JAWAHARLAL NEHRU TECHNLOGICAL UNIVERSITY HYDERABAD
M. TECH. ELECTRICAL POWER ENGINEERING/ ELECTRICAL POWER 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	Power System Analysis	3	0	0	3
Professional Core - II	Economic Operation of Power Systems	3	0	0	3
Professional Elective - I	1. HVDC Transmission 2. Renewable Energy Systems 3. Smart Grid Technologies 4. Modern Control Thoery	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 Systems Computation Lab-I	0	0	4	2
Lab - II	Advanced Power Systems Lab	0	0	4	2
Audit - I	Audit Course - I	2	0	0	0
	Total Credits	**16**	**0**	**8**	**18**

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	Power System Dynamics	3	0	0	3
Professional Elective - III	1. Restructured Power Systems 2. EHV AC Transmission 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. Power Quality 3. Power Apparatus Design 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
	Total Credits	**14**	**0**	**12**	**18**

Audit Course I & II:

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (EPE/EPS)

POWER SYSTEM ANALYSIS (Professional Core - I)

Prerequisite: Computer Methods in Power Systems

Course Objectives: to prepare the students to

- Build the Nodal admittance and Nodal impedance matrices of a practical network.
- Study various methods of load flow.
- Analyse various types of faults in power system.
- Understand power system security concepts
- Understand state estimation and study simple algorithms for state estimation.

Course Outcomes: Students will be able to:

- To build/construct Y_{BUS} and Z_{BUS} of any practical network.
- calculate voltage phasors at all buses, given the data using various methods of load flow.
- calculate fault currents in each phase.
- Rank various contingencies according to their severity.
- Estimate the bus voltage phasors given various quantities viz. power flow, voltages, taps , CB status etc.

UNIT-I: NETWORK MATRICES
Introduction, per unit system, Bus Admittance Matrix, Network Solution, Network Reduction(Kron Reduction), Y_{BUS} structure and manipulation Bus Impedance matrix, Methods to determine columns of Z_{BUS}.

UNIT-II: LOAD FLOW STUDIES
Overview of Gauss-Siedel, Newton-Raphson load flow methods, fast decoupled method, 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-III: FAULT CALCULATIONS
Symmetrical faults-Fault calculations using Z_{BUS} - Fault calculations using Z_{BUS} equivalent circuits, Selection of circuit breakers**,** symmetrical components, unsymmetrical faults - Problems on various types of faults.

UNIT-IV: CONTINGENCY ANALYSIS
Security Analysis: Security state diagram, contingency analysis, generator shift distribution factors, line outage distribution factor, multiple line outages, overload index ranking

UNIT-V: STATE ESTIMATION
Sources of errors in measurements, Virtual and Pseudo measurements, Observability concepts,Tracking state Estimation, Weighted Least Square method,Bad Data detection and estimation.

TEXT BOOKS:
1. J.J. Grainger & W.D.Stevenson, “Power system analysis ”, McGraw Hill ,2003.
2. A. R. Bergen & Vijay Vittal , “Power System Analysis” ,Pearson , 2000.
REFERENCES:
1. L.P. Singh , “Advanced Power System Analysis and Dynamics”, New Age International, 2006.
2. G.L. Kusic, “Computer aided power system analysis” ,Prentice Hall India, 1986.

3. A.J. Wood, " Power generation, operation and control" , John Wiley, 1994.
4. P.M. Anderson, "Faulted power system analysis" , IEEE Press , 1995.
5. NPTEL Course, A. K. Sinha, Power System Analysis, https://www.youtube.com/playlist?list=PL36A60B630E8C7B56
6. Pradeep Yemula, Power System Practice, online course https://www.youtube.com/playlist?list=PL-uxPiMl0_6GWFPGXgVapb1yjVAZs9YGz

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (EPE/EPS)

ECONOMIC OPERATION OF POWER SYSTEMS (Professional Core - II)

Prerequisite: Electrical Power Systems

Course Objectives: Students will be able to:

- understand economic load scheduling problem and unit commitment problem.
- understand hydro-thermal scheduling problem.
- understand load frequency control (LFC)
- understand the optimal power flow (OPF) problem.

Course Outcomes: the student will be able to

- distinguish between economic load dispatch and unit commitment problem
- solve economic load scheduling (with and without network losses) and unit commitment problem
- solve hydro-thermal scheduling problem
- analyze the single area and two area systems for frequency deviation
- 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.

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. Olle I. Elgerd, “Electric Energy Systems Theory an Introduction”, TMH, 2nd Edition, 1983
2. J.J. Grainger &W.D.Stevenson, “Power system analysis ”, McGraw Hill ,2003

REFERENCES:

1. Allen J. Wood, Bruce F. Wollenberg, Gerald B. Sheblé-Power Generation, Operation and Control-Wiley-Interscience (2013)
2. NPTEL Course, Prof. S. N. Singh, Power System Operation and Control, https://www.youtube.com/playlist?list=PL4BFB13CCDB954BCF

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (EPE/EPS)

HVDC TRANSMISSION (Professional Elective - I)

Prerequisite: Power Systems and Power Electronics

Course Objectives:

- to prepare the students to understand the state-of-the-art of HVDC technology.
- to enable the students to model and analyse HVDC systems

Course Outcomes: Students will be able to:

- understand the state-of-the-art of HVDC technology.
- model and analye the HVDC system for inter-area power flow regulation.
- analyze the converter and dc grid faults and adopt methods to mitigate them.
- analyse the HVDC converter reactive power requirements and address the issues.

UNIT-I: GENERAL ASPECTS OF DC TRANSMISSION
Evolution of HVDC transmission, Comparison of HVDC and HVAC systems, Types of DC links, Components of a HVDC system, Valve characteristics, Properties of converter circuits, assumptions,single phase and Three-phase Converters, Pulse number, choice of best circuit for HVDC converters.

UNIT-II: ANALYSIS OF BRIDGE CONVERTER
Analysis of simple rectifier circuits, Required features of rectification circuits for HVDC transmission.
Analysis of HVDC converter: Different modes of converter operation, Output voltage waveforms and DC voltage in rectification, Output voltage waveforms and DC in inverter operation, Thyristor/Valve voltages. Equivalent electrical circuit.

UNIT-III: DC LINK CONTROL
Grid control, basic means of control, power reversal, limitations of manual control,Constant current versus Constant Voltage, Desired features of control.
Actual control characteristics: Constant-minimum-ignition-angle control,Constant-current control, Constant-extinction-angle control. Stability of control, tap-changer control**,**Power control and current limits, frequency control.

UNIT-IV: CONVERTER FAULTS & PROTECTION
Converter mal-operations, Commutation failure, Starting and shutting down the converter bridge, Converter protection.

UNIT-V: REACTIVE POWER MANAGEMENT
Smoothing reactor and DC Lines, Reactive power requirements, Harmonic analysis, Filter design

TEXT BOOKS:

1. J. Arrillaga, “High Voltage Direct Transmission”, Peter Peregrinus Ltd. London, 1983.
2. K. R. Padiyar, “HVDC Power Transmission Systems”, New Age International Publishers, 3rd Edition, 2015.

REFERENCES:

1. High Voltage Direct Current Transmission, NPTEL Lectures by Prof. S. N. Singh, https://www.youtube.com/playlist?list=PL4B78E9972172086A

2. E. W. Kimbark, “Direct Current Transmission”, Vol. I, Wiley Interscience, 1971.
3. Erich Uhlmann, “Power Transmission by Direct Current”, B.S. Publications, 2004.
4. SN Singh, “*Electric Power Generation, Transmission and Distribution*, PHI, New Delhi 2nd edition, 2008.
5. V. Kamaraju, ”HVDC Transmission” Tata McGraw-Hill Education Pvt Ltd,New delhi,2011.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (EPE/EPS)

RENEWABLE ENERGY SYSTEMS (Professional Elective - I)

Prerequisite: Power Systems and Electrical Machines

Course Objectives: to prepare the students to
- learn various renewable energy sources
- gain understanding of integrated operation of renewable energy sources
- understand power electronics interface with the grid

Course Outcomes: Students will be able to
- Knowledge about renewable energy
- Understand the working of distributed generation system in autonomous/grid connected modes

UNIT- I: SOLAR ENERGY SYSTEMS:
Introduction – solar radiation - solar thermal energy conversion - Flat plate collector - concentric collectors- solar pond - central receiver system- solar pumping - Solar photovoltaic systems - characteristics of PV cell- Photo voltaic modules - Types of Photo voltaic systems.

UNIT-II: WIND ENERGY AND BIO GAS:
Basics of wind energy - classification of turbines - wind characteristics - energy extraction - Betz limit - Modes of wind power generation- Bio Mass energy conversion - Anaerobic Digestion - Aerobic Digestion - Gasification-Bio Gas Plants.

UNIT-III: OCEAN ENERGY CONVERSION:
Tidal Energy generation - characteristics of Tides - Power generation schemes - Components in Tidal power plant- Wave Energy - Principle of wave energy plant - Wave energy conversion machines - Ocean Thermal Energy conversion - Principle - cycles of operation - Types of OTEC plants - Applications

UNIT-IV: GEO-THERMAL ENERGY AND FUEL CELLS:
HYBRID ENERGY SYSTEMS:
Geothermal Energy - Structure of Earth's interior - Geothermal fields, gradient, resources - Geothermal power generation - Fuel cells – Introduction - Principle of operation - Types of **FUEL CELLS** - State of art fuel cells-energy output of a fuel cell - operating characteristics of fuel cells - thermal efficiency - Need for Hybrid systems - Types of Hybrid systems.

UNIT-V: ENERGY SYSTEMS AND GRIDS
Introduction, Energy systems, Distribution technologies, Energy storage for grid electricity, Social and environmental aspects of energy supply and storage.
Electricity grids(networks), DC grids, Special challenges and opportunities for renewable electricity, Power Electronic Interface with the Grid

TEXT BOOKS:
1. D.P.Kothari, K.C.Singal, R.Ranjan, "Renewable Energy Resources and emerging technologies"- PHI 2/e 2011.
2. John Twidell and Tony Weir ,"Renewable Energy Resources" - 2nd edition, CRC Press.
3. Rakosh Das Begamudre, "Energy conversion systems"- New Age International Publishers, New Delhi - 2000.
4. "Renewable Energy Resources" by John Twidell and Tony Weir, 2nd Edition, Fspon & Co.

REFERENCES:

1. “Understanding Renewable Energy Systems”, by Volker Quaschning, 2005, UK.
2. “Renewable Energy Systems-Advanced Conversion, Technologies & Applications” by Faner Lin Luo Honer Ye, CRC press, Taylor & Francis group.
3. NPTEL Course on Non-Conventional Energy Sources, https://www.youtube.com/playlist?list=PL3QMEfkolRFbGhXveCE7RFDBgY0_gRxkh

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (EPE/EPS)

SMART GRID TECHNOLOGIES (Professional Elective - I)

Prerequisite: Power Systems

Course Objectives: to prepare the students to

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

Course Outcomes: Students will be able to

- Distinguish between conventional grid and smart grid
- Apply smart metering concepts to industrial and commercial installations
- Formulate solutions in the areas of smart substations, distributed generation and wide area measurements
- Develop 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: SMART METERS
Introduction to Smart Meters, Real Time Pricing, Automatic Meter Reading (AMR), Advanced Metering Infrastructure (AMI), Outage Management System (OMS), Plug in Hybrid Electric Vehicles (PHEV), Vehicle to Grid, Smart Sensors, Smart Appliances, Home & Building Automation, Smart Substations, Substation Automation, Feeder Automation, Wide Area Measurement System (WAMS), Phasor Measurement Unit (PMU)

UNIT-III: INFORMATION AND STORAGE SYSTEMS
Geographic Information System (GIS), Intelligent Electronic Devices (IED) & their application for monitoring & protection, Smart storage like Battery, Pumped Hydro, Compressed Air Energy Storage, fuel-cells

UNIT-IV: MICROGRID
Concept of microgrid, need & applications of microgrid, formation of micro-grid, Issues of interconnection, protection & control of microgrid, Plastic & Organic solar cells, Thin film solar cells, Variable speed wind generators, micro-turbines, Captive power plants, Integration of renewable energy sources

UNIT-V: POWER QUALITY
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. and communication protocols in grid.

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”,
2. Wiley 2012
3. Stuart Borlase, “Smart Grid: Infrastructure, Technology and solutions “ CRC Press
4. A.G.Phadke, “Synchronized Phasor Measurement and their Applications”, Springer
5. S. Chowdhury, S. P. Chowdhury, and P. Crossley, “Microgrids and active distribution networks”, IET, 2009, http://uni-site.ir/khuelec/wp-content/uploads/Microgrids-and-Active-Distribution-Networks.pdf
6. Prof. N. P. Padhy and Prof. Premalatha Jena, NPTEL course – Introduction to Smart Grid https://www.youtube.com/playlist?list=PLLy_2iUCG87D59-Bc8Jqfqt43LvPC0KgC

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (EPE/EPS)

MODERN CONTROL THEORY (Professional Elective - I)

Prerequisite: Linear 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:

- 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, Jordon 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.
State Feedback Controllers and Observers:
State feedback controller design through Pole Assignment, using Ackkermans formula– State observers: Full order and Reduced order observers.

UNIT III: 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 IV: Stability Analysis:

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

UNIT V: Calculus of Variations:
---- optimal control

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 – 3rd edition.
2. Donald E.Kirk, Optimal Control Theory an Introduction, Prentice - Hall Network series - First edition.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (EPE/EPS)

ELECTRICAL POWER DISTRIBUTION SYSTEM (Professional Elective - II)

Prerequisite: Power Systems

Course Objectives: to prepare the students to

- Learn about load forecasting
- Understand power distribution system reconfiguration and restoration
- Learn control and communication systems
- Understand distribution automation

Course Outcomes: Students will be able to

- understand power distribution system
- explore distribution automation and its application in practice
- learn control and communication systems
- apply optimization techniques for distribution systems
- carryout distribution energy management

UNIT-I: LOAD FORECASTING
Distribution of Power, Management, Power Loads, Load Forecasting Short-term & Long-term, Power System Loading, Technological Forecasting.

UNIT-II: DISTRIBUTION AUTOMATION
Advantages of Distribution Management System (DMS) Distribution Automation: Definition, Restoration / Reconfiguration of Distribution Network, Different Methods and Constraints, Power Factor Correction

UNIT-III: CONTROL AND COMMUNICATION
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: OPTIMALITY PRINCIPLES
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: ENERGY MANAGEMENT
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. Turan Gonen, “Electric Power Distribution Engineering”, 3rd Edition CRC Press,
2. Anthony J Panseni, “Electrical Distribution Engineering”, CRC Press
3. James Momoh, “Electric Power Distribution, automation, protection & control”, CRC Press
4. NPTEL course, Electricial Distribution System Analysis, https://www.youtube.com/playlist?list=PLLy_2iUCG87DxrqJr3dBhSruMiRHK0rNr

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (EPE/EPS)

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 AND TRANSIENT REACTIVE POWER COMPENSATION IN TRANSMISSION SYSTEM
Uncompensated line – types of compensation – Passive shunt and series and dynamic shunt compensation – examples.
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 DISTRIBUTION SIDE REACTIVE POWER MANAGEMENT:
Load patterns, basic methods load shaping, power tariffs- KVAR based tariffs penalties for voltage flickers and Harmonic voltage levels
System losses, loss reduction methods, 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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (EPE/EPS)

MATHEMATICAL METHODS FOR POWER ENGINEERING (Professional Elective - II)

Prerequisite: Mathematics

Course Objectives: to prepare the students to

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

Course Outcomes: Students will be able to

- understand vector spaces, linear transformation, eigenvalues and eigenvectors of linear operators
- learn about linear programming problems and understand 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
- understand 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, Marginal and Conditional distributions, Elements of stochastic processes

UNIT- V:
Mathematical methods applied to Power Engineering, examples – economic load dispatch, optimal power flow, unit commitment

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 Liebermann G J, “Introduction to Operations Research”, 7th Edition, McGraw Hill, 2001
6. Simmons D M, “Non Linear Programming for Operations Research”, PHI, 1975
7. MIT online course, Prof. Gilbert Strang, Linear Algebra, https://www.youtube.com/playlist?list=PL49CF3715CB9EF31D
8. Matpower, Free open-source tools for electric power system simulation and optimization, https://matpower.org/

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (EPE/EPS)

HYBRID ELECTRIC VEHICLES (Professional Elective - II)

Prerequisite: Power Systems, Electrical Machines and Power Electronics

Course Objectives: to prepare the students to

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

Course Outcomes: Students will be able to

- Acquire fundamental concepts and principles of hybrid electric vehicles (HEV)
- Design and analyse HEVs
- Apply electric drives in vehicles / traction
- Understand energy management in HEVs

UNIT-I: INTRODUCTION TO HYBRID ELECTRIC VEHICLES (HEV)
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 characterizationTransmission characteristics, Mathematical models to describe vehicle performance

UNIT-II: HYBRID TRACTION
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: CONTROL OF MOTORS FOR HEV
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: DESIGN OF HEV
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: ENERGY MANAGEMENT IN HEV
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. NPTEL Course on Electric Vehicles, https://www.youtube.com/playlist?list=PLlYm0-AHZdZRLYSylFinxkspWmcgNvbtl

2. Iqbal Hussein, Electric and Hybrid Vehicles: Design fundamentals, CRC Press, 2003.
3. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
4. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (EPE/EPS)

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 emphasis 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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. TECH. I Year I Sem. (EPE/EPS)

POWER SYSTEMS COMPUTATION LAB - I (Lab - I)

Prerequisite: power systems

Course Objectives: Students will be able to:

- Construction of Y-bus, z-bus for a n-bus system.
- Analyze various Load flow studies .
- Steady state, transient stability analysis.
- Economic load dispatch problem.
- Unitcommitment problem.
- State estimation of power system.

Course Outcomes: Students will be able to:

- Construct Y-bus and Z-bus
- Compare the different load flow methods
- Analyze the different stability analysis of variety of power systems
- Understood Economic load dispatch and Unitcommitment problems.
- Understood State estimation of power system.

List of Experiments

1. Develop Program for Y_{BUS} formation by direct inspection method.
2. Develop Program for Y_{BUS} formation by Singular Transformation method.
3. Develop Program for G-S Load Flow Algorithm.
4. Develop Program for N-R Load Flow Algorithm in Polar Coordinates.
5. Develop Program for FDLF Algorithm.
6. Develop Program for DC load Flow Algorithm.
7. Develop Program for Z_{BUS} Building Algorithm.
8. Develop Program for Short Circuit Analysis using Z_{BUS} Algorithm.
9. Develop Program for Transient Stability Analysis for Single Machine connected to Infinite Bus
10. Develop Program for Economic Load Dispacth Problem using Lambda Iterative Method.
11. Develop Program for Unit Commitment Problem using Forward Dynamic Programming Method.
12. Develop Program for State Estimation of Power System.

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. (EPE/EPS)

ADVANCED POWER SYSTEMS LAB (Lab - II)

Prerequisite:power systems and FACTS

Course Objectives: Students will be able to:

- Determine transmission line parameters
- Determine transmission line regulation and efficiency
- Determine various fault calculations
- Perform load and line compesation

Course Outcomes: Students will be able to:

- Calculate transmission line parameters
- Calculate transmission line regulation and efficiency
- Calculate various fault parameters
- Compare system parameters with and with out compenasation

List of Experiments

1. Determination of Line Parameters R, L and C.
2. Determination of T/L efficiency and Regulation for a given load.
3. Analysis of Ferranti effect on Transmission Lines under light loadings.
4. Determination of ABDC parameters of a given Transmission Line Network.
5. Fault Analysis:
   I. Single Line to Ground fault (L-G).
   II. Line to Line fault (L-L).
   III. Double Line to Ground fault (L-L-G).
   IV. Triple Line to Ground fault (L-L-L-G).
6. Analysis of Uncompensated lines and their voltage profiles.
7. Shunt compensation of Transmission lines (Capacitor/Reactors)
8. Load Compensation analysis
9. Line Compensation using FACTS devices.
10. Analysis of Transmission lines under Surge Impedance Loading.
11. Determination of Sequence impedance of Transmission Line and SIL analysis.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (EPE/EPS)

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. (EPE/EPS)

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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (EPE/EPS)

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. (EPE/EPS)

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. (EPE/EPS)

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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (EPE/EPS)

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 scho 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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M. Tech. (EPE/EPS)

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 Tarining-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. (EPE/EPS)

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 (dont'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.