

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. TECH. POWER ENGINEERING AND ENERGY SYSTEMS**  
**EFFECTIVE FROM ACADEMIC YEAR 2019- 20 ADMITTED BATCH**

**R19 COURSE STRUCTURE AND SYLLABUS**

**I YEAR I SEMESTER**

Course Code	Course Title	L	T	P	Credits
Professional Core - I	Economic Operation of Power Systems	3	0	0	3
Professional Core - II	Renewable Energy Technologies	3	0	0	3
Professional Elective - I	1. Engineering Heat Transfer 2. Thermal Power Plant 3. Smart Grid Technologies 4. Modern Control Theory	3	0	0	3
Professional Elective - II	1. Electrical Power Distribution System 2. Reactive Power Compensation and Management 3. Mathematical Methods for Power Engineering 4. Hybrid Electric Vehicles	3	0	0	3
MC	Research Methodology and IPR	2	0	0	2
Lab - I	Power and Energy Systems Lab - I	0	0	4	2
Lab - II	Energy Computational Lab	0	0	4	2
Audit - I	Audit Course - I	2	0	0	0
	<b>Total Credits</b>	<b>16</b>	<b>0</b>	<b>8</b>	<b>18</b>

**I YEAR II SEMESTER**

Course Code	Course Title	L	T	P	Credits
Professional Core - III	Digital Protection of Power System	3	0	0	3
Professional Core - IV	Energy Efficiency in Thermal Systems	3	0	0	3
Professional Elective - III	1. Restructured Power Systems 2. Nuclear Power Plants 3. Swarm Intelligence Techniques in Power Systems 4. Industrial Load Modelling and Control	3	0	0	3
Professional Elective - IV	1. AI Techniques in Power Systems 2. Wind Energy Conversion Systems 3. Optimization of Energy Systems 4. Power System Reliability and Planning	3	0	0	3
--	Mini Project with Seminar	0	0	4	2
Lab - III	Power Systems Computation Lab-II	0	0	4	2
Lab - IV	Power System Protection Lab	0	0	4	2
Audit - II	Audit Course - II	2	0	0	0
	<b>Total Credits</b>	<b>14</b>	<b>0</b>	<b>12</b>	<b>18</b>

**Audit Course I & II**

1. English for Research Paper Writing
2. Disaster Management
3. Sanskrit for Technical Knowledge
4. Value Education
5. Constitution of India
6. Pedagogy Studies
7. Stress Management by Yoga
8. Personality Development through Life Enlightenment Skills

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. TECH. I Year I Sem. (PEES)**

**ECONOMIC OPERATION OF POWER SYSTEMS (Professional Core - I)**

**Prerequisite:** Electrical Power Systems

**Course Objectives:** Students will be able to:

- formulate and derive the necessary conditions for economical load scheduling problem.
- understand various constraints, problem formulation and methods to solve the unit commitment problem.
- understand the constraints related to hydel power plants, problem formulation and solution techniques for hydro-thermal scheduling problem.
- understand the necessity, factors governing the frequency control and analyze the uncontrolled and controlled LFC system.
- understand the basic difference between ELS and OPF problem, formulation of the OPF problem and solution techniques.

**Course Outcomes:**

- Student can solve the economic load scheduling with and without network losses both in classical method and iterative methods.
- Student can solve the unit commitment problem using priority-list method and forward-dynamic method.
- should able to solve hydro-thermal scheduling problem for short-term and long-term range.
- should able to analyze the single area and two area systems for frequency deviation under sudden change in load.
- should able to solve the OPF problem using ac and dc load flow methods.

**UNIT-I: ECONOMIC LOAD SCHEDULING**

Characteristics of Steam Turbine, Variations in steam unit characteristics, Economic dispatch with piecewise linear cost functions, Lambda Iterative method, LP method, Economic dispatch under composite generation production cost function, Base point and Participation factors, Thermal system Dispatching with Network losses considered.

**UNIT-II: UNIT COMMITMENT**

Unit Commitment – Definition – Constraints in Unit Commitment–Unit Commitment solution methods – Priority–List Methods – Dynamic Programming Solution.

**UNIT-III: HYDRO THERMAL SCHEDULING**

Characteristics of Hydroelectric units, Introduction to Hydrothermal coordination, Long-Range and Short-Range Hydro-Scheduling, Hydroelectric plant models, Hydrothermal scheduling with storage limitations, Dynamic programming solution to hydrothermal scheduling.

**UNIT-IV: LOAD FREQUENCY CONTROL**

Control of generation – models of power system elements – single area and two area block diagrams – generation control with PID controllers – implementation of Automatic Generation control (AGC) – AGC features.

**UNIT-V: OPTIMAL POWER FLOW**

Introduction to Optimal power flow problem, OPF calculations combining economic dispatch and power flow, OPF using DC power flow, Algorithms for solution of the ACOPF, Optimal Reactive Power Dispatch.

**TEXT BOOKS:**

1. J.J. Grainger & W.D. Stevenson, "Power system analysis", McGraw Hill, 2003
2. Allen J. Wood, Bruce F. Wollenberg, Gerald B. Sheblé-Power Generation, Operation and Control-Wiley-Interscience (2013)

**REFERENCES:**

1. Olle I. Elgerd, "Electric Energy Systems Theory an Introduction", TMH, 2<sup>nd</sup> Edition, 1983.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. TECH. I Year I Sem. (PEES)**

**RENEWABLE ENERGY TECHNOLOGIES (Professional Core - II)**

**Course objectives:**

- To explain the concepts of Non-renewable and renewable energy systems
- To outline utilization of renewable energy sources for both domestic and industrial applications
- To analyse the environmental and cost economics of renewable energy sources in comparison with fossil fuels.

**Course Outcomes:** Student have

- An understanding of renewable energy sources
- A knowledge of working principle of various energy systems
- A capability to carry out basic design of certain renewable energy systems

**Unit - I**

**Fundamentals of Energy:** Energy consumption and standard of living, Oil crisis, Classification of energy resources, Consumption trend of primary energy resources, conventional energy sources and their distribution, Energy chain, common forms of energy, importance and salient features of non-conventional energy resources, environmental aspects of energy, Environment-economy-energy and sustainable development, Energy densities of various fuels, World energy status, Energy scenario in India.

**Unit - II**

**Solar energy:** Solar energy basics, Sun-Earth relation spectrum, Terrestrial and extra-terrestrial radiation, spectral energy distribution of solar radiation, Depletion of solar radiation, measurement of solar radiation, solar radiation data, Solar time, Solar radiation geometry, Solar day length, Empirical equations for estimation of solar radiation on horizontal surfaces, Global, diffused and beam radiation, Solar radiation on inclined surface (Problems on energy availability on surfaces)

**Unit - III**

**Wind Energy:** Wind origin, nature, types, Wind data and wind rose, wind speed variation, Wind siting Wind turbine classification and types of rotors, Wind turbine aerodynamics, power extraction from wind, Betz criteria, Axial thrust on the turbine, torque developed by the turbine, Dynamic matching, speed control strategies, Wind turbine operational characteristics, wind energy conversion systems, environmental aspect, Wind energy potential and installation in India (Problems on energy Conversion)

**Unit - IV**

**Biomass Energy:** Biomass resources and their classification, Biomass conversion technologies: Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion – operational parameters of biogas plants, Types of biogas Plants and biogas plant design – Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy program in India (Problems on biogas plant design)

**Unit - V**

**Ocean Energy:** Origin and nature of tidal energy, Tidal range power, tidal energy conversion schemes - Principle of Ocean Thermal Energy Conversion (OTEC) - Ocean thermal power plants-wave energy, power in waves, wave energy technologies- Geothermal power plants - Various types.

**Small Hydro Power Plant:** Importance of small hydro power plants and their Elements - Types of turbines for small hydro - Estimation of primary and secondary power.

**TEXT BOOKS:**

1. Renewable Energy Sources, Twidell, J.W. and Weir, A., EFN Spon Ltd., 1986.
2. Renewable Energy Engineering and Technology, Kishore VVN, Teri Press, New Delhi, 2012
3. Renewable Energy Power for a Sustainable Future, Godfrey Boyle, Oxford University Press, U.K, 1996.

**REFERENCE BOOKS:**

1. Solar Energy - Principles of thermal collection and storage, S. P. Sukhatme
2. Solar Engineering of Thermal Processes, J. A. Duffie and W. A. Beckman
3. Principles of Solar Engineering, Kreith, F and Kreider, J. F., McGraw-Hill, 1978.
4. Renewable Energy, Bent Sorensen, Elsevier, Academic Press, 2011
5. Power Plant Technology, J Wakil
6. Non-Conventional Energy Sources, G.D Rai

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. TECH. I Year I Sem. (PEES)**  
**ENGINEERING HEAT TRANSFER (Professional Elective - I)**

**Course objective:**

- To understand the fundamental laws of Heat transfer modes
- To develop the skills to correlate the Physics with applications

**Course Outcomes:** Student will be able to use the concepts of Heat Transfer and fluid flow in the field of energy applications.

**UNIT - I**

**Conduction:** Introduction – Modes of heat transfer – Basic Equations - Combined modes – Steady one-dimensional – Steady heat source system – Conduction Shape Factor - Unsteady heat conduction - Lumped heat capacity system - Infinite solid flat plate - cylinder (Heisler charts).

**Types of fins** – Analysis of fins of uniform cross section, effectiveness - Efficiency of fin. Applications.

**UNIT- II:**

**Forced Convection:** Flow with heat transfer - Flat Plate - Boundary layer - Laminar and Turbulent Flow - Forced convection over a flat plate – External Flow – Internal Flow - Empirical relations.

**Free convection** - Free convection from vertical and horizontal surfaces - Enclosed spaces. Applications to flat plate Collectors.

**UNIT - III**

**Radiation:** Overview of Mechanism – laws of radiation- Radiant heat exchange in gray - non-gray bodies – Furnaces – Performance terms and definitions – Furnace heat balance method – Factors affecting furnace performance

**UNIT - IV**

**Boiling Heat Transfer:** Regimes of pool boiling – Correlations – Boilers – Performance terms and definitions – Reference standards – Direct Method of Testing – Boiler Efficiency Calculation.

**Condensation:** Types - Film condensation on horizontal and vertical surfaces - Condensers.

**UNIT - V**

**Heat Exchanger:** Definition and classification – Heat Exchanger Types by flow design, construction and application - Concept of LMTD and overall heat transfer coefficient - Fouling factor- Derivation of LMTD and effectiveness for parallel and counter flow heat exchangers - NTU approach and design procedure. Purpose of the Performance Test - Performance terms and definitions – Industrial Heat Exchangers - Methodology of heat exchanger performance assessment.

**TEXT BOOKS:**

1. Heat transfer, Cengel and Ghajar, Tata McGraw Hill
2. Heat Transfer - A basic approach, Necati Ozisik, Mc Graw Hill

**REFERENCE BOOKS:**

1. Fundamentals of Heat and Mass transfer, Incropera and Dewit, Wiley
2. Heat Transfer, Ghoshdastidar, Oxford University Press
3. Convective Heat Transfer Analysis, Patrick H.Oosthuizen, David Naylor, Mc Graw Hill
4. Engineering heat and mass transfer, Mahesh M Rathore, Laxmi Publications
5. Energy Efficiency In Thermal Utilities (Book 2)
6. Energy Performance Assessment For Equipment And Utility Systems (Book 4)

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. TECH. I Year I Sem. (PEES)**

**THERMAL POWER PLANT (Professional Elective - I)**

**Course objective:**

- To obtain knowledge on power generation techniques
- To suggest suitable methods to improve the performance of thermal power plants

**Course Outcome:** Students will be able to get exposure to different cycles and their working principle related to thermal power plants.

**UNIT - I:**

**Fuels and Combustion:** Types of fuels – Coal firing – Pulverization of solid fuels – Fuel handling systems – Coal cycle – Ash cycle – Types of Furnaces – Fluidized Bed Combustion (FBC) – Liquid and gaseous fuels – Byproducts of combustion (simple problems) – Heat of combustion – Combustion temperatures – Stack.

**UNIT - II:**

**Steam Generators and Accessories:** Steam generators – Classification – Types – High-pressure boilers – Super critical boilers – Steam piping Accessories - Super heaters – Re-heaters – Economizers – Air Preheaters - Pumps and Fans - Types of Condensers – Direct contact condensers - Surface condensers - Feed water heaters – Types – Boiler Makeup – Evaporators - Condensate circulation system – Cooling towers – Types – Wet and dry cooling towers.

**UNIT - III**

**Steam Turbines:** Classification – Steam Compounding - Advantages and disadvantages – Governing – Turbine losses – Turbine efficiencies – Turbine materials.

**Gas turbines:** Open and Closed Cycle gas turbines – Design for high temperature - Combined cycles with heat recovery boiler – Combined cycle for power plant – Combined cycle with multi pressure steam - Influence of component efficiencies on cycle performance – IGCC plant.

**UNIT - IV**

**Power Plant Performance:** General layout of modern thermal power plants – Components / Equipment in thermal power plant – Coal Mills – Boiler – Draft system – Water pumping system – LP and HP heaters – Turbine – Condenser -- Performance terms and definitions - Performance Evaluation.

**UNIT - V**

**Environmental Aspects**

Environmental aspects of thermal power plants - Constituents of the atmosphere – Ash and Dust handling - Oxides of Sulfur, Nitrogen and Carbon – Greenhouse effect – Acid precipitation – Particulate matter – Electrostatic precipitators – Thermal pollution.

**TEXT BOOKS:**

1. Power Plant Engineering, P.K.Nag / Tata McGraw Hill.
2. Energy Efficiency In Thermal Utilities (Book 2)
3. Energy Performance Assessment For Equipment And Utility Systems (Book 4)

**REFERENCE BOOKS:**

1. A course in Power Plant Engineering, Arora and Domkundwar, Dhanpat Rai.
2. Power Plant Technology, El Wakil/ Mc Graw Hill.



3. Power Plant Engineering, G.R. Nagpal/Khanna Publishers.
4. Power Plant Technology, Rajput

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. TECH. I Year I Sem. (PEES)**

**SMART GRID TECHNOLOGIES (Professional Elective - I)**

**Prerequisite:** Power Systems

**Course Objectives:** Students will be able to

- Understand concept of smart grid and its advantages over conventional grid
- Know smart metering techniques
- Learn wide area measurement techniques
- Understanding the problems associated with integration of distributed generation & its solution through smart grid.

**Course Outcomes:** Students will be able to

- Appreciate the difference between smart grid & conventional grid
- Apply smart metering concepts to industrial and commercial installations
- Formulate solutions in the areas of smart substations, distributed generation and wide area measurements
- Come up with smart grid solutions using modern communication technologies

**UNIT- I**

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- II**

Introduction to Smart Meters, Real Time Pricing, 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 .

**UNIT- III**

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- IV**

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- V**

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. Advanced Metering Infrastructure (AMI) and Various Communication means and IP based Protocols.

**TEXT BOOKS:**

1. Ali Keyhani, "Design of smart power grid renewable energy systems", Wiley IEEE, 2011
2. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press, 2009

**REFERENCES:**

1. JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, "Smart Grid: Technology and Applications", Wiley 2012
2. Stuart Borlase, "Smart Grid: Infrastructure, Technology and solutions " CRC Press
3. A.G.Phadke, "Synchronized Phasor Measurement and their Applications", Springer

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. TECH. I Year I Sem. (PEES)**

**MODERN CONTROL THEORY (Professional Elective - I)**

**Prerequisite:** Control Systems

**Course Objectives:**

- To explain the concepts of basics and modern control system for the real time analysis and design of control systems.
- To explain the concepts of state variables analysis.
- To study and analyze non linear systems.
- To analyze the concept of stability for nonlinear systems and their categorization.
- To apply the comprehensive knowledge of optimal theory for Control Systems.

**Course Outcomes:** Upon completion of this course, students should be able to:

- Various terms of basic and modern control system for the real time analysis and design of control systems.
- To perform state variables analysis for any real time system.
- Apply the concept of optimal control to any system.
- Able to examine a system for its stability, controllability and observability.
- Implement basic principles and techniques in designing linear control systems.
- Formulate and solve deterministic optimal control problems in terms of performance indices.
- Apply knowledge of control theory for practical implementations in engineering and network analysis.

**UNIT I: Mathematical Preliminaries and State Variable Analysis:**

Fields, Vectors and Vector Spaces – Linear combinations and Bases – Linear Transformations and Matrices – Scalar Product and Norms – Eigen values, Eigen Vectors and a Canonical form representation of Linear systems – The concept of state – State space model of Dynamic systems – Time invariance and Linearity – Non uniqueness of state model – State diagrams for Continuous-Time State models - Existence and Uniqueness of Solutions to Continuous-Time State Equations – Solutions of Linear Time Invariant Continuous-Time State Equations – State transition matrix and it's properties. Complete solution of state space model due to zero input and due to zero state.

**UNIT II: Controllability and Observability:**

General concept of controllability – Controllability tests, different state transformations such as diagonalization, Jordan canonical forms and Controllability canonical forms for Continuous-Time Invariant Systems – General concept of Observability – Observability tests for Continuous-Time Invariant Systems – Observability of different State transformation forms.

**UNIT III: State Feedback Controllers and Observers:**

State feedback controller design through Pole Assignment, using Ackkermans formula– State observers: Full order and Reduced order observers.

**UNIT IV: Non-Linear Systems:**

Introduction – Non Linear Systems - Types of Non-Linearities – Saturation – Dead-Zone - Backlash – Jump Phenomenon etc; Linearization of nonlinear systems, Singular Points and its types– Describing function–describing function of different types of nonlinear elements, – Stability analysis of Non-Linear systems through describing functions. Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, Stability analysis of nonlinear systems based on phase-plane method.

**UNIT V: Stability Analysis:**

Stability in the sense of Lyapunov, Lyapunov's stability and Lyapunov's instability theorems - Stability Analysis of the Linear continuous time invariant systems by Lyapunov second method – Generation of Lyapunov functions – Variable gradient method – Krasovskii's method.

**TEXT BOOKS :**

1. M.Gopal, Modern Control System Theory, New Age International - 1984
2. Ogata. K, Modern Control Engineering, Prentice Hall - 1997

**REFERENCES:**

1. N K Sinha, Control Systems, New Age International – 3<sup>rd</sup> edition.
2. Donald E.Kirk, Optimal Control Theory an Introduction, Prentice - Hall Network series - First edition.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. TECH. I Year I Sem. (PEES)**

**ELECTRICAL POWER DISTRIBUTION SYSTEM (Professional Elective - II)**

**Prerequisite:** Power Systems

**Course Objectives:** Students will be able to

- Learning about power distribution system
- Learning of SCADA System
- Understanding Distribution Automation

**Course Outcomes:** Students will be able to

- Knowledge of power distribution system
- Study of Distribution automation and its application in practice
- To learn SCADA system

**UNIT- I:**

Distribution of Power, Management, Power Loads, Load Forecasting Short-term & Long-term, Power System Loading, Technological Forecasting.

**UNIT- II:**

Advantages of Distribution Management System (D.M.S.) Distribution Automation: Definition, Restoration / Reconfiguration of Distribution Network, Different Methods and Constraints, Power Factor Correction

**UNIT- III:**

Interconnection of Distribution, Control & Communication Systems, Remote Metering, Automatic Meter Reading and its implementation. SCADA: Introduction, Block Diagram, SCADA Applied To Distribution Automation. Common Functions of SCADA, Advantages of Distribution Automation through SCADA

**UNIT- IV:**

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

**UNIT- V:**

Maintenance of Automated Distribution Systems, Difficulties in Implementing Distribution. Automation in Actual Practice, Urban/Rural Distribution, Energy Management, AI techniques applied to Distribution Automation

**TEXT BOOKS:**

1. A.S. Pabla, " Electric Power Distribution", Tata McGraw Hill Publishing Co. Ltd., Fourth Edition.
2. M.K. Khedkar, G.M. Dhole, "A Text Book of Electrical power Distribution Automation", University Science Press, New Delhi

**REFERENCES:**

1. Anthony J Panseni, "Electrical Distribution Engineering", CRC Press
2. James Momoh, "Electric Power Distribution, automation, protection & control", CRC Press

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. TECH. I Year I Sem. (PEES)**

**REACTIVE POWER COMPENSATION AND MANAGEMENT (Professional Elective - II)**

**Prerequisite:** Power Systems

**Course Objectives:**

- To identify the necessity of reactive power compensation
- To describe load compensation
- To select various types of reactive power compensation in transmission systems
- To illustrate reactive power coordination system
- To characterize distribution side and utility side reactive power management.

**Course Outcomes:** Upon the completion of this course, the student will be able to

- Distinguish the importance of load compensation in symmetrical as well as un symmetrical loads
- Observe various compensation methods in transmission lines
- Construct model for reactive power coordination
- Distinguish demand side reactive power management & user side reactive power management

**UNIT- I:**

**LOAD COMPENSATION**

Objectives and specifications – reactive power characteristics – inductive and capacitive approximate biasing – Load compensator as a voltage regulator – phase balancing and power factor correction of unsymmetrical loads- examples.

**UNIT- II**

**STEADY-STATE REACTIVE POWER COMPENSATION IN TRANSMISSION SYSTEM**

Uncompensated line – types of compensation – Passive shunt and series and dynamic shunt compensation – examples.

**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-III**

**REACTIVE POWER COORDINATION**

Objective – Mathematical modeling – Operation planning – transmission benefits – Basic concepts of quality of power supply – disturbances- steady –state variations – effects of under voltages – frequency –Harmonics, radio frequency and electromagnetic interferences

**UNIT-IV**

**DEMAND SIDE MANAGEMENT**

Load patterns – basic methods load shaping – power tariffs- KVAR based tariffs penalties for voltage flickers and Harmonic voltage levels

**DISTRIBUTION SIDE REACTIVE POWER MANAGEMENT:**

System losses –loss reduction methods – examples – Reactive power planning – objectives – Economics Planning capacitor placement – retrofitting of capacitor banks

**UNIT-V****USER SIDE REACTIVE POWER MANAGEMENT**

KVAR requirements for domestic appliances – Purpose of using capacitors – selection of capacitors – deciding factors – types of available capacitor, characteristics and Limitations

**Reactive power management in electric traction systems and arc furnaces:**

Typical layout of traction systems – reactive power control requirements – distribution transformers- Electric arc furnaces – basic operations- furnaces transformer –filter requirements – remedial measures –power factor of an arc furnace

**TEXT BOOKS:**

1. Reactive power control in Electric power systems by T.J.E.Miller, John Wiley and sons, 1982.
2. Reactive power Management by D.M.Tagare, Tata McGraw Hill, 2004.

**REFERENCES:**

1. Wolfgang Hofmann, Jurgen Schlabbach, Wolfgang Just "Reactive Power Compensation: A Practical Guide, April, 2012, Wiley publication.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. TECH. I Year I Sem. (PEES)**

**MATHEMATICAL METHODS FOR POWER ENGINEERING (Professional Elective - II)**

**Prerequisite:** Mathamatices

**Course Objectives:** Students will be able to

- To understand the relevance of mathematical methods to solve engineering problems.
- To understand how to apply these methods for a given engineering problem.

**Course Outcomes:** Students will be able to

- Knowledge about vector spaces, linear transformation, eigenvalues and eigenvectors of linear operators
- To learn about linear programming problems and understanding the simplex method for solving linear programming problems in various fields of science and technology
- Acquire knowledge about nonlinear programming and various techniques used for solving constrained and unconstrained nonlinear programming problems
- Understanding the concept of random variables, functions of random variable and their probability distribution
- Understand stochastic processes and their classification

**UNIT- I**

Vector spaces, Linear transformations, Matrix representation of linear transformation, Eigen values and Eigen vectors of linear operator

**UNIT- II**

Linear Programming Problems, Simplex Method, Duality, Non Linear Programming problems

**UNIT- III**

Unconstrained Problems, Search methods, Constrained Problems

**UNIT- IV**

Lagrange method, Kuhn-Tucker conditions, Random Variables, Distributions

**UNIT- V**

Independent Random Variables, Marginal and Conditional distributions, Elements of stochastic processes

**TEXT BOOKS:**

1. Kenneth Hoffman and Ray Kunze, "Linear Algebra", 2nd Edition, PHI, 1992
2. Erwin Kreyszig, "Introductory Functional Analysis with Applications", John Wiley & Sons, 2004

**REFERENCES:**

1. Irwin Miller and Marylees Miller, John E. Freund's "Mathematical Statistics", 6th Edn, PHI, 2002
2. J. Medhi, "Stochastic Processes", New Age International, New Delhi., 1994
3. A Papoulis, "Probability, Random Variables and Stochastic Processes", 3rd Edition, McGraw Hill, 2002
4. John B Thomas, "An Introduction to Applied Probability and Random Processes", John Wiley, 2000

5. Hillier F S and Lieberman G J, "Introduction to Operations Research", 7th Edition, McGraw Hill, 2001
6. Simmons D M, "Non Linear Programming for Operations Research", PHI, 1975

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. TECH. I Year I Sem. (PEES)**

**HYBRID ELECTRIC VEHICLES (Professional Elective - II)**

**Prerequisite:** Power Systems, Electrical Machines and Power Electronics

**Course Objectives:** Students will be able to

- To understand upcoming technology of hybrid system
- To understand different aspects of drives application
- Learning the electric Traction

**Course Outcomes:** Students will be able to

- Acquire knowledge about fundamental concepts, principles, analysis and design of hybrid and electric vehicles.
- To learn electric drive in vehicles / traction.

**UNIT-I:**

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-II:**

Basic concept of hybrid traction, Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, Fuel efficiency analysis.

**UNIT-III:**

Introduction to electric components 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-IV:**

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-V:**

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

**TEXT BOOKS:**

1. Sira -Ramirez, R. Silva Ortigoza, "Control Design Techniques in Power Electronics Devices", Springer.
2. Siew-Chong Tan, Yuk-Ming Lai, Chi Kong Tse, "Sliding mode control of switching Power Converters"

**REFERENCES:**

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design fundamentals, CRC Press, 2003.
2. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and

- Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
3. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
  4. Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. TECH. I Year I Sem. (PEES)**

**RESEARCH METHODOLOGY AND IPR**

**Prerequisite:** None

**Course Objectives:**

- To understand the research problem
- To know the literature studies, plagiarism and ethics
- To get the knowledge about technical writing
- To analyze the nature of intellectual property rights and new developments
- To know the patent rights

**Course Outcomes:** At the end of this course, students will be able to

- Understand research problem formulation.
- Analyze research related information
- Follow research ethics
- Understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
- Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasize the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
- Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

**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 and databases. Geographical Indications. 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.

**TEXT BOOKS:**

1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"

**REFERENCES:**

1. Ranjit Kumar, 2nd Edition , "Research Methodology: A Step by Step Guide for beginners"
2. Halbert, "Resisting Intellectual Property", Taylor & Francis Ltd ,2007.
3. Mayall , "Industrial Design", McGraw Hill, 1992.
4. Niebel , "Product Design", McGraw Hill, 1974.
5. Asimov , "Introduction to Design", Prentice Hall, 1962.
6. Robert P. Merges, Peter S. Menell, Mark A. Lemley, " Intellectual Property in New Technological Age", 2016.
7. T. Ramappa, "Intellectual Property Rights Under WTO", S. Chand, 2008

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. TECH. I Year I Sem. (PEES)**

**POWER & ENERGY SYSTEMS LAB – I (Lab - I)**

**Prerequisites:** Power System Analysis, Power System Reliability, Voltage Stability

**Course Objectives:**

- Develop Programs for Power System Analysis.
- Design models for Power Systems and Power Electronics.
- Develop Programs of Power System Reliability and Power Electronics.

**Course outcomes:** Upon the completion of the lab, the student will be able to Understand / Simulate / Analyze

- Power System Analysis using Software.
- Models of Power Systems and Power Electronics.
- Programs of Power System Reliability and Power Electronics.

**List of Experiments**

1. Develop Program for  $Y_{BUS}$  formation.
2. Develop Program for G-S Load Flow Analysis.
3. Develop Program for N-R Load Flow Analysis.
4. Develop Program for FDLF Load Flow Analysis.
5. Develop Program for Short Circuit Analysis.
6. Develop Program for Transient Stability Analysis for Single Machine connected to Infinite Bus by Point by Point Method.
7. Develop Program for Generation System Reliability Analysis.
8. Develop Program for Distribution System Reliability Analysis.
9. Develop Simulation of RLC Circuit
10. Develop Simulation of Single Phase Full Converter with RLE Load
11. Develop Program model for Closed Loop Speed Control of Separately Excited D.C Motor.
12. Develop Program model for Sinusoidal Pulse Width Modulation.

**Note:** From the above list minimum 10 experiments are to be conducted using suitable software.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. TECH. I Year I Sem. (PEES)**

**ENERGY COMPUTATIONAL LAB (Lab - II)**

**Course objective:**

1. To expose to programming language, C / Fortran
2. To solve problems in renewable energy conversion technologies

**Course Outcomes:** Student get

1. Exposure to C programming
2. Expertise in developing programs in various applications.

**List of Experiments:**

1. Fundamentals of C Programming
2. Applications of C programming in the following areas:  
Problems related to Renewable Energy Sources: Solar and Wind  
Problems related to Heat transfer  
Problems related to Linear Control Systems
3. Use of Origin Lab – Data Analysis and Graphing Software

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. (PEES)**

**ENGLISH FOR RESEARCH PAPER WRITING (Audit Course - I & II)**

**Prerequisite:** None

**Course objectives:** Students will be able to:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission

**UNIT-I:**

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

**UNIT-II:**

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, 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 are needed 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 needed when writing the Discussion, skills are needed when writing the Conclusions. useful phrases, how to ensure paper is as good as it could possibly be the first- time submission

**TEXT BOOKS/ REFERENCES:**

1. Goldbort R (2006) Writing for Science, Yale University Press (available on Google Books)
2. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press
3. Highman N (1998), Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book.
4. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. (PEES)**

**DISASTER MANAGEMENT (Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:** Students will be able to

- learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- critically understand the strengths and weaknesses of disaster management approaches,
- planning and programming in different countries, particularly their home country or the countries they work in

**UNIT-I:**

**Introduction:**

Disaster: Definition, Factors and Significance; Difference Between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

**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-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 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-IV:**

**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-V:**

**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/ REFERENCES:**

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "New Royal book Company.
2. Sahni, Pardeep Et. Al. (Eds.), " Disaster Mitigation Experiences and Reflections", Prentice Hall of India, New Delhi.
3. Goel S. L., Disaster Administration and Management Text and Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. (PEES)**

**SANSKRIT FOR TECHNICAL KNOWLEDGE (Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:**

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world
- Learning of Sanskrit to improve brain functioning
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature

**Course Outcomes:** Students will be able to

- Understanding basic Sanskrit language
- Ancient Sanskrit literature about science & technology can be understood
- Being a logical language will help to develop logic in students

**UNIT-I:**

Alphabets in Sanskrit,

**UNIT-II:**

Past/Present/Future Tense, Simple Sentences

**UNIT-III:**

Order, Introduction of roots,

**UNIT-IV:**

Technical information about Sanskrit Literature

**UNIT-V:**

Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

**TEXT BOOKS/ REFERENCES:**

1. "Abhyaspustakam" – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" Prathama Deeksha-Vempati Kutumbshastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. (PEES)**

**VALUE EDUCATION (Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:** Students will be able to

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

**Course outcomes:** Students will be able to

- Knowledge of self-development
- Learn the importance of Human values
- Developing the overall personality

**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 judgements

**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.

**UNIT-IV:**

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-V:**

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

**TEXT BOOKS/ REFERENCES:**

1. Chakroborty, S.K. "Values and Ethics for organizations Theory and practice", Oxford University Press, New Delhi

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. (PEES)**

**CONSTITUTION OF INDIA (Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:** Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

**Course Outcomes:** Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

**UNIT-I:**

**History of Making of the Indian Constitution:** History Drafting Committee, (Composition & Working), **Philosophy of the Indian Constitution:** Preamble, Salient Features.

**UNIT-II:**

**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-III:**

**Organs of Governance:** Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualification, Powers and Functions.

**UNIT-IV:**

**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-V:**

**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/ REFERENCES:**

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. (PEES)**

**PEDAGOGY STUDIES (Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:** Students will be able to:

- Review existing evidence on the review topic to inform programme design and policy making undertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

**Course Outcomes:** Students will be able to understand:

- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

**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 indepth 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/ REFERENCES:**

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31 (2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.



4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning of basic maths and reading in Africa: Does teacher preparation count? International Journal Educational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education. Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. [www.pratham.org/images/resource%20working%20paper%202.pdf](http://www.pratham.org/images/resource%20working%20paper%202.pdf).

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. (PEES)**

**STRESS MANAGEMENT BY YOGA (Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:**

- To achieve overall health of body and mind
- To overcome stress

**Course Outcomes:** Students will be able to:

- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

**UNIT-I:**

Definitions of Eight parts of yog. (Ashtanga)

**UNIT-II:**

Yam and Niyam.

**UNIT-III:**

Do's and Don't's in life.

- i) Ahinsa, satya, astheya, bramhacharya and aparigraha
- ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

**UNIT-IV:**

Asan and Pranayam

**UNIT-V:**

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

**TEXT BOOKS/ REFERENCES:**

1. 'Yogic Asanas for Group Training-Part-I': Janardan Swami Yogabhyasi Mandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**M. Tech. (PEES)**

**PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS**  
**(Audit Course - I & II)**

**Prerequisite:** None

**Course Objectives:**

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

**Course Outcomes:** Students will be able to

- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students

**UNIT-I:**

Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)

**UNIT-II:**

Neetisatakam-Holistic development of personality

- Verses- 52,53,59 (don't's)
- Verses- 71,73,75,78 (do's)

**UNIT-III:**

Approach to day to day work and duties.

- Shrimad Bhagwad 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-IV:**

Statements of basic knowledge.

- Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68
- Chapter 12 -Verses 13, 14, 15, 16,17, 18
- Personality of Role model. Shrimad Bhagwad Geeta:

**UNIT-V:**

- Chapter2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18, 38,39
- Chapter18 – Verses 37,38,63

**TEXT BOOKS/ REFERENCES:**

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