M. Tech. (EE): Syllabus Revision in 2018-19.

S. No	Course Code	Session 2017-18	Session 2018-19	Remark Syllabus Change/ new course
1	**MTEE PS101**	**Advanced Power System Analysis** **UNIT-1** **Fault Analysis**: Positive, negative and zero sequence impedance, per unit system, symmetrical components, Analysis of shunt, series and simultaneous faults, symmetrical three-phase faults, unsymmetrical faults Short Circuit studies. **UNIT** -2 **Unbalanced Operation of 3-phase Induction Motors**: Characteristics with application of unbalanced voltage to a balanced motor and with application of balanced voltage to a motor having unbalanced impedances in the rotor circuit. **UNIT**-3 **Linear Graph Theory**: Study of linear graph theory, Network topology, incidence, Cut-set and Tie-set matrices and their interpretation. Calculation of Z-bus, Y-bus, Z-branch and Y loop matrices by singular and non-singular transformations. Algorithm for the calculation of Y-bus and Z-bus. Fault calculations	**Advanced Power System Analysis** **Unit 1**: Load flow: Overview of Newton-Raphson, Gauss-Siedel, fast decoupled methods, convergence properties, sparsity techniques, handling Qmax violations in constant matrix, inclusion in frequency effects, AVR in load flow, handling of discrete variable in load flow. **Unit 2**: Fault Analysis**:** Simultaneous faults, open conductor's faults, generalized method of fault analysis. **Unit 3:** Security Analysis: Security state diagram, contingency analysis, generator shift distribution factors line outage, distribution factor, multiple line outages, overload index ranking. **Unit 4:** Power System Equivalents: WARD, REI.equivalents **Unit 5:** State Estimation: Sources of errors in measurement, Virtual and Pseudo, Measurement, Observability, Tracking state estimation, WSL method, bad data correction. **Unit 6:** Voltage Stability: Voltage collapse, P-V curve, multiple power flow solution, continuation power flow, optimal multiplies load flow, voltage collapse proximity indices.	**Syllabus Change**

		using Z-bus. **UNIT**-4 **Load Flow Studies**: Formulation of load flow problem. Various types of buses. Gause-Siedel, Newton-Raphson and Fast Decoupled Algorithms. Calculation of reactive power at voltage controlled buses in the Gauses-Seidel iterative method using Y-bus, Representation of transformers **UNIT**-5 **Tap Changing:** Fixed tap setting transformer, Tap changing under load transformers, Phase shifting transformers, Tie line control, Comparison of methods for load flow.		
2	**MTEEPS 102**	**Advanced Power Electronics** **UNIT -1** **Solid State Power Semi-conducting Devices**: Review of the thyristors, TRAIC, GTO, transistor MOSFET and other modem power devices (IGBT, SIT, SITCH, MCT), characteristics ratings, commutation methods, protection and requirement of firing circuits. **UNIT-2** **Phase Controlled Converters**: Single and three-phase controlled converters, power factor improvement techniques. Dual Converter mode of operation, Firing Circuits.	**Power System Dynamics-I** **Unit 1:** Synchronous Machines: Per unit systems, Park's Transformation (modified) Flux-linkage equations. **Unit 2:** Voltage and current equations, Formulation of State-space equations, Equivalent circuit. **Unit 3:** Sub-transient and transient inductance and Time constants, Simplified models of synchronous machines. **Unit 4:** Small signal model: Introduction to frequency model. **Unit 5:** Excitation systems and Philips-Heffron model, PSS Load modeling. **Unit 6:** Modeling of Induction Motors, Prime mover controllers.	**New Course**

		UNIT-3 **Choppers**: Review of choppers, commutation circuits, firing circuits. Introduction to multi-quadrant and multi phase choppers. **UNIT-4** **Inverters:** Line commutated, voltage source, and current source inverters; Commutation techniques, Voltage control and harmonic reduction techniques. PWM rectifiers and inverters. **UNIT-5** **Cyclo-converters (Frequency Conversion)**: Single phase and three phase cyclo-converters. Recent trends in power converters and controllers.		
3	**MTEEPS 103**	**Power System Transient & High Voltage Engineering** **UNIT-1** Wave terminology, development of wave equations, terminal problems, lattice diagrams. Origin and nature of power system surges, wave shapes, attenuation, effect of shielding by ground wires and masts, tower footing-resistance. **UNIT-2** Traveling waves, multi-velocity waves, methods of measuring tower footing resistance, voltages across insulator strings. Dynamic over-voltages during surges and system faults, system	**Renewable Energy System (MTEEPS103A)** **Unit 1:** Introduction, Distributed vs Central Station Generation, Sources of Energy such as Micro-turbines, Internal Combustion Engines. **Unit 2:** Introduction to Solar Energy, Wind Energy, Combined Heat and Power, Hydro Energy, Tidal Energy, Wave Energy, Geothermal Energy, Biomass and Fuel Cells. **Unit 3:** Power Electronic Interface with the Grid **Unit 4:** Impact of Distributed Generation on the Power System, Power Quality Disturbances Sparse Modeling and Estimation, Modeling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning **Unit 5:** Transmission System Operation,	**New Course**

		recovery voltage characteristics. **UNIT-3** Methods of neutral grounding and their effect on system behavior. Insulation coordination, requirement in surge protection of lines and equipment. Impulse generator development. Impulse testing technique. **UNIT-4** Power frequency h.v. transformers, cascade connection. H.V.D.C. generators, tests with power frequency and d.c. voltages. Large current generating and measurement techniques. Partial discharge testing. **UNIT-5** High voltage and high current testing of power equipment. Field investigations. Magnetic links their calibration and mounting, klydenographs, potential dividers and cathodes ray oscillorgraph.	Protection of Distributed Generators **Unit 6:** Economics of Distributed Generation, Case Studies	
4			**Smart Grids (MTEEPS103B)** **Unit 1:** Introduction to Smart Grid, Evolution of Electric Grid, Concept of Smart Grid, Definitions Need of Smart Grid, Concept of Robust & Self Healing Grid Present development & International policies in Smart Grid **Unit 2:** Introduction to Smart Meters, Real Time Prizing, Smart Appliances, Automatic Meter Reading(AMR), Outage Management System(OMS), Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation, Smart Substations, Substation Automation, Feeder Automation .	**New Course**

			Unit 3: Geographic Information System(GIS), Intelligent Electronic Devices(IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System(WAMS), Phase Measurement Unit(PMU) **Unit 4:** Concept of micro-grid, need & applications of micro-grid, formation of micro-grid, Issues of interconnection, protection & control of micro-grid, Plastic & Organic solar cells, Thin film solar cells, Variable speed wind generators, fuel-cells, micro-turbines, Captive power plants, Integration of renewable energy sources. **Unit 5:** 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. **Unit 6:** Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighborhood Area, Network (NAN), Wide Area Network (WAN), Bluetooth, ZigBee, GPS, Wi-Fi, Wi-Max based communication, Wireless Mesh Network, Basics of CLOUD Computing & Cyber Security for Smart Grid, Broadband over Power line (BPL), IP based protocols.	
5			**High Power Converters (MTEEPS103C)** **Unit 1:** Power electronic systems, An overview of PSDs, multipulse diode rectifier, multipulse, SCR rectifier. **Unit 2:** Phase shifting transformers, multilevel voltage source inverters:	**Title Change** **Code Change**

			two level voltage source inverter, cascaded, H bridge multilevel inverter. **Unit 3:** Diode clamped multilevel inverters, flying capacitor multilevel inverter. **Unit 4:** PWM current source inverters, DC to DC switch mode converters. **Unit 5:** AC voltage controllers: Cyclo-converters, matrix converter, Power conditioners and UPS. **Unit 6:** Design aspects of converters, protection of devices and circuits	
6			**Wind and Solar Systems (MTEEPS103D)** **Unit 1:** Historical development and current status, characteristics of wind power generation, network integration issues **Unit 2:** Generators and power electronics for wind turbines, power quality standards for wind turbines, Technical regulations for interconnections of wind farm with power systems. **Unit 3:** Isolated wind systems, reactive power and voltage control, economic aspects **Unit 4:** Impacts on power system dynamics, power system interconnection **Unit 5:** Introduction of solar systems, merits and demerits, concentrators, various applications. **Unit6:** Solar thermal power generation, PV power generation, Energy Storage device. Designing the solar system for small installations.	**New Course**
7	**MTEEPS 104A**	**EHV AC/DC Transmission** **UNIT-1**	**Electrical Power Distribution System (MTEEPS104A)**	**Syllabus Change** **Title Change** **Code Change**

		EHV AC Transmission Bulk power transmission over long distance, need for EHV transmission problems of EHV transmission, Power Handling capacity and surge impedance loading. Current carrying capacity of conductor. Choice of economic voltage, standard transmission voltages. **UNIT-2** **Bundled Conductors**: Properties of bundled conductors, geometric mean radius of bundle, inductance and capacitance, Voltage gradients of conductors, maximum surface voltage gradients of bundled conductors. **UNIT-3** **EHV Lines** :Electrostatic fields of EHV lines. Effect of E.S. field on Humans, Animals and Plants, corona loss, maximum surface electric fields for bundled and single conductor lines. **UNIT-4** **Rectification**: The 3-phase Bridge rectifier or Graetz circuit, Inversion, Kinds of D.C links, Paralleled and Series connection of thyristors, Major components of a converter station-converter unit, filters, reactive power source. **UNIT-5** **HVDC**:Introduction to Multi-terminal HVDC Systems and HVDC Circuit Breakers. Application of HVDC	**Unit 1:** Distribution of Power, Management, Power Loads, Load Forecasting Short-term & Long-term, Power System Loading, Technological Forecasting. **Unit 2:** Advantages of Distribution Management System (D.M.S.), Distribution Automation: Definition, Restoration / Reconfiguration of Distribution Network, Different Methods and Constraints**,** Power Factor Correction. **Unit 3:** Interconnection of Distribution, Control & Communication Systems, Remote Metering, Automatic Meter Reading and its implementation. **Unit 4:** SCADA: Introduction, Block Diagram, SCADA Applied To Distribution Automation. Common Functions of SCADA, Advantages of Distribution Automation through SCADA. **Unit 5:** Calculation of Optimum Number of Switches, Capacitors, Optimum Switching Device Placement in Radial, Distribution Systems, Sectionalizing Switches – Types, Benefits, Bellman's Optimality Principle, Remote Terminal Units, Energy efficiency in electrical distribution & Monitoring. **Unit6:** Maintenance of Automated Distribution Systems, Difficulties in Implementing Distribution. Automation in Actual Practice, Urban/Rural Distribution, Energy Management, AI techniques applied to Distribution Automation.	

		transmission, Ground return and ground electrode.		
8	**MTEEPS 104B**	**Advanced Power Electronics Drives** **UNIT-1** Basic power electronic drive system, components. Different types of loads, shaft-load coupling systems. Stability of power electronic drive. **UNIT-2** Conventional methods of D.C.motor speed control, single phase and three phase converter fed D.C motor drive. Power factor improvement techniques, **UNIT-3** Four quadrant operation. Chopper fed drives, input filter design. Step -up chopper for photovoltaic systems. Braking and speed reversal of DC motor drives using choppers, multiphase choppers. **UNIT-4** Conventional methods of induction motor speed control.Solid state controllers for Stator voltag control, soft starting of induction motors, Rotor side speed control of wound rotor induction motors. Voltage source and Current source inverter fed induction motor drives. **UNIT-5** Speed control of synchronous motors, field oriented control, load commutated inverter drives, switched	**Mathematical Methods for Power Engineering (MTEEPS104B)** **Unit 1:** Vector spaces, Linear transformations, Matrix representation of linear transformation. **Unit 2:** Eigen values and Eigen vectors of linear operator **Unit 3:** Linear Programming Problems, Simplex Method, Duality**,** Non Linear Programming problems **Unit 4:** Unconstrained Problems, Search methods**,** Constrained Problems **Unit 5:** Lagrange method, Kuhn-Tucker conditions, Random Variables**,** Distributions **Unit 6:** Independent Random Variables, Marginal and Conditional distributions, Elements of stochastic processes	**New Course**

		reluctance motors and permanent magnet motor drives.		
9	**MTEEPS 104C**	**REACTIVE POWER COMPENSATION AND MANAGEMENT** **UNIT I: Load Compensation** Objectives and specifications – reactive power characteristics – inductive and capacitive approximate biasing –Load patterns – basic methods load shaping – power tariffs-KVAR based tariffs **UNIT II: Steady – state reactive power compensation in transmission system:** Load compensator as a voltage regulator – phase balancing and power factor correction of unsymmetrical loads Uncompensated line – types of compensation – Passive shunt and series and dynamic shunt compensation – examples **UNIT III: Transient state reactive power compensation in transmission systems:** Characteristic time periods – passive shunt compensation – static compensations- series capacitor compensation –compensation using synchronous condensers – examples **UNIT-IV: Reactive power coordination:** Objective – Mathematical modeling – Operation planning – transmission benefits – Basic concepts of quality of	**Pulse Width Modulation for PE Converters (MTEEPS104C)** **Unit 1:** Introduction to PE converters, Modulation of one inverter phase leg, Modulation of single phase, VSI and 3 phase VSI. **Unit 2:** Zero space vector placement modulation strategies, Losses-Discontinuous modulation, Modulation of CSI. **Unit 3:** Over modulation of converters, programme modulation strategies. **Unit 4:** Pulse width modulation for multilevel inverters, Implementation of modulation controller **Unit 5:** Continuing developments in modulation as random PWM, PWM for voltage unbalance. **Unit 6:** Effect of minimum pulse width and dead time.	**Syllabus Change** **Title Change** **Code Change**

		power supply – disturbances- steady – state variations – effects of under voltages – frequency – Harmonics, radio frequency and electromagnetic interferences **UNIT-V: Distribution side Reactive power Management**: KVAR requirements for domestic appliances – Purpose of using capacitors ,System losses –loss reduction methods – examples – Reactive power planning – objectives – Economics Planning capacitor placement – retrofitting of capacitor banks		
10			**Electric and Hybrid Vehicles (MTEEPS104D)** **Unit 1:** History of hybrid and electric vehicles, Social and environmental importance of hybrid and electric vehicles, Impact of modern drive-trains on energy supplies, Basics of vehicle performance, vehicle power source characterization Transmission characteristics, Mathematical models to describe vehicle performance **Unit 2:** Basic concept of hybrid traction, Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, Fuel efficiency analysis. **Unit 3:** Basic concept of hybrid traction, Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, Fuel efficiency analysis. **Unit 4:** Introduction to electric components	**New Course**

			used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Introduction Motor drives configuration and control of Permanent Magnet Motor drives Configuration and control of Switch Reluctance, Motor drives, drive system efficiency. **Unit 5:** Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics Selecting the energy storage technology, Communications, supporting subsystems **Unit 6:** Introduction to energy management and their strategies used in hybrid and electric vehicle, Classification of different energy management strategies Comparison of different energy management strategies Implementation issues of energy strategies.	
11	**MTEEPS 105**	**Power System Simulation Lab** **<u>List of Experiments</u>** Simulate Swing Equation in Simulink (MATLAB) 1. Modeling of Synchronous Machine. 2. Modeling of Induction Machine. 3. Simulate simple circuits using Circuit Maker. 4. (A) Modeling of Synchronous Machine with PSS. (B) Simulation of Synchronous Machine with FACTS device. 5. (A) Modeling of Synchronous Machine with FACTS device. (B) Simulation of Synchronous	**Research Methodology and IPR** **Unit 1:** 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 2:** Effective literature studies approaches, analysis Plagiarism, Research ethics, **Unit 3:** 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 4:** Nature of Intellectual Property:	**New Course**

		Machine with FACTS devices. 6. FACTS Controller designs with FACT devices for SMIB system	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 5:** Patent Rights: Scope of Patent Rights. Licensing and transfer of technology.Patent information and databases.Geographical Indications. **Unit 6:** New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc.Traditional knowledge Case Studies, IPR and IITs.	
12			**MTEEPS106** **AUDIT 1 and 2 : English for Research Paper Writing** **UNIT-1:** Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness. **UNIT-2:** Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check. **UNIT-3:** key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when Writing	**New Course**

			a Review of the Literature. **UNIT-4:** skills are needed when writing the Methods, skills needed when writing the Results, Skills are needed when writing the Discussion; skills are needed when writing the Conclusions. **UNIT-5:** useful phrases, how to ensure paper is as good as it could possibly be the first-time Submission. **AUDIT 1 and 2: Disaster Management** **UNIT-1: Introduction** Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude. **UNIT-2: 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-3: 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-4: Disaster Preparedness and Management** Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness. **UNIT-5: 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. **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. **AUDIT 1 and 2 : Sanskrit for Technical Knowledge** **UNIT-1:** Alphabets in Sanskrit. **UNIT-2:** Past/Present/Future Tense. **UNIT-3:** Simple Sentences Order. **UNIT-4:** Introduction of roots. **UNIT-5:** Technical information about Sanskrit Literature, Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics	

AUDIT 1 and 2 : Value Education

Syllabus

UNIT-1: 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-2: 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-3: Personality and Behavior Development - Soul and Scientific attitude.

- Punctuality, Love and Kindness.
- Avoid fault Thinking.
- Free from anger, Dignity of labor.
- Universal brotherhood and religious tolerance.

UNIT-4: Positive Thinking. Integrity and discipline. Positive Thinking. Integrity and discipline.

- True friendship.
- Happiness Vs suffering, love for truth.
- Aware of self-destructive habits.
- Association and Cooperation.

			□ Doing best for saving nature **UNIT-5:** Character and Competence –Holy books vs. Blind faith. □ Self-management and Good health. □ Science of reincarnation. □ Equality, Nonviolence ,Humility, Role of Women. □ All religions and same message. □ Mind your Mind, Self-control. □ Honesty, Studying effectively. **AUDIT 1 and 2 : Constitution of India** **Syllabus** **UNIT-1: History of Making of the Indian Constitution:** History Drafting Committee, (Composition & Working). **Philosophy of the Indian Constitution:** Preamble Salient Features. **UNIT-2: 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-3: Organs of Governance:**	

			□ Parliament □ Composition □ Qualifications and Disqualifications □ Powers and Functions □ Executive □ President □ Governor □ Council of Ministers □ Judiciary, Appointment and Transfer of Judges, Qualifications □ Powers and Functions **UNIT-3: Local Administration:** □ District's Administration head: Role and Importance, □ Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. □ Pachayati raj: Introduction, PRI: Zila Pachayat. □ Elected officials and their roles, CEO Zila Pachayat: Position and role. □ Block level: Organizational Hierarchy (Different departments), □ Village level: Role of Elected and Appointed officials, □ Importance of grass root democracy **UNIT-5: 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. **AUDIT 1 and 2: Pedagogy Studies** **Syllabus** **UNIT-1: 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-2:** Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. □ Curriculum, Teacher education **UNIT-3:** 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-4:** 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-5: Research gaps and future directions** □ Research design □ Contexts □ Pedagogy □ Teacher education □ Curriculum and assessment □ Dissemination and research impact **AUDIT 1 and 2: Stress Management by Yoga** **UNIT-1:** Definitions of Eight parts of yog (Ashtanga). **UNIT-2:** Yam and Niyam: Do`s and Don't's in life. **UNIT-3:** Ahinsa, satya, astheya,	

			bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwar pranidhan. **UNIT-4:** Asan and Pranayam I) Various yog poses and their benefits for mind & body **UNIT-5:** Regularization of breathing techniques and its effects-Types of pranayam. **AUDIT 1 and 2: Personality Development through Life Enlightenment Skills** **UNIT-1:** Neetisatakam - 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-2**: Approach to day to day work and duties. □ Shrimad BhagwadGeeta: 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-3**: Statements of basic knowledge. □ Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68	

			□ Chapter 12 -Verses 13, 14, 15, 16, 17, 18 **UNIT-4:** Personality of Role model. Shrimad BhagwadGeeta: □ Chapter2-Verses 17, □ Chapter 3-Verses 36, 37, 42, □ Chapter 4-Verses 18, 38, 39 □ Chapter18 – Verses 37, 38, 63	
13			**Power System Steady State Analysis Lab (MTEEPS107)** **Experiment List** Simulate Swing Equation in Simulink (MATLAB) 1. Modeling of Synchronous Machine. 2. Modeling of Induction Machine. 3. Simulate simple circuits using Circuit Maker. 4. (A) Modeling of Synchronous Machine with PSS. (B) Simulation of Synchronous Machine with FACTS device. 5. (A) Modeling of Synchronous Machine with FACTS device. (B) Simulation of Synchronous Machine with FACTS devices. 6. FACTS Controller designs with FACT devices for SMIB system	**Title Change** **Code Change**
14			**Renewable Energy Lab (MTEEPS108)** **Experiment List** 1 Power Curves 2 Build a Wind Farm	**New Course**

			3 Test the Capabilities of the Hydrogen Fuel Cells and Capacitors 4 Effect of Temperature on Solar Panel Output 5 Variables Affecting Solar Panel Output 6 Effect of Load on Solar Panel Output 7 Wind Turbine Output: The Effect of Load 8 Test the Capabilities of Solar Panels and Wind Turbines	
15	**MTEEPS 201**	**Advance Power System Stability** **UNIT-1** Modelling of cylindrical rotor salient pole synchronous machines, flux linkage equations, voltage equations, Park's transformation, various inductances and time constraints of synchronous machines, vector diagrams for steady state and transient conditions, **UNIT-2** power angle curves. Steady state and transient stabilities, their definitions and methods of determination. Development of Swing equation. Steady state stability of single machine connected to an infinite bus by the method of small oscillations. **UNIT-3** Two machine systems. Coherent and non-coherent machines. Equal area criterion of determining transient	**Digital Protection of Power System** **Unit1:** Evolution of digital relays from electromechanical relays**,** Performance and operational characteristics of digital protection. **Unit 2:** Mathematical background to protection algorithms**,** Finite difference techniques **Unit 3:** Interpolation formulae, Forward, backward and central difference interpolation, Numerical differentiation, Curve fitting and smoothing, Least squares method, Fourier analysis, Fourier series and Fourier transform**,** Walsh function analysis **Unit 4:** Basic elements of digital protection, Signal conditioning: transducers, surge protection, analog filtering, analog multiplexers**,** Conversion subsystem: the sampling theorem, signal aliasing, Error, sample and hold circuits, multiplexers, analog to digital conversion, Digital filtering concepts, The digital relay as a unit consisting of hardware and software	**New Course**

		stability, fault clearing time and critical clearing angle. Solution of Swing equation by step by step method. **UNIT-4** Euler's Method and Runga-Kutta Method, Application of Computers in the study of transient stability using these methods. Introduction to steady state and transient Stability using these methods. **UNIT-5** Introduction to steady state and transient stabilities of multi-machine system without controller. Factors affecting steady state and transient stabilities, methods of improving steady state and transient stabilities, high speed circuit breakers, auto-reclosing circuit breaker, single pole operation, excitation control, and bypass valving.	**Unit 5:** Sinusoidal wave based algorithms,Sample and first derivative (Mann and Morrison) algorithm, Fourier and Walsh based algorithms. **Unit 6:** Fourier Algorithm: Full cycle window algorithm, fractional cycle window algorithm, Walsh function based algorithm, Least Squares based algorithms. Differential equation based algorithms. Traveling Wave based Techniques, Digital Differential Protection of Transformers, Digital Line Differential Protection, Recent Advances in Digital Protection of Power Systems.	
16	**MTEEPS 202**	**FLEXIBLE AC TRANSMISSION SYSTEMS** **UNIT-1** Fundamentals of ac power transmission, transmission problems and needs, emergence of FACTS-FACTS control considerations, **UNIT-2** FACTS controllers. Principles of shunt compensation – Variable Impedance type & switching converter type-Static Synchronous Compensator (STATCOM) configuration, characteristics and control.	**Power System Dynamics-II** **Unit 1:** Basic Concepts of Dynamic Systems and Stability Definition, Small Signal Stability (Low Frequency Oscillations) of Unregulated and Regulated System. **Unit 2:** Effect of Damper, Flux Linkage Variation and AVR **Unit 3:** Large Signal Rotor Angle Stability, Dynamic Equivalents And Coherency, Direct Method of Stability Assessment, Stability Enhancing Techniques**,** Mitigation Using Power System Stabilizer.	**Code Change** **Title change**

		UNIT-3 Principles of static series compensation using GCSC, TCSC and TSSC, applications, Static Synchronous Series Compensator (SSSC). **UNIT-4** Principles of operation-Steady state model and characteristics of a static voltage regulators and phase shifters-power circuit configurations**.** **UNIT-5** UPFC -Principles of operation and characteristics, independent active and reactive power flow control, comparison of UPFC with the controlled series compensators and phase shifters.	**Unit 4:** Asynchronous Operation and Resynchronization**,** Multi-Machine Stability. **Unit 5:** Dynamic Analysis of Voltage Stability, Voltage Collapse. **Unit 6:** Frequency Stability, Automatic Generation Control, Primary and Secondary Control, Sub-Synchronous Resonance and Counter Measures	
17	**MTEEPS 203**	**Advanced Circuit Analysis and Design** **UNIT-1** **Network Topology**: Network geometry, incidence matrix, tie-set matrix and loop currents, cut-set matrix, and node pair potentials. Properties of cut-set and tieset matrices, f–cutset Analysis, f-circuit Analysis, Node-pair Analysis. Duality, planner and non-planner networks. Branch parameters matrices. Kirchhoff's equilibrium equations on loop basic. Equilibrium equations on the node basis. **UNIT-2** **Elements of Realizability** : Driving point functions, Brune's positive real	**Restructured Power Systems (MTEEPS203A)** **Unit1:** Fundamentals of restructured system, Market architecture, Load elasticity**,** Social welfare maximization. **Unit2:** OPF: Role in vertically integrated systems and in restructured markets**,** congestion management. **Unit3:** Optimal bidding, Risk assessment, Hedging, Transmission pricing**,** Tracing of power. **Unit4:** Ancillary services, Standard market design, Distributed generation in restructured markets. **Unit5:** Developments in India, IT applications in restructured markets.	**Code Change** **Title change**

		functions, properties of positive real functions. Testing driving point functions An application of the maximum modulus theorem, properties of Hurwitz polynomials, the computation of residues, even & odd functions, Sturm's theorem, An alternative test for positive real character. Driving point synthesis with LC elements: Elementary synthesis operations, LC Network Synthesis. **UNIT-3** **RC and RL Networks**: Properties of RC network functions, foster form of RC networks, and faster form of RL networks. The cauer form of RC and RL networks, RLC one Terminal-Pairs: Minimum positive real functions. Brune's method of RLC synthesis. **UNIT-4** **Active RC filters**: Realisable approximation to Ideal filter, constant time delay & ThomEEon filter, frequency transformation, Active RC filter, Multi amplifier Biquad realization. Fixed capacitor filter. **UNIT-5** **Computer Application**: Network solution by matrix Inversion- Gauss Elimination Method, Computer Programme for plotting transient response, Computer Programme for finding roots of polynomial	**Unit6:** Working of restructured power systems, PJM, Recent trends in Restructuring.	
18			**Advanced Digital Signal Processing (MTEEPS203B)** **Unit 1:** Discrete time signals, Linear shift invariant systems, Stability and causality, Sampling of continuous	**New Course**

			time signals, Discrete time Fourier transform- Discrete Fourier series- Discrete Fourier Transform, Z transform-Properties of different transforms. **Unit 2:** Linear convolution using DFT, Computation of DFT Design of IIR digital filters from analog filters, Impulse invariance method, Bilinear transformation method. **Unit 3:** FIR filter design using window functions, Comparison of IIR and FIR digital filters, Basic IIR and FIR filter realization structures, Signal flow graph representations Quantization process and errors, Coefficient quantisation effects in IIR and FIR filters. **Unit 4:** A/D conversion noise- Arithmetic round-off errors, Dynamic range scaling, Overflow oscillations and zero Input limit cycles in IIR filters**,** Linear Signal Models. **Unit 5:** All pole, All zero and Pole-zero models, Power spectrum estimation- Spectral analysis of deterministic signals, Estimation of power spectrum of stationary random signals. **Unit 6:** Optimum linear filters, Optimum signal estimation, Mean square error estimation, Optimum FIR and IIR Filters.	
19			**Dynamics of Electrical Machines (MTEEPS203C)** **Unit 1:** Stability, Primitive 4 Winding Commutator Machine, Commutator Primitive Machine, Complete Voltage Equation of Primitive 4 Winding Commutator Machine. **Unit 2:** Torque Equation Analysis of Simple	**New Course**

			DC Machines using the Primitive Machine Equations, The Three Phase Induction Motor, Transformed Equations, Different Reference Frames for Induction, Motor Analysis Transfer**,** Function Formulation. **Unit 3:** Three Phase Salient Pole Synchronous Machine**,** Parks Transformation, Steady State Analysis. **Unit 4:** Large Signal Transient, Small Oscillation Equations in State Variable form**,** Dynamical Analysis of Interconnected Machines. **Unit 5:** Large Signal Transient Analysis using Transformed Equations**,** DC Generator /DC Motor System. **Unit 6:** Alternator /Synchronous Motor System.	
20			**Power Apparatus Design (MTEEPS203D)** **Unit 1:** Principles of Design of Machines - Specific loadings, choice of magnetic and electric loadings, Real and apparent flux densities, temperature rise calculation, Separation of main dimension for DC machines Induction machines and synchronous machines, Design of Transformers-General considerations, output equation, emf per turn, choice of flux density and current density, main dimensions, leakage reactance and conductor size, design of tank and cooling **Unit 2:** Specific loadings, choice of magnetic and electric loadings Real and apparent flux -densities, temperature rise calculation, Separation of main dimension for DC machines, Induction machines	**New Course**

			and synchronous machines Heating and cooling of machines, types of ventilation, continuous and intermittent rating. **Unit 3:** General considerations, output equation, emf per turn, choice of flux density and current density, main dimensions, leakage reactance and conductor size, design of tank and cooling tubes, Calculation of losses, efficiency and regulation, Forces winding during short circuit. **Unit 4:** General considerations, output equation, Choice of specific electric and magnetic loadings, efficiency, power factor, Number of slots in stator and rotor**,** Elimination of harmonic torques. **Unit 5:** Design of stator and rotor winding, slot leakage flux, Leakage reactance, equivalent resistance of squirrel cage rotor, Magnetizing current, efficiency from design data. **Unit 6:** Types of alternators, comparison, specific loadings, output co-efficient, design of main dimensions, Introduction to Computer Aided Electrical Machine Design Energy efficient machines.	
21	**MTEEPS 204A**	**Advanced Relaying & Protection System** **UNIT-1** **Review of:** Characteristics & operating equations of basic electromagnetic relays, comparison of transistor operation with electromechanical relays. Introduction to static relays & their basic construction.	**Advanced Micro-Controller Based Systems** **Unit1:** Basic Computer Organization, Accumulator based Processes-Architecture, Memory Organization-I/O Organization. **Unit2:** Micro-Controllers-Intel 8051, Intel 8056- Registers, Memories, I/O Ports, Serial Communication**,** Timers, Interrupts, Programming. **Unit3:** Intel 8051 – Assembly language programming, Addressing-	**New Course**

		UNIT-2 **Comparators:-** Introduction, mixing transformers, Amplitude comparators, Rectified bridge & direct comparators, phase comparators, direct, coincidence & phase splitting type comparators. Duality between phase & amplitude comparators. **UNIT-3** **Directional relays:** - Integrating phase comparison type, instantaneous coincidence type, rectifier phase comparator type, amplitude comparator, directional units. Over current relays: - Introduction, instantaneous over current relay, time - over current relay, definite time over current relay. Differential **UNIT-4** **Relays:-** Introduction, types of differential relays, analysis of electromagnetic & static differential relays, differential relay equations for e.m. type & static type relays, voltage & current comparison, harmonic restraint, percentage differential relays for transformer protection. **UNIT-5** **Distance Relays:** - Characteristics, elements of 3-zone directional & MHO relay protection. Special characteristics i.e. swiveling characteristic, conic section & Quadrilateral characteristic.	Operations, Stack & Subroutines Interrupts-DMA. **Unit4:** PIC 16F877- Architecture Programming, Interfacing Memory/ I/O Devices**,** Serial I/O and data communication. **Unit5:** Digital Signal Processor (DSP), Architecture – Programming**,** Introduction to FPGA. **Unit 6:** Microcontroller development for motor control applications, Stepper motor control using micro controller.	

		Microprocessor based Relay:- Implementation of over current, impedance, reactance, directional & Mho relays using assembly level programming. Review of arc formation, interruption of currents in circuit breakers, operation of SF6, vacuum type and H.V.D.C. circuit breakers, different ratings of circuit breakers & testing methods of circuit breakers.		
22	**MTEEPS 204B**	**Power Generation Sources** **UNIT-1** **Generation of Electricity and Sources of Energy** : Major sources of energy-Salient features, selection of site, basic schemes and constituents of Steam, Hydro, Nuclear, Diesel and Gas Turbine Power Stations. Co-generation, Hydro-thermal Energy co-ordination. ***UNIT-2*** ***Steam Power Plants:*** *Thermodynamic cycles and use of high steam pressure and temperature. Super heating of steam. Reheat cycle. Regenerative cycle. Binary vapour cycle. Coal Classification, use of high ash coal, Indian Coal, supply, storage and handling of coal, Ash handling and dust collectors.* **Steam Generators**: Fire tube and water tube boilers. Modern boilers.	**SCADA System and Applications** **Unit 1:** Introduction to SCADA, Data acquisition systems, Evolution of SCADA, Communication technologies **Unit 2:** Monitoring and supervisory functions, SCADA applications in Utility Automation, Industries SCADA **Unit 3:** Industries SCADA System Components, Schemes- Remote Terminal Unit (RTU), Intelligent Electronic Devices(IED), Programmable Logic Controller (PLC), Communication Network, SCADA Server, SCADA/HMI Systems **Unit 4:** SCADA Architecture, Various SCADA architectures, advantages and disadvantages of each System, single unified standard architecture -IEC 61850. **Unit 5:** SCADA Communication, various industrial communication technologies, wired and wireless methods and fiber optics, Open standard communication protocols **Unit 6:** SCADA Applications: Utility	**New Course**

		Economizer and air preheated, condenser, supply of cooling water to condenser, cooling towers. **Steam Primemovers**: Impulse and reaction types. Heat balance and efficiency. **UNIT-3** **Station Auxiliaries**: Types of auxiliaries, power supply scheme for auxiliaries. Modern development in steam power plants. **Hydro Electric Plants:** Selection of site, classification and basic schemes. Types of turbines, capacity calculation, Pump storage projects. **Nuclear Power Plant**: Types of fuels. Classification of reactors, methods of cooling; moderators, methods of control, safety measures, Basic schemes of nuclear power stations: Boiling water reactor, pressurized heavy water reactor, fast breeder reactor, Cost of Nuclear Energy. Nuclear Power Stations of India. **UNIT-4** **Gas Turbine Power Plants**: Operation of gas turbine power plant, open cycle plant, closed cycle plant, Combined gas turbine and steam turbine cycle. Comparative study of thermal, hydro, and nuclear power stations: Economic comparison of power stations, Inter connections. Base and peak load power stations. Impact of thermal, hydro and nuclear stations on	applications, Transmission and Distribution sector operations, monitoring, analysis and improvement, Industries - oil, gas and water, Case studies, Implementation, Simulation Exercises	

		environment. **UNIT-5** **New Energy Sources**: Principle of MHD power generation, open cycle MHD system and closed cycle MHD system. Wind power generation. Solar power generation: Solar power plant, photo voltaic cell, photo voltaic power generation. Tidal power generation. Geo-thermal power generation.		
23	**MTEEPS 204C**	**DEMAND SIDE ENERGY MANAGEMENT** **<u>Unit-1</u>** : **Energy Audit** : Definitions-Need-concepts-Types of energy audit; Energy index – cost index – pie harts – Sankey diagrams. **<u>Unit-2</u>** : **Energy Economics**: Introduction-Cost benefit risk analysis-Payback period-Straight line depreciation-Sinking fund depreciation—Reducing balance depreciation-Net present value method-Internal rate of return method-Profitability index for benefit cost ratio. **<u>Unit-3</u>** : **Energy Conservation in Electric utilities and Industry**: Electrical load management: Energy and load management devices-Conservation strategies; conservation in electric utilities and industry: Introduction-Energy conservation in utilities by	**Power Quality** **Unit1:** Introduction-power quality-voltage quality-overview of power quality phenomena, classification of power quality issues-power quality measures and standards-THD-TIF-DIN-C, message weights-flicker factor transient phenomena-occurrence of power quality problems, power acceptability curves-IEEE guides, standards and recommended practices. **Unit 2:** Harmonics-individual and total harmonic distortion, RMS value of a harmonic waveform- Triplex harmonics-important harmonic introducing devices-SMPS-,Three phase power converters-arcing devices saturable devices-harmonic distortion of fluorescent lamps-effect of power system harmonics on power system equipment and loads. **Unit 3:** Modeling of networks and components under non-sinusoidal conditions transmission and distribution systems, Shunt capacitors-transformers-electric machines-ground, systems loads that cause power quality problems, power quality problems created by drives and its impact on drive.	**Code Change**

		improving load factor-Utility voltage regulation-Energy conservation in Industries-Power factor improvement. **Unit-4 :** **Energy–efficient electric motors (EEMs)** : Energy efficient motors-construction and technical features-case studies of EEMs with respect to cost effectiveness-performance characteristics; Economics of EEMs and system life cycle-direct savings and payback analysis-efficiency factor or efficiency evaluation factor **Unit-5 :** **Electric Lighting:** Introduction-Need for an energy management program-Building analysis-Modification of existing systems-Replacement of existing systems-priorities: Illumination requirement : Task lighting requirements-lighting levels-system modifications-non illumination modifications-lighting for non task areas-reflectances-space geometry ;System elements.	**Unit 4:** Power factor improvement-Passive Compensation, Passive Filtering , Harmonic Resonance Impedance Scan Analysis- Active Power Factor Corrected Single Phase Front End, Control Methods for Single Phase APFC, Three Phase APFC and Control Techniques, PFC, Based on Bilateral Single Phase and Three Phase Converter **Unit 5:** Static VAR compensators-SVC and STATCOM Active Harmonic Filtering-Shunt Injection, Filter for single phase, three-phase three-wire and three-phase four wire systems, d-q domain control of three phase shunt active filters uninterruptible power supplies constant voltage, transformers, series active power filtering techniques for harmonic cancellation and isolation. **Unit 6:** Dynamic Voltage Restorers for sag , swell and flicker problems. Grounding and wiring introduction, NEC grounding requirements-reasons for grounding typical grounding and wiring problems solutions to grounding and wiring problems	
24			**AI Techniques (MTEEPS204D)** **Unit-I:** Biological foundations to intelligent Systems, Artificial Neural Networks, Single layer and Multilayer Feed Forward NN, LMS and Back Propagation Algorithm, Feedback networks and Radial Basis Function Networks. **Unit-II:** Fuzzy Logic, Knowledge	**New Course**

			Representation and Inference Mechanism, Defuzzification Methods **Unit-III:** Fuzzy Neural Networks, some algorithms to learn the parameters of the network like GA **Unit-IV:** System Identification using Fuzzy and Neural Network **Unit-V:** Genetic algorithm, Reproduction cross over, mutation, Introduction to evolutionary program **Unit-VI:** Applications of above mentioned techniques to practical problems	
25	**(MTEE PS205)**	**Advance Power System design Lab** **List of Experiment:** 1. To compute the fault level, post-fault voltages and currents for different types of faults. 2. To plot Swing Curve for one Machine System 3. To Formulate Y_{BUS} Matrix By Singular Transformation. 4. Gauss Siedal Load flow analysis using Matlab Software. 5. Newton Raphson load flow analysis Matlab Software. 6. Load sharing between two interconnected power systems. 7. Load sharing between two interconnected power systems including	**MTEEPS205** **AUDIT 1 and 2 : English for Research Paper Writing** **UNIT-1:** Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness. **UNIT-2:** Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check. **UNIT-3:** key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when Writing a Review of the Literature. **UNIT-4:** skills are needed when writing the Methods, skills needed when writing the	**New Course**

		transmission losses component. **8.** Load-frequency dynamics of single area power system.	Results, Skills are needed when writing the Discussion; skills are needed when writing the Conclusions. **UNIT-5:** useful phrases, how to ensure paper is as good as it could possibly be the first-time Submission. **AUDIT 1 and 2: Disaster Management** **UNIT-1: Introduction** Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude. **UNIT-2: 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-3: 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-4: Disaster Preparedness and Management Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness. **UNIT-5: 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. **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. **AUDIT 1 and 2 : Sanskrit for Technical Knowledge** **UNIT-1:** Alphabets in Sanskrit. **UNIT-2:** Past/Present/Future Tense. **UNIT-3:** Simple Sentences Order. **UNIT-4:** Introduction of roots. **UNIT-5:** Technical information about Sanskrit Literature, Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics **AUDIT 1 and 2 : Value Education** **Syllabus**	

			UNIT-1: 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-2:** 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-3**: Personality and Behavior Development - Soul and Scientific attitude. □ Punctuality, Love and Kindness. □ Avoid fault Thinking. □ Free from anger, Dignity of labor. □ Universal brotherhood and religious tolerance. **UNIT-4:** Positive Thinking. Integrity and discipline. Positive Thinking. Integrity and discipline. □ True friendship. □ Happiness Vs suffering, love for truth. □ Aware of self-destructive habits. □ Association and Cooperation. □ Doing best for saving nature **UNIT-5:** Character and Competence –Holy books vs. Blind faith.	

			□ Self-management and Good health. □ Science of reincarnation. □ Equality, Nonviolence ,Humility, Role of Women. □ All religions and same message. □ Mind your Mind, Self-control. □ Honesty, Studying effectively. **AUDIT 1 and 2 : Constitution of India** **Syllabus** **UNIT-1: History of Making of the Indian Constitution:** History Drafting Committee, (Composition & Working). **Philosophy of the Indian Constitution:** Preamble Salient Features. **UNIT-2: 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-3: Organs of Governance:** □ Parliament □ Composition □ Qualifications and Disqualifications	

			□ Powers and Functions □ Executive □ President □ Governor □ Council of Ministers □ Judiciary, Appointment and Transfer of Judges, Qualifications □ Powers and Functions **UNIT-3: Local Administration:** □ District's Administration head: Role and Importance, □ Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. □ Pachayati raj: Introduction, PRI: Zila Pachayat. □ Elected officials and their roles, CEO Zila Pachayat: Position and role. □ Block level: Organizational Hierarchy (Different departments), □ Village level: Role of Elected and Appointed officials, □ Importance of grass root democracy **UNIT-5: 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. **AUDIT 1 and 2: Pedagogy Studies** **Syllabus** **UNIT-1: 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-2:** Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. □ Curriculum, Teacher education **UNIT-3:** 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-4:** 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-5: Research gaps and future directions** □ Research design □ Contexts □ Pedagogy □ Teacher education □ Curriculum and assessment □ Dissemination and research impact **AUDIT 1 and 2: Stress Management by Yoga** **UNIT-1:** Definitions of Eight parts of yog (Ashtanga). **UNIT-2:** Yam and Niyam: Do`s and Don't's in life. **UNIT-3:** Ahinsa, satya, astheya, bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwar pranidhan.	

			UNIT-4: Asan and Pranayam I) Various yog poses and their benefits for mind & body **UNIT-5:** Regularization of breathing techniques and its effects-Types of pranayam. **AUDIT 1 and 2: Personality Development through Life Enlightenment Skills** **UNIT-1:** Neetisatakam - 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-2**: Approach to day to day work and duties. □ Shrimad BhagwadGeeta: 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-3**: Statements of basic knowledge. □ Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68 □ Chapter 12 -Verses 13, 14, 15, 16, 17, 18 **UNIT-4:** Personality of Role model. Shrimad BhagwadGeeta:	

			□ Chapter2-Verses 17, □ Chapter 3-Verses 36, 37, 42, □ Chapter 4-Verses 18, 38, 39 □ Chapter18 – Verses 37, 38, 63	
26			**Power System Protection Lab (MTEEPS206)** **Experiment List** 1 Introduction to Power System Protection 2 Impact of Induction Motor Starting on Power System 3 Modelling of Differential Relay using MATLAB 4 Radial Feeder Protection 5 Parellel Feeder Protection 6 Principle of Reverse Power Protection 7 Differential Protection of Transformer 8 To the study time vs.voltage characteristcs of over voltage induction relay	**New Course**
27			**Application to Power System Lab (MTEEPS207)** **Experiment List** 1. To compute the fault level, post-fault voltages and currents for different types of faults. 2. To plot Swing Curve for one Machine System 3. To Formulate Y_{BUS} Matrix By Singular Transformation. 4. Gauss Siedal Load flow analysis using Matlab Software. 5. Newton Raphson load flow analysis	Title Change Code Change

			Matlab Software. 6. Load sharing between two interconnected power systems. 7. Load sharing between two interconnected power systems including transmission losses component. **8.** Load-frequency dynamics of single area power system.	
28			**Mini Project and Seminar (MTEEPS208)**	**New Course**
29	**MTEEPS301**	**POWER SYSTEM NETWORKING AND MANAGEMENT** **Unit-1** Role of Reactive Power on Voltage and Voltage Regulation, Relation between Incremental Reactive Power, Active Power and Voltage at a Node, Reactive Compensation in Power System **Unit-2** Types of Compensator, Sub-Synchronous Resonance, Flexible AC Transmission systems (FACTS), Control of Voltage-Control by Generators, Control by VAR generators, control by Transformers. **Unit-3** Automatic load frequency control of single area system, Speed Governing System, Block Diagram Model, Static and Dynamic Response with and without Integral Control, Control Area Concept, Two Area Load Frequency Control, Digital load frequency controller, De-centralized Control **Unit-4**	**Power System Transients (MTEEPS301A)** **Unit 1**: Fundamental circuit analysis of electrical transients, Laplace Transform method of solving simple Switching transients, Damping circuits -Abnormal switching transients, Three-phase circuits and transients, Computation of power system transients Unit 2: Principle of digital computation – Matrix method of solution, Modal analysis- Z transform- Computation using EMTP, Lightning, switching and temporary over voltages, Lightning, Physical phenomena of lightning. Unit 3: Interaction between lightning and power system, Influence of tower footing resistance and Earth Resistance, Switching: Short line or kilometric fault, Energizing transients - closing and, re-closing of lines, line dropping, load rejection – over voltages induced by faults Unit 4: Switching HVDC line travelling waves on transmission line, Circuits with distributed Parameters Wave Equation, Reflection, Refraction, Behavior of Travelling waves at the line Terminations, Lattice Diagrams – Attenuation and Distortion, Multi-conductor system, and Velocity	**Code Change** **Title Change**

		Concept of Stability: Steady State, Dynamic and Transient Stability, Voltage Stability-Voltage Collapse. The Synchronous Machine-Three Phase Generation, Synchronous Reactance and equivalent circuits, Real and Reactive Power Control, Loading Capability Diagram, The Two Axis Machine Model, Voltage Equations, Salient Pole-Machines, Transient and Sub-Transient Effects, Short Circuit Currents-Problem **Unit-5** Dynamic Analysis and Modelling of Synchronous Machines, Excitation System, the Prime Mover and Governing System, Induction Machine Modelling.	wave Unit 5: Insulation co-ordination: Principle of insulation co-ordination in Air Insulated substation (AIS) and Gas Insulated Substation (GIS) Coordination between insulation and protection level, Statistical approach Unit 6: Protective devices, Protection of system against over voltages, lightning arresters, substation earthing	
30			**FACTS and Custom Power Devices (MTEEPS301B)** **Unit 1**: Reactive power flow control in Power Systems, Control of dynamic power unbalances in Power System - Power flow control,Constraints of maximum transmission line loading, Benefits of FACTS Transmission line compensation, Uncompensated line -Shunt compensation, Series compensation Phase angle control, Reactive power compensation Shunt and Series compensation principles, Reactive compensation at transmission and distribution level Unit 2: Static versus passive VAR compensator, Static shunt compensators: SVC and, STATCOM, Operation and control of TSC, TCR and STATCOM –Compensator control, Comparison between SVC	**Title Change** **Code Change**

			and STATCOM Unit 3: Static series compensation: TSSC, SSSC -Static voltage and phase angle regulators, TCVR and TCPAR Operation and Control, Applications, Static series compensation, GCSC, TSSC, TCSC and Static synchronous series compensators and their Control Unit 4: SSR and its damping Unified Power Flow Controller, Circuit Arrangement, Operation and control of UPFC, Basic Principle of P and Q control, Independent real and reactive power flow control-Applications. Unit 5: Introduction to interline power flow controller, Modeling and analysis of FACTS, Controllers, Simulation of FACTS controllers Power quality problems in distribution systems, harmonics, loads that create harmonics, modeling, harmonic propagation, series and parallel resonances, mitigation of harmonics, passive filters, active filtering – shunt , series and hybrid and their control Unit 6: Voltage swells, sags, flicker, unbalance and mitigation of these problems by power line conditioners, IEEE standards on power quality.	
31			**Industrial Load Modeling and Control (MTEEPS301C)** **UNIT–I**: Electric Energy Scenario-Demand Side Management-Industrial Load Management, Load Curves-Load Shaping Objectives, Methodologies-Barriers, Classification of Industrial, Loads, Continuous and Batch processes -Load Modeling.	**Syllabus Change** **Title Change** **Code Change**

			UNIT–II: Electricity pricing – Dynamic and spot pricing –Models, Direct load control-Interruptible load control, Bottom up approach-scheduling- Formulation of load, Models, Optimization and control algorithms - Case studies **UNIT–III:** Reactive power management in industries, controls-power quality impacts, application of filters Energy saving in industries **UNIT–IV:** Cooling and heating loads, load profiling, Modeling- Cool storage, Types-Control strategies, Optimal operation, Problem formulation- Case studies **UNIT–V:** Captive power units, Operating and control strategies, Power Pooling- Operation models, Energy banking, Industrial Cogeneration **UNIT–VI:** Selection of Schemes Optimal Operating Strategies, Peak load saving, Constraints Problem formulation- Case study, Integrated Load management for Industries	
32			**Dynamics of Linear Systems (MTEEPS301D)** **Unit-I:** State variable representations of systems, transfer function and transfer function matrix, solutions of state equations **Unit-II:** Observability and controllability, minimal realization of MIMO systems, analysis of linear time varying systems, the concepts of stability **Unit-III:** Lyapunov stability analysis, Lyapunov function and its properties, controllability by	**New Course**

			state variable feedback **Unit-IV:** Ackerman's Formula - stabilisation by output feedback**,** asymptotic observers for state measurement**,** observer design **Unit-V:** State space representation of discrete systems**,** solution of state equations, controllability and observabilty stability analysis using Lyapunov method **Unit-VI:** State feedback of linear discrete time systems**,** design of observers - MATLAB Exercises	
33	**MTEEP S302**	**MODELING AND ANALYSIS OF ELECTRICAL MACHINES** **Unit-1** Matric analysis of Electrical machines, invariance of power, Modelling and their solutions, Generalised of first kind, quasi holonomic reference frame, impedance metrics, torque matrix, flux and current density matric modelling of DC Machines. **Unit-2** Steady state and transient analysis repulsion and universal machines, cross field generator, steady state. Transient analysis, Matrix analysis of single and three phase transformer under steady state and transient conditions **Unit-3** Rectifier transformer, Generalised theory of electrical machines in rotational frame Holonomic and non - holonomic reference frame Torque matrix. Voltage and impedance matrix	**Business Analytics (MTEEPS302A)** **Unit-I:** Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics**,** Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, 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	**New Course**

		Unit-4 Transient analysis of single phase and three induction motor. Analysis using revolving field theory; sequence reference frame. **Unit-5** State space modelling of electrical machines; Equivalent circuits, synchronous generator under sudden short circuit; generalized fault analysis.	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 Using Analytic 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 in: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism. **Industrial Safety (MTEEPS302B)** **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, equipment and methods.	
			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, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. 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 treeconcept, 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, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. 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: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance. **Operations Research (MTEEPS302C)** **Unit 1**: Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models **Unit 2:** Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming **Unit 3**: Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT **Unit 4:** Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.	

			Unit 5:	Competitive Models,Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation	
			Cost Management of Engineering Projects (MTEEPS302D)		
			Unit 1:	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 2:	Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution : conception to commissioning. Project execution as conglomeration of technical and non technical 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 3:	Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption 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 Costing. Costing of service sector. Just-in-time approach, Material Requirement **Unit 4:** Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing. **Unit 5:** Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory. **Composite Materials (MTEEPS302E)** **UNIT–I**: INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance. **UNIT – II**: REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress	

			conditions. **UNIT–III:** Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications. **UNIT–IV:** Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications. **UNIT – V:** Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations. **Waste to Energy (MTEEPS302F)** **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 chullahs, 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 their classification - 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	
34	**MTEEPS 303**	**POWER SYSTEM OPERATION AND CONTROL** **Unit-1**	**Dissertation-I / Industrial Project** **Dissertation-I**: will have mid semester presentation and end semester presentation.	**Code Change**

		Load forecasting, Unit commitment, Economic dispatch problem of thermal units, Gradient method, Newton's method, Base point and participation factor method. **Unit-2** Hydroelectric plant models, short term hydrothermal scheduling problem, gradient approach, Hydro units in series, pumped storage hydro plants, hydro-scheduling using Dynamic programming and linear programming **Unit-3** Review of LFC and Economic Dispatch control (EDC) using the three modes of control viz. Flat frequency, tie-line control, and tie-line bias control, AGC implementation , AGC features static and dynamic response of controlled two area system. **Unit-4** MVAR control, Application of voltage regulator, synchronous condenser, and transformer taps – static var compensators. **Unit-5** Power system security, contingency analysis, linear sensitivity factors, AC power flow methods, contingency selection, concentric relaxation, bounding-security constrained, optimal power flow-Interior point algorithm-Bus incremental costs.	Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available. End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions and must bring out individuals contribution. Continuous assessment of Dissertation – I and Dissertation – II at Mid Semester and End Semester will be monitored by the departmental committee.	

35	**MTEEPS 304A**	**POWER SYSTEM PLANNING AND RELIABILITY** **Unit-1** Objectives of planning, Long and short term planning, Load forecasting , characteristics of loads, methodology of forecasting, energy forecasting, peak demand forecasting, total forecasting, annual and monthly peak demand, forecasting. **Unit-2** Reliability concepts, exponential distributions, meantime to failure, series and, parallel system, MARKOV process Recursive technique. **Unit-3** Generator system reliability analysis, probability models for generators unit and loads, reliability analysis of isolated and interconnected system, generator system cost analysis, corporate model, energy transfer and off peak. **Unit-4** Transmission system reliability model analysis, average interruption rate, LOLP method, frequency and duration method, Two plant single load system-two plant two load system, Load forecasting uncertainly interconnection benefits. **Unit-5**		**No Change**

		Introduction system modes of failure, The loss of load approach, frequency & duration approach, spare value , assessment, multiple bridge equivalents.		
36	**MTEEPS304B**	**POWER QUALITY** **<u>Unit 1</u> :** Power and Voltage Quality : General, classes of Power Quality Problems, Power quality terms, Power frequency variations, the power quality evaluation procedure. Voltage quality : Transients, long and short duration Voltage variations, Voltage imbalance, waveform distortion, Voltage Flicker. **<u>Unit 2</u> : Voltage sags and Interruptions** : Sources of sags and Interruptions. Estimating Voltage sag performance. Fundamental Principles of Protection. Solutions at the end-user level. . **<u>Unit 3</u> : Fundamentals of Harmonics :** Harmonic distortion. Voltage versus Current distortion. Harmonic indexes. Harmonic sources from commercial loads. Harmonic sources from industrial loads. Locating Harmonic sources. System response characteristics. Effects of Harmonic Distortion. **<u>Unit 4</u> : Distributed Generation and Power Quality :** Resurgence of DG.		**No Change**

		DG Technologies. Interface to the Utility System. Power Quality Issues. Operating Conflicts. DG on distribution Networks. Siting DG distributed Generation, Interconnection standards. **<u>Unit 5</u>: Wiring and Grounding :** Resourses, Definitions, Reasons for Grounding, Typical wiring and grounding problems, Solution to wiring and grounding problems.		
37	**MTEEPS 304C**	**Power System Deregulation** **Unit –I** Deregulation, Reconfiguring Power systems, unbundling of electric utilities, Background to deregulation and the current situation around the world, benefits from a competitive electricity market after effects of deregulation **Unit –II** Role of the independent system operator, Operational planning activities of ISO: ISO in Pool markets, SO in Bilateral markets, Operational planning activities of a GENCO: Genco in Pool and Bilateral markets, market participation issues, competitive bidding **Unit –III** Power wheeling, Transmission open		**No Change**

		access, pricing of power transactions, security management in deregulated environment, and congestion management in deregulation **Unit –IV** General description of some ancillary services, ancillary services management in various countries, and reactive power management in some deregulated electricity markets **Unit –V** Reliability analysis: interruption criterion, stochastic components, component models, And Calculation methods, Network model: stochastic networks, series and parallel connections, minimum cut sets, reliability cost		
38	**MTEEPS 305**	Seminar		**Subject Removed**
39	**MTEEPS 401**	**Dissertation**	**Dissertation II** **Dissertation – II:** will be extension of the to work on the topic identified in Dissertation – I. Continuous assessment should be done of the work done by adopting the methodology decided involving numerical analysis/ conduct experiments, collection and analysis of data, etc. There will be pre submission seminar at the end of academic term. After the approval the student has to submit the detail report and external examiner is called for the viva-voce to assess along with guide.	**No Change**