas, Samskrita, "Abhyaspustakam" by Bharti Publication, New Delhi.
2. "Teach Yourself Sanskrit" Prathama Deeksha –Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi

Reference Book: Suresh Soni "India's Glorious Scientific Tradition" by Ocean books (P) Ltd., New Delhi.

2EPS05 / 2EEP05–AUDIT II (ii)VALUE EDUCATION

Unit I : Values and self-development, social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non- moral valuation, Standards and principles, Value judgments.

Unit -II:
Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline.

Unit-III:
Personality and Behavior Development - Soul and Scientific attitude, Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship, Happiness Vs suffering, love for truth, Aware of self-destructive habits, Association and Cooperation, doing best for saving nature.

Unit -IV:
Character and Competence –Holy books vs Blind faith, Self-management and Good health, Science of reincarnation, Equality, Non-violence, Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively.

Reference Book:

Chakraborty, S.K. "Values and Ethics for organizations Theory and practice" by OxfordUniversity Press, New Delhi.

2EPS05 / 2EEP05–AUDIT II: (iii) PEDAGOGY STUDIES

Unit I: Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology**,** Theories of learning, Curriculum, Teacher education, Conceptual framework, Research questions**,** Overview of methodology and searching.

Unit -II :
Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries, Curriculum, Teacher education.

Unit -III :
Evidence on the effectiveness of pedagogical practices, Methodology for the in depth stage: quality assessment of included studies, How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy, Theory of change, Strength and nature of the body of evidence for effective pedagogical practices, Pedagogic theory and pedagogical approaches, Teachers' attitudes and beliefs and Pedagogic strategies.

Unit-IV :
Professional development: alignment with classroom practices and follow-up support, Peer support,Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large class sizes.

Unit -V :
Research gaps and future directions, Research design, Contexts, Pedagogy, Teacher education,Curriculum and assessment, Dissemination and research impact.

Text Books:

1. Ackers J, Hardman F , " Classroom interaction in Kenyan primary schools" (2001)
2. Agrawal M , " Curricular reform in schools: The importance of evaluation" by Journal ofCurriculum Studies.(2004)

Reference Book:

1. Alexander RJ ," Culture and pedagogy: International comparisons in primary education " byOxford and Boston: Blackwell.(2001)

2EPS05 / 2EEP05–AUDIT II

(iii) PERSONALITY DEVELOPMENT THROUGH LIFE ENHANCEMENT SKILLS

Unit -I :
Neeti satakam-Holistic development of personality
Verses- 19,20,21,22 (wisdom)
Verses- 29,31,32 (pride & heroism)
Verses- 26,28,63,65 (virtue)
Verses- 52,53,59 (dont's)
Verses- 71,73,75,78 (do's)

Unit -II :
Approach to day to day work and duties.
Shrimad Bhagavad Geeta : Chapter 2-Verses 41, 47,48,
Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35,
Chapter 18-Verses 45, 46, 48.

Unit -III :
Statements of basic knowledge.
Shrimad Bhagavad Geeta: Chapter2-Verses 56, 62, 68
Chapter 12 -Verses 13, 14, 15, 16,17, 18
Personality of Role model.Shrimad Bhagavad Geeta:
Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
Chapter 4-Verses 18, 38,39
Chapter18 – Verses 37,38,63

Reference Books:

1. "Srimad Bhagavad Gita" by Swami SwarupanandaAdvaita Ashram (Publication Department),Kolkata
2. Bhartrihari's- Three Satakam (Niti-stringer-vairagya) by P.Gopinath,Rashtriya Sanskrit Sansthanam, New Delhi.

SEMESTER III

3EPS01 / 3EEP01- PROGRAM ELECTIVE –V

(i) ELECTRIC VEHICLES

UNIT -I:
Conventional vehicle, Basics of vehicle performance , History of electric vehicles , Comparison of EV with IC engine driven vehicles , social and environmental importance of electric vehicles , impact of modern drive-trains on energy supplies.

UNIT - II:
Micro hybrid vehicles , Mild hybrid vehicles , Full hybrid vehicles , Parallel hybrid vehicles , Series Hybrid Vehicles, Series-Parallel Hybrid vehicles , Plug-in hybrid vehicles , Power flow diagrams for various operating modes.

UNIT -III:
Basic concept of electric traction :Introduction to various electric drive-train topologies , Power flow control in electric drive-train topologies , Fuel efficiency analysis

UNIT -IV:
Electric components used in electric vehicles , Configuration and control of DC Motor drives; Induction Motor drives , Permanent Magnet Motor drives , Switch Reluctance Motor drives , Drive system efficiency.

UNIT -V:
Storage requirements for Electric Vehicles, Battery based energy storage , Fuel Cell based energy storage , Super-capacitor-based energy storage , Power pack management systems , Cell balancing techniques , Flywheel based energy storage and its analysis , Hybridization of different energy storage devices , Compressed air storage systems , Super-conducting magnetic storage systems.

UNIT -VI:
Converter configurations for hybrid energy systems based on Battery and Ultra Capacitors - Cascaded converter, multiple parallel-connected converter, dual-active-bridge converter, multiple-input converter, multiple modes single converter, interleaved converter, switched capacitor converter, converters for coupled inductor based hybridization.

Text Books:

1. James Larminieand John Lowry, " Electric Vehicle Technology Explained " by John Wiley andSons.
2. Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, "Modern Electric, Hybrid Electric andFuel Cell Vehicles: Fundamentals, Theory and Design " by CRC Press.

Reference Books:

1. Ali Emadi, " Advanced Electric Drive Vehicles" by CRC Press, Taylor & Francis Group.
2. Iqbal Hussein , " Electric and Hybrid Vehicles: Design Fundamentals" by CRC Press.
3. Chung Chow Chan, K.T.Chau, " ModernElectricVehicle Technology" by Oxford UniversityPress.

3EPS01 / 3EEP01- PROGRAM ELECTIVE –V

(ii) RENEWABLE ENERGY SYSTEMS

Unit I: Introduction to wind energy, basic principles of wind energy, conversion, power in the wind, maximum power, forces on the blade, wind energy conversion, small producers and large producers, wind data and energy estimation, site selection consideration, Basic components of wind energy conversion systems, classifications of WECS, advantages and disadvantages of WECS, generating system, scheme of electric generation, generator control, load control, energy storage, applications of wind energy, inter connecting system, environmental aspects, safety systems, prospects.

Unit-II :
Introduction to solar energy storage systems, thermal storage, sensible heat storage, latent heat storage, solar pond, non-conductive solar pond, Extraction of Thermal energy, Applications of Solar pond. Solar Energy Applications: solar thermal electric conversion, Solar electric power generation, Principles of solar cells, semiconductor junctions, Conversion efficiency and power output, Photovoltaic system for power generation, Solar cell connecting arrangements, storage batteries, Inverters, applications of solarPV system.

Unit-III : Introduction to biomass, Biomass conversion technologies, wet process and dry process, Biogas generation, classification of biogas plants, continuous & batch types, The dome and the drum types, Different variations in the drum type, Types of Biogas plants, Floating gas holder, Fixed dome digester, Biogas from plant wastes, Community biogas plants, Materials used for biogas generation, selection of site for biogas plant, Methods of maintaining Biogas generation, starting a biogas plant, Fuel properties of biogas, utilization of biogas, methods of obtaining energy from Biomass Combustion.

Unit-IV: Introduction to Geothermal Energy, fields, Hydro thermal & semi thermal fields, prime movers for Geothermal Energy conversion, classifications, Advantages of Geothermal Energy over other energy forms, Applications of Geothermal Energy at different temperatures, Geothermal Energy in India, prospects.

Unit-V:
Fuel cells: Chemistry applied to fuel cells, principle and operation, classification and types of fuel cells, performance characteristics of fuel cells, classification of fuel cell system. Basic principle of tidal power, components of tidal power plants, operation methods of utilization of tidal energy, estimation of power and energy in single and double basin tidal system, Ocean Wave energy.

Unit-VI:
Introduction to Distributed Generation, review of Distributed Energy Resources, integration of distributedgeneration to grid, concept of micro-grid, typical micro-grid configurations, AC and DC micro-grids, interconnection of micro-grids, technical and economic advantages of micro-grid, challenges and disadvantages of micro-grid development, concept of islanding.

Text Books:
1. B.R.Gupta, " Generation of electrical energy" by Eurasia Publishing House, New Delhi
2. G.D.Rai, " Non-conventional energy resources" by Khanna Publishers
3. S.P.Sukhatme, " Solar energy " by Tata McGraw Hill.

Reference Books:
1. Thomas Ackermann," Wind Power in Power System" by John Willey &Sons, 2005
2. Gilbert M.Masters.,"Renewable and efficient electric power systems" by Wiley,IEEE.
3. N. Jenkins, J.B. Ekanayake and G. Strbac," Distributed Generation" ISBN 978-1-84919-116-6,IET, 2010.
4. S. Chowdhury, S.P. Chowdhury and P. Crossley, " Microgrids and Active DistributionNetworks" ISBN 978-1-84919-014-5, IET, 2009.

3EPS01 / 3EEP01 – Program Elective –V

(iii) EMBEDDED SYSTEMS

Unit I: Introduction: Embedded systems design, embedded system architecture, embedded systems model, An Overview of Programming Languages and Examples of their Standards, Standards and Networking, Multiple Standards-Based Device Example: Digital Television (DTV).

Unit-II:
Embedded Hardware Building Blocks and the Embedded Board: Powering the hardware, Instruction Set Architecture (ISA) architecture model, internal processor design and its performance.

Unit-III:
Memory: ROM, RAM and auxiliary memory, Memory Management of External Memory, Performance of memory. I/O: Managing Data: Serial vs. Parallel I/O, Interfacing the I/O Components, I/O performance. Buses: arbitration, timing, and performance.

Unit-IV:
Device Drivers: Device Drivers for Interrupt-Handling, Memory Device Drivers, On-board Bus Device Drivers, Board I/O Driver. Embedded OS: Multitasking and Process Management, Memory Management.

Unit-V: Embedded OS: I/O and File System Management, OS Standards: POSIX, OS Performance Guidelines. Middleware: meaning and examples. Application layer software: meanings and examples.

Unit-VI: Embedded system design & implementation: Defining the System-Creating the Architecture and Documenting the Design, Stages in creating an Embedded System Architecture. Implementing the Design. Quality Assurance and Testing of the Design.

Text Book: TammyNoergaard ," Embedded Systems Architecture" by Elsevier Newnes Publication.

Reference Books:
1. Rajkamal , "Embedded Systems, Architecture, Programming & Design" by TMH.
2. Jane W. S. Liu " Real Time Systems", by Pearson Education
3. Vahid&Givargis," Embedded System Design" by John Wiley & Sons Ltd.
4. Peter Marwedel ," Embedded Systems Design" by Springer, Netherland.

3EPS02 / 3EEP02–OPEN ELECTIVE

(i) INDUSTRIAL SAFETY

Unit-I :
Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting

Unit-II :
Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

Unit-III :
Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, Screw down grease cup, Pressure grease gun, Splash lubrication, Gravity lubrication, Wick feed lubrication Side feed lubrication, Ring lubrication, Definition, principle and factors affecting the corrosion, Types of corrosion, corrosion prevention methods.

Unit-IV :
Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like: Any one machine tool, Pump, Air compressor, Internal combustion engine, Boiler, Electrical motors, Types of faults in machine tools and their general causes.

Unit-V:
Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: Machine tools, Pumps, Air compressors, Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycleconcept and importance.

TEXT BOOKS:

1. Higgins &Morrow , " Maintenance Engineering Handbook " by Da Information Services.
2. H. P. Garg," Maintenance Engineering" by S. Chand and Company.

REFERENCE BOOKS:

1. Audels , "Pump-hydraulic Compressors " by TMH Publication.
2. Winterkorn, Hans, "Foundation Engineering Handbook" by Chapman & Hall London.

3EPS02 / 3EEP02 OPEN ELECTIVE

(ii) COST MANAGEMENT OF ENGINEERING PROJECTS

Unit I: Introduction and Overview of the Strategic Cost Management Process, Cost concepts in decision- making, relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System, Inventory valuation , Creation of a Database for operational control , Provision of data for Decision Making.

Unit -II :
Project: meaning, Different types, why to manage, cost overruns centers, various stages of project execution: conception to commissioning , Project execution as conglomeration of technical and nontechnical activities , Detailed Engineering activities , Pre project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance, Project contracts. Types and contents, Project execution ,Project cost control , Bar charts and Network diagram , Project commissioning , mechanical and process.

Unit-III :
Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal CostingandAbsorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis; Various decision-making problems. Standard Costing and Variance Analysis; Pricing strategies: Pareto Analysis. Target costing,Life Cycle Costin . Costing of service sector , Just-in-time approach, Material Requirement Planning,Enterprise Resource Planning, Total Quality Management and Theory of constraints, Activity-Based CostManagement, Bench Marking , Balanced Score Card and Value-Chain Analysis , Budgetary Control ,Flexible Budgets , Performance budgets , Zero-based budgets , Measurement of Divisional profitabilitypricing decisions including transfer pricing.

Unit-IV :
Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportationproblems, Assignment problems, Simulation, Learning Curve Theory.

Text Books:

1. Charles T. Horngren , Srikant M. Datar , Madhav V. Rajan " Cost Accounting : A Managerial Emphasis" by by Pearson
2. Charles T. Horngren and George Foster , " Advanced Management Accounting by Pearson.

Reference Books:

1. Robert S Kaplan Anthony A. Alkinson , " Management & Cost Accounting by Pearson
2. Ashish K. Bhattacharya, A. H. Principles ," Practices of Cost Accounting" by Wheeler publisher
3. N.D. Vohra, " Quantitative Techniques in Management " by Tata Mc Graw Hill Book Co. Ltd.

3EPS02 / 3EEP02– OPEN ELECTIVE

(iii) WASTE TO ENERGY

Unit -I: Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste, MSW, Conversion devices, Incinerators, gasifiers, digestors.

Unit -II: Biomass Pyrolysis: Pyrolysis Types- slow, fast; Manufacture of charcoal: Methods, Yields and application; Manufacture of pyrolytic oils and gases, yields and applications.

Unit -III: Biomass Gasification: Gasifiers – Fixed bed system, Downdraft and updraft gasifiers, Fluidized bed gasifiers, Design, construction and operation, Gasifier burner arrangement for thermal heating, Gasifier engine arrangement and electrical power,Equilibrium and kinetic consideration in gasifier operation

Unit-IV: Biomass Combustion: Biomass stoves – Improved challahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit-V: Biogas: Properties of biogas (Calorific value and composition), Biogas plant technology and status, Bio energy system, Design and constructional features, Biomass resources and theirclassification, Biomass conversion processes, Thermo-chemical conversion, Direct combustion,biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion, Types of biogas Plants, Applications, Alcohol production from biomass, Bio diesel production, Urban waste to energy conversion, Biomass energy programme in India.

Text Books:

1. Desai, Ashok V., " Non-Conventional Energy" by Wiley Eastern Ltd.
2. Khandelwal, K. C. and Mahdi, S. S., " Biogas Technology - A Practical Hand Book" (Vol. I &II) by TataMcGraw Hill Publishing Co. Ltd.

Reference Books:

1. C. Y. WereKo-Brobby and E. B. Hagan, " Biomass Conversion and Technology" by John Wiley.
2. Challal, D. S., " Food, Feed and Fuel from Biomass by IBH Publishing Co. Pvt. Ltd.

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(iv) BUSINESS ANALYTICS

Unit I:
Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organization, competitive advantages of Business Analytics.
Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modeling, sampling, and estimation methods overview.

Unit II :
Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression, Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.

Unit III:
Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

Unit IV :
Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation UsingAnalytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.

Unit V :
Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.

Unit VI :
Recent Trends inEmbedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.Recent Trends inEmbedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.

Text Book:

Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, " Business analyticsPrinciples, Concepts, and Applications" by Pearson FT Press

Reference Book: James Evans, "Business Analytics" by persons Education.

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