ACADEMIC REGULATIONS

PROGRAM STRUCTURE

and

DETAILED SYLLABUS

Master of Technology

(Power Systems)

(Two Year Regular Programme)

(Applicable for Batches admitted from 2018)

Gokaraju Rangaraju Institute of Engineering and Technology

(Autonomous)

Bachupally, Kukatpally, Hyderabad- 500 090

Gokaraju Rangaraju Institute of Engineering and Technology

(Autonomous)

Department of Electrical and Electronics Engineering

Power Systems

I YEAR - I SEMESTER

Sl. No	Group	Subject	Credits			Credits	Int. Marks	Ext. Marks	Total Marks
			L	T	P				
1	Core I	Power System Analysis	3	-	-	3	30	70	100
2	Core II	Power System Dynamics - I	3	-	-	3	30	70	100
3	**PE I**	1. Advanced Power Electronic Converters 2. Power Quality 3. Renewable Energy Systems	3	-	-	3	30	70	100
4	**PE II**	1. Optimal and Adaptive Control 2. PWM for power electronic converter 3. Electric and Hybrid Vehicles	3	-	-	3	30	70	100
5	Core	Power System Steady State Analysis Lab	-	-	4	2	30	70	100
6	Core	Power Systems Dynamics Lab	-	-	4	2	30	70	100
7	Core	Research Methodology and IPR	2	-	-	2	30	70	100
8	Audit	Audit course -1	2	-	-	0	30	70	100
Total			**16**	**-**	**8**	**18**	**240**	**560**	**800**

I YEAR - II SEMESTER

Sl. No	Group	Subject	Credits			Credits	Int. Marks	Ext. Marks	Total Marks
			L	T	P				
1	Core III	Digital Protection of Power System	3	-	-	3	30	70	100
2	Core IV	Power System Dynamics - II	3	-	-	3	30	70	100
3	**PE III**	1.FACTS and Custom Power Devices 2.Dynamics of Electrical Machines 3.Advanced Digital Signal Processing	3	-	-	3	30	70	100
4	**PE IV**	1. AI Techniques 2. Distributed Generation 3. Smart Grids	3	-	-	3	30	70	100
5	Core	Power Quality lab	-	-	4	2	30	70	100
6	Core	Power system Protection Lab	-	-	4	2	30	70	100
7	Audit	Audit course – 2	2	-	-	2	30	70	100
8	Core	Mini-Projects	2	-	-	0	30	70	100
Total			**16**	**-**	**8**	**18**	**240**	**560**	**800**

II YEAR - I SEMESTER

Sl. No	Group	Subject	Credits			Credits	Int. Marks	Ext. Marks	Total Marks
			L	T	P				
1	**PE V**	1. HVDC 2. Industrial Load Modeling and Control 3. SCADA Systems and Applications	3	-	-	3	30	70	100
2	**Open Elective**	1. Business Analytics 2. Industrial Safety 3. Operations Research 4. Cost Management of Engineering Projects 5. Composite Materials 6. Waste to Energy	3	-	-	3	30	70	100
3	Dissertation	Dissertation Phase – I	-	-	20	10	30	70	100
Total			**6**	**-**	**20**	**16**	**90**	**210**	**300**

II YEAR - II SEMESTER

Sl. No	Group	Subject	Credits			Credits	Int. Marks	Ext. Marks	Total Marks
			L	T	P				
1	Dissertation	Dissertation Phase – II	-	-	32	16	30	70	100
Total					**32**	**16**	**30**	**70**	**100**

Audit course 1 & 2

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER SYSTEM ANALYSIS

Course Code: **L/T/P/C: 3/0/0/3**

COURSE OBJECTIVES:

- Study various methods of load flow and their advantages and disadvantages
- Analyze various types of faults in power system
- Illustrate power system security concepts and study the methods to rank the contingencies
- Apply state estimation and study simple algorithms for state estimation
- Study voltage stability phenomenon.

COURSE OUTCOMES: At the end of this course, students will be able to

- Develop various models of power system Load Flow Analysis.
- Distinguish Power System Fault Analysis.
- Generalize Power System Security Analysis.
- Estimate the Static State Estimation of Power Systems.
- Identify methods to improve Power System Voltage stability.

UNIT I

Load Flow Studies: Introduction- Network Model Formulation – Formation of YBUS by Singular Transformation – Load Flow Problem – Gauss – Siedel Method – Network - Raphson Method – Decoupled Load Flow Studies – Comparison of Load Flow Methods – Control of Voltage Profile – Load Flow under Power Electronic Control.

UNIT II

Fault Analysis: Introduction – Analysis of Symmetrical Faults- Transient on a Transmission Line – Short Circuit of a Synchronous Machine & Loaded Synchronous- Selection of Circuit Breakers – Algorithm for Short Circuit Studies - Symmetrical Components – Sequence Impedances of Transmission Lines - Unsymmetrical Faults: Symmetrical Component Analysis of Unsymmetrical Faults – Single Line – to- Ground (LG) Fault – Line – to -Line (LL) Fault – Double Line – to – Ground (LLG) Fault -Open Conductor Faults.

UNIT III

Security Analysis: Introduction – System State Classification – Security Analysis – Contingency Analysis -Sensitivity Factors – Power System Voltage Stability

UNIT IV

State Estimation: Introduction – Least Square Estimation: The Basic Solution – Static State Estimation of Power Systems – Tracking State Estimation of Power Systems – Some Computational Considerations – External System Equivalencing – Treatment of Bad Data – Network Observability and Pseudo – Measurements – Application of Power System State Estimation.

UNIT V

Voltage Stability: Introduction -Basic concepts related to Voltage Stability – Transmission System, Generator & Load Characteristics – Characteristics of reactive compensating devices -Voltage Collapse – Typical scenario of voltage collapse – General characterization based on actual incidents – Classification of Voltage Stability – Voltage Stability Analysis – Modeling Requirements – Static & Dynamic Analysis – Determination of shortest distance to instability –The continuation power-flow analysis – Prevention of Voltage Collapse – System Design & System Operating Measures.

TEXT BOOKS

1. D.P Kothari, I J Nagrath , "Power System Engineering", Tata McGraw-Hill, 2016.
2. D.P Kothari, I J Nagrath , " Modern Power System Analysis", Tata McGraw-Hill, 2011.
3. P. Kundur, "Power System Stability and Control", Tata McGraw-Hill, 1994.

REFERENCE BOOKS

1. P.M. Anderson, "Faulted power system analysis", IEEE Press, 1995.
2. J.J. Grainger &W.D. Stevenson, "Power system analysis", McGraw Hill ,2003.
3. P. Sauer and M. A. Pai, "Power System Dynamics and Stability", Prentice Hall, 1997.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER SYSTEM DYNAMICS-I

Course Code: **L/T/P/C: 3/0/0/3**

COURSE OBJECTIVES:

- Study of system dynamics and its physical interpretation
- Development of mathematical models for synchronous machine
- Modelling of Induction motor
- Illustration of use of Excitation Systems
- Evaluate Characteristics and Dynamics of Synchronous Machine

COURSE OUTCOMES: At the end of this course, students will be able to

- Discuss the modelling of synchronous machine in details
- Illustrate simulation studies of Power System Dynamics
- Describe stability analysis with and without power system stabilizer (PSS)
- Interpret the load modelling in power system.
- Analyse the use and types of Excitation systems

UNIT I

Synchronous Machines: Physical Description, Mathematical Description, Per Unit Systems; Park's Transformation (modified): dq0 transformation; Flux Linkage Equations: Equivalent circuits for direct and quadrature axes.

UNIT II

Steady State Analysis: Voltage and Current Equations, Phasor Representation, Rotor Angle; Formulation of State -Space equations; Steady State Equivalent Circuit.

UNIT III

Synchronous Machine Representation: Synchronous Machine Parameters, Sub-Transient and Transient Inductance and Time Constants, Classical flux linkage model including the effects of sub transient circuits, simplified models of Synchronous machines.

UNIT IV

Small Signal model: Small Signal Stability of SMIB system: Generator represented by classical model, Effects of synchronous machine field circuit dynamics, Philips-Heffron model and Calculation of K constants.

UNIT V

Effects of Excitation systems: Excitation systems: Excitation System Requirements, Elements of Excitation System, Types of Excitation systems: DC Excitation system, AC Excitation system, Static Excitation system; Power System Load Modelling: Static and Dynamic Load Models; Modelling of Induction Motors: Equations of an Induction Machine, Steady-State Characteristics.

TEXT BOOKS

1. Prabha Kundur, “Power System Stability and Control”, McGraw Hill Inc., 1994.

REFERENCE BOOKS

1. K.R.Padiyar, “Power System Dynamics” , B.S.Publications.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED POWER ELECTRONIC CONVERTERS

Course Code: **L/T/P/C: 3/0/0/3**

COURSE OBJECTIVES:

- Explain the operation of advanced power electronic circuit topologies.
- Summarize the control strategies involved in power electronic circuits.
- How to analyze different power supplies.
- Analyze and design switched mode regulators for various industrial applications.
- Propose few practical circuits, used in practice

COURSE OUTCOMES: At the end of this course, students will be able to

- Valuate the design of APFC.
- Analyze and design of Switched Mode power conversion topologies,
- Analyze and design of DC-DC converters.
- Analyze and design of resonant converters.
- Design DC-DC convertors for different renewable energy resources

UNIT I

Boost type APFC and control – Introduction, Circuit Model Analysis, Design - Three phase utility interphases and control

UNIT II

SMPS Topologies: Buck regulators-condition for continuous inductor current and capacitor voltage, Boost regulators-condition for continuous inductor current and capacitor voltage, Buck-Boost regulators-condition for continuous inductor current and capacitor voltage. Cuk regulators-condition for continuous inductor current and capacitor voltage, Comparison of regulators.

UNIT III

DC Power Supplies: DC power supplies-classification-switched mode dc power supplies-fly back Converter -forward converter- push pull converter-half bridge converter, Applications.

UNIT IV

Resonant Converters: Introduction, Class E resonant inverter, Zero Current Switching resonant converters-L type ZCS resonant converter-M type ZCS resonant converter-Zero Voltage Switching resonant converters-Two quadrant ZVS resonant converters, Resonant DC Link Inverters with Zero Voltage Switching.

UNIT V

Modelling and design of DC-DC Converters for various renewable energy – Small Signal Modelling, Conversion. Few power electronic circuits used in practice for controlling electric drives- Analysis and comparison of different PWM Techniques for Induction Motor drives.

TEXT BOOKS

1. Rashid “Power Electronics” Prentice Hall India 2007.
2. G.K.Dubey et.al “Thyristorised Power Controllers” Wiley Eastern Ltd., 2005, 06.
3. Cyril W Lander “Power Electronics” McGraw Hill., 2005.
4. B. K Bose “Modern Power Electronics and AC Drives” Pearson Education (Asia)., 2007.
5. Abraham Pressman “Switching Power Supply Design” McGraw Hill Publishing Company. 2001.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER QUALITY

Course Code: **L/T/P/C: 3/0/0/3**

COURSE OBJECTIVES:

- Provide the students a deep insight in to the various Power Quality (PQ) problems.
- Analyse the PQ problems and their causes.
- Study the various compensation techniques
- Analyse the various control algorithms of shunt compensators
- Analyse the various control algorithms of series compensators

COURSE OUTCOMES: At the end of this course, students will be able to

- Understand the different power quality issues and standards
- Understand the causes of various PQ issues and mitigation techniques
- Understand the Active and Passive compensations for 1-ph and 3-ph systems
- Analyse the Shunt and Series Compensators like DSTATCOM and DVR
- Understand the UPQCs

UNIT I

Introduction and Power Quality Standards: Introduction - Classification of Power Quality Problems - Causes, Effects and Mitigation Techniques of Power Quality Problems – Power Quality Terminology, Standards, Definitions, Monitoring and Numerical Problems.

UNIT II

Causes of Power Quality Problems: Introduction to Non-Linear Loads, Power Quality Problems caused by Non-Linear Loads, Analysis of Non-Linear Loads, Numerical Problems.

UNIT III

Passive Shunt and Series Compensation : Introduction – Classification and Principle of operation of Passive Shunt and Series Compensators - Analysis and Design of Passive Shunt Compensators for Single-Phase System, Three-Phase Three Wire System and Three-Phase Four Wire System.

UNIT IV

Active Shunt and Series Compensation: Introduction to Shunt compensators; Classification of DSTATCOMs – Principle of Operation of DSTATCOM – Different Control Algorithms of DSTATCOM: PI Controller, I Cosφ Control Algorithm, Synchronous Reference Frame Theory, Single-Phase PQ theory and DQ Theory Based Control Algorithms. Analysis and Design of Shunt Compensators, Numerical Problems.

Introduction to Series Compensators; Classification of Series Compensators –Principle of Operation of DVR –Different Control Algorithms of DVR: Synchronous Reference Frame Theory-Based Control of DVR. Analysis and Design of Active Series Compensators, Numerical Problems.

UNIT V

Unified Power Quality Compensators: Introduction to Unified Power Quality Compensators (UPQC) – Classification of UPQCs – Principle of Operation of UPQC – Control of UPQCs: Synchronous Reference Frame Theory-Based UPQC – Analysis and Design of UPQCs, Numerical Problems.

TEXT BOOKS

1. Bhim Singh, Ambrish Chandra, Kamal Al-Haddad, "Power Quality Problems and Mitigation Techniques" Wiley Publications, 2015.

REFERENCE BOOKS

1. Math H. Bollen, "Understanding Power Quality Problems", IEEE Press, 2000
2. G.T. Heydt, "Electric power quality", McGraw-Hill Professional, 2007
3. J. Arrillaga, "Power System Quality Assessment", John wiley, 2000

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

RENEWABLE ENERGY SYSTEMS

Course Code: **L/T/P/C: 3/0/0/3**

COURSE OBJECTIVES:

- Learn various renewable energy sources
- Gain understanding of integrated operation of renewable energy sources
- Study the concepts of distributed generation
- learn the basics of transmission system operation
- Study the economic aspects of distributed generation

COURSE OUTCOMES: At the end of this course, students will be able to

- Gain Knowledge about different renewable energy sourses
- Describe the challenges and problems associated with the use of various energy sources
- Understand the working of distributed generation system in autonomous / grid connected modes
- Differentiate the concept of transmission and protection of distribution generators
- Know the Impact of Distributed Generation on Power System

UNIT I

Introduction - Energy and sustainable development, Scientific principles of renewable energy, Social implications, distributed energy systems and dispersed generation, Impact of renewable energy generation on environment, sources of energy as Micro turbines, Internal combustion engines.

UNIT II

Solar Power – Status, properties and requirements, Photovoltaics, Fast variations with time, Wind Power - Status, properties, requirements, Power Distribution as a Function of the Wind Speed, Combined heat and power – Status and properties, Hydro Energy – Properties and variation with time, Tidal, Wave and Geothermal energy – social and environmental aspects.Bio mass - Classification, direct combustion of heat and social and environmental aspects. and Fuel Cells - types

UNIT III

Impact of Distributed generation on the Power system – Impact of the changes, Overloading , Power Quality – Voltage, Current and multiple generator tripping and design of distributed generation.

UNIT IV

Fundamentals of Transmission System Operation, Frequency Control, Balancing, and Reserves, Restoration after a Blackout, Voltage Stability, Kinetic Energy and Inertia Constant Frequency Stability Angular Stability and Fault Ride-Through Protection - Over current Protection, Calculating the Fault Currents, Bus bar Protection, Excessive Fault Current and Generator Protection.

UNIT-V

Distributed generation – Introduction, Reasons, Technical Impacts, Economic Impact, Barriers and Renewable Sources of Energy and Interconnection and Case Studies.

TEXT BOOKS

1. John Twidell and Wier, Renewable Energy Resources, CRC Press, 2009.
2. Math H.Bollen, FainanHassan,"Integration of Distributed Generation in the Power System", July2011,Wiley –IEEE Press.
3. Loi Lei Lai, Tze Fun Chan, "Distributed Generation: Induction and Permanent Magnet Generators", October 2007, Wiley-IEEE Press.

REFERENCE BOOKS

1. RanjanRakesh, Kothari D.P, Singal K.C, "Renewable Energy Sources and Emerging Technologies",2nd Ed. Prentice Hall of India ,2011
2. Roger A.Messenger, Jerry Ventre, "Photovoltaic System Engineering", 3rd Ed, 2010.
3. James F.Manwell, Jon G.McGowan, Anthony L Rogers, "Wind energy explained: Theory Design and Application", John Wiley and Sons 2nd Ed, 2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

OPTIMAL AND ADAPTIVE CONTROL

Course Code: **L/T/P/C: 3/0/0/3**

COURSE OBJECTIVES:

- To know the operation of closed and open loop optimal control.
- Understand the adaptive control strategies.
- Learn dynamic programming method.
- To impart knowledge on parameter estimation methods.
- To introduce stability, Robustness and Applications of adaptive control method.

COURSE OUTCOMES: At the end of this course, students will be able to

- Apply the mathematical area of calculus of variation for solving optimal control problems.
- Analyze performance measure and mathematical treatment of optimal control problems.
- Acquire knowledge on solving optimal control design problems by taking into consideration the physical constraints on practical control systems.
- Apply advanced control theory to practical engineering problems.
- Design controllers using optimal control theory.

UNIT I

Optimal control problem – fundamental concepts and theorems of calculus of variations– Euler - Language equation and extremal of functional.

UNIT II

Variational approach to solving optimal control problems. Hamiltonian and different boundary conditions for optimal control problem. Linear regulator problem - Pontryagin's minimum principle.

UNIT III

Dynamic Programming- Principle of optimality and its application to optimal control problem.

UNIT IV

Hamilton-Jacobi-Bellman equation- model reference adaptive systems (MRAS)- Design hypothesis.

UNIT V

Introduction to design method based on the use of Liapunov function. Design and simulation of variable structure adaptive model following control.

TEXT BOOKS

1. Donald E. Kirk, "Optimal Control Theory, An introduction", Prentice Hall Inc., 2004
2. A.P. Sage, "Optimum Systems Control", Prentice Hall, 1977

2. HSU and Meyer , “Modern Control, Principles and Applications”, McGraw Hill, 1968

REFERENCE BOOKS

1. Yoan D. Landu, “Adaptive Control (Model Reference Approach)”, Marcel Dekker. 1981.
2. K.K.D.Young, “Design of Variable Structure Model Following Control Systems”, IEEE Transactions on Automatic Control, Vol. 23, pp 1079-1085, 1978.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PWM FOR POWER ELECTRONIC CONVERTER

Course Code: **L/T/P/C: 3/0/0/3**

COURSE OBJECTIVES:

- Discuss various PE converters
- Interpret Zero space vector placement modulation strategies
- Determine programmed modulation strategies
- Adapt pulse width modulation for multilevel inverters.
- Interpret the necessity and Importance of PWM techniques

COURSE OUTCOMES: At the end of this course, students will be able to

- Analyze modulation of single phase VSI and 3 phase VSI
- Control CSI and VSI using PWM
- Implement PWM using different strategies
- Analyze PWM for multilevel inverters
- Interpret the Continuing developments in modulation.

UNIT I

Introduction to PE converters, Modulation of one inverter phase leg, Modulation of Single Phase VSI-Topology, Analytic calculation of harmonic losses, Three Phase VSI-Topology, Analytic calculation of harmonic losses

UNIT II

Zero space vector placement modulation strategies, Space vector modulation- Naturally sampled SVM, Analytical solution for SVM, Harmonic losses for SVM, Discontinuous modulation, Modulation of CSI.

UNIT III

Over modulation of converters- Over modulation region, Naturally and regular sampled over modulation of one phase leg of an inverter, programmed modulation strategies-optimized space vector modulation, Harmonic elimination PWM, Optimum PWM.

UNIT IV

Pulse width modulation for multilevel inverters, Implementation of modulation controller, Overview of Power electronic conversion systems, Elements of a PWM converter system.

UNIT V

Continuing developments in modulation as random PWM, PWM for voltage unbalance, Effect of minimum pulse width and dead time.

TEXT BOOKS

1. D. Grahame Holmes, Thomas A. Lipo, “Pulse width modulation of Power Converter: Principles and Practice”, John Wiley & Sons

2. Bin Vew, “High Power Converter”, Wiley Publication
3. Marian K. Kazimicrczuk, “Pulse width modulated dc-dc power converter”, Wiley Publication.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRIC AND HYBRID VEHICLES

Course Code: **L/T/P/C: 3/0/0/3**

COURSE OBJECTIVES:

- To understand upcoming technology of electric and hybrid electric vehicles
- Analyze different aspects of drive train topologies
- Learn different energy management strategies
- To understand different communication systems used in electric and Hybrid electric vehicles.
- Explain vehicle to grid configurations

COURSE OUTCOMES: At the end of this course, students will be able to

- Impact of conventional vehicles on the society and different types of drive train topologies
- Load modelling based on the road profile and braking concepts
- Different types of motors used in electric and hybrid electric vehicles
- Different types of energy storage systems
- The concept vehicle to grid (V2G) and grid to vehicle (G2V).

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

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, braking fundamentals and regenerative braking in EVs.

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. Plug-in electric vehicles, Vehicle to grid(V2G) and G2V fundamentals.

TEXT BOOKS

1. Mehrdad Ehsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.
2. James Larminie, "Electric Vehicle Technology Explained", John Wiley & Sons, 2003
3. Iqbal Hussain, "Electric & Hybrid Vehicles – Design Fundamentals", Second Edition, CRC Press, 2011

REFERENCE BOOKS

1. Hybrid Vehicles and the future of personal transportation, Allen Fuhs, CRC Press, 2011.
2. Vehicle Power Management: Modeling, Control and Optimization, Xi Zhang, Chris Mi, Springer, 2011.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER SYSTEM STEADY STATE ANALYSIS LAB

Course Code: **L/T/P/C: 0/0/4/2**

COURSE OBJECTIVES:

- The solutions for power systems under short circuit conditions.
- Analysis of synchronous machine characteristics, and synchronization of machine to the power line voltage and frequency.
- Design solutions for power system problems.
- Analysis of load-flow studies which are important tools of numerical analysis applied to a power system.
- Modelling of transmission lines.

COURSE OUTCOMES: At the end of this course, students will be able to

- Understand power industry practices for design, operation, and planning.
- Use mathematical tools that are essential for system analysis and design.
- Use commercial software packages in designing solutions to problems.
- Have group participation in design and problem solving.
- Analyse the performance of synchronous machine

LIST OF EXPERIMENTS:

1. Sinusoidal Voltages and Currents
2. Computation of line parameters
3. Modelling of transmission lines
4. Formation of bus Admittance matrix
5. Load Flow solution using Gauss Siedel method.
6. Load flow solution using Newton Raphson method in Rectangular coordinates
7. Transient and small signal stability analysis of single-machine infinite bus system
8. Power flow solution of 3 – bus system
9. Power flow analysis of slack bus connected to different loads
10. Load flow analysis of 3 motor systems connected to slack bus
11. Power flow analysis of wind power system with different buses
12. Power Flow analysis using continuation power flow method
13. Unsymmetrical fault Analysis: LG, LL, LLG Fault
14. Z–Bus Building Algorithm
15. (a) Obtain Symmetrical Components of a set of Unbalanced currents.
    (b) Obtain the original Unbalanced phase voltages from Symmetrical Components.
16. Short circuit Analysis of a power system with 12 buses.
17. Determination of natural oscillations of rotor angle and grid frequency for a given synchronous machine.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER SYSTEMS DYNAMICS LAB

Course Code: **L/T/P/C: 0/0/4/2**

COURSE OBJECTIVES:

- Study of system dynamics with mathematical interpretation
- Modelling and Analysis for dynamics of synchronous machine
- Perform different Stability analysis for SMIB
- Interpret and Simulate Philips-Heffron model.
- Modelling of Induction motor

COURSE OUTCOMES: At the end of this course, students will be able to

- Model the dynamics of synchronous machine
- Perform different Stability analysis for SMIB
- Solve for K-Constants in a given SMIB system
- Simulate Philips-Heffron model in different conditions
- Model State Equations for Induction motor.

LIST OF EXPERIMENTS:

1. Analysis of Synchronous machine with simplified model.
2. Analysis of Synchronous machine with AVR.
3. Analysis of Synchronous machine with PSS.
4. Transient Stability analysis for an SMIB system.
5. Calculation of K-constants for SMIB system.
6. Calculation of K-constants for SMIB system with AVR: impact of variation of K5.
7. Simulation of Load-Frequency control with different controllers.
8. Simulation of Philips-Heffron model using Step input.
9. Simulation of Philips-Heffron model using Step input with and without AVR.
10. Calculation of Eigen values using Philips-Heffron model.
11. Compute Short-circuit analysis for an unbalanced system.
12. Simulation of Induction motor with State equations.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DIGITAL PROTECTION OF POWER SYSTEM

Course Code: **L/T/P/C: 3/0/0/3**

COURSE OBJECTIVES:

- Study of Digital Relays and its protection
- Developing mathematical approach towards protection
- Study of algorithms for numerical protection
- Apply different Applications of Travelling Waves.
- Importance in Digital Protection of transformers, machines and buses

COURSE OUTCOMES: At the end of this course, students will be able to

- Learn the importance of Digital Relays
- Summarize elements of digital protection
- Apply Mathematical approach towards protective relaying Techniques/Functions
- Develop various Protection algorithms
- Apply relaying Techniques to Travelling waves.

UNIT I

Introduction to Digital Relaying: Evolution of digital relays from electromechanical relays, Performance and operational characteristics of digital protection, Benefits of digital relaying

UNIT II

Basic elements of digital protection: Introduction to Digital Signal Processing, The DSP signal Processing Chain, Conversion subsystem: analog to digital conversion, Sampling, Anti -aliasing Filters, Functional Block diagram of Numerical Relay.Digital filtering concepts, Discrete time systems, Windows and windowing, Linear phase, Approximation – filter synthesis

UNIT III

Mathematical basis for protective relaying algorithm: Introduction, Fourier Series and Transform, Other orthogonal expansions

Transmission line relaying: Introduction, source of error, Relaying as parameter estimation: Curve fitting and smoothing, Fourier algorithms

UNIT IV

Algorithms: Sinusoidal wave based algorithms, Sample and first derivative (Mann and Morrison) algorithm. Fourier and Walsh based algorithms, Least Squares based algorithms. Differential equation based algorithms

UNIT V

Relaying applications of travelling waves: Travelling waves on single-phase and Three Phase Lines Travelling Wave distance relay, Travelling wave differential relays.

Digital Protection of transformers, machines and buses:Power transformer algorithms, Generator protection, Motor protection, Digital bus protection Recent Advances in Digital Protection of Power Systems: Adaptive relaying Wide area measurement systems (WAMS) and its Architecture

TEXT BOOKS

1. S.R.Bhide "Digital Power System Protection" PHI Learning Pvt.Ltd.2014**.**
2. A.G. Phadke and J. S. Thorp, "Computer Relaying for Power Systems", Wiley/Research studies Press, 2009

REFERENCE BOOKS

1. A.T. Johns and S. K. Salman, "Digital Protection of Power Systems", IEEE Press,1999.
2. Gerhard Zeigler, "Numerical Distance Protection", Siemens Publicis Corporate Publishing, 2006

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER SYSTEM DYNAMICS-II

Course Code: **L/T/P/C: 3/0/0/3**

COURSE OBJECTIVES:

- Discuss the Study of power system dynamics
- Interpret power system dynamic phenomena
- Analyse of various forms of stability
- Perform Stability analysis for a given system in Power System Dynamics
- Formulate State Equations for Multi-Machine Stability

COURSE OUTCOMES: At the end of this course, students will be able to

- Understand the power system stability problem.
- Analyse the stability problems and implement modern control strategies.
- Simulate small signal and large signal stability problems.
- Formulate State Equations for Multi-Machine Stability
- Perform Stability analysis for a given system in Power System Dynamics

UNIT I

Small Signal Stability-1: Fundamental Concepts of Stability of Dynamic Systems, State Space Representation, Eigen Values and Stability, Controllability and Observability, Effects of Excitation system, SMIB Block diagram including excitation system, Effects of AVR on synchronizing and damping torque components, Significance of AVR gain on Rotor Oscillation frequency: Block diagram representation with AVR and PSS, Impact of PSS on Synchronizing and Damping Torques.

UNIT II

Small Signal Stability-2: Small Signal Stabilitywith Damper windings, System State Matrix with Damper windings and AVR.

UNIT III

Transient Stability: Large Signal Rotor Angle Stability, Transient Stability analysis of SMIB system, Numerical Integration methods: Modified Euler method and Second Order RK method; Direct Method of Transient Stability Analysis; Stability Enhancing Techniques; Small Signal Stability Enhancement using Power System Stabilizer.

UNIT IV

Multi-Machine Stability: Small Signal Stability of Multi-machine system, Formulation of State Equations.

UNIT V

Dynamic Analysis of Voltage Stability: Basic Concepts related to Voltage Stability, Voltage Collapse, Classification of Voltage Stability, Voltage Stability Analysis: V-Q Sensitivity Analysis.

TEXT BOOKS

1. P. Kundur, “Power System Stability and Control”, McGraw Hill Inc, 1994

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FACTS AND CUSTOM POWER DEVICES

Course Code: **L/T/P/C: 3/0/0/3**

COURSE OBJECTIVES:

- To know the operation of closed and open loop optimal control.
- Understand the adaptive control strategies.
- Learn dynamic programming method.
- To impart knowledge on parameter estimation methods.
- To introduce stability, Robustness and Applications of adaptive control method.

COURSE OUTCOMES: At the end of this course, students will be able to

- Understand the operating principles of various FACTS devices.
- Know the importance of compensation methods in power system network.
- Relate the performance and applications of VSI & CSI.
- Extend the knowledge of active & reactive power and voltage control with FACTS Devices.
- Analyse the role of SVC&STATCOM in improving the power system dynamics.

UNIT I

Reactive power flow control in Power Systems – Control of dynamic power unbalances in Power System. Power flow control -Constraints of maximum transmission line loading – Benefits of FACTS Transmission line compensation. Uncompensated line -Shunt compensation - Series compensation –Phase angle control. Reactive power compensation. Shunt and Series compensation principles – Reactive compensation at transmission and distribution level.

UNIT II

Static versus passive VAR compensator, Static shunt compensators: SVC and STATCOM - Operation and control of TSC, TCR and STATCOM - Compensator control. Comparison between SVC and STATCOM.

UNIT III

Static series compensation: TSSC, SSSC -Static voltage and phase angle regulators – TCVR and TCPAR Operation and Control –Applications, Static series compensation – GCSC, TSSC, TCSC and Static synchronous series compensators and their Control.

UNIT IV

Circuit Arrangement, Operation and control of UPF. Basic Principle of P and Q control- Independent real and reactive power flow control- Applications. Introduction to interline power flow controller.

UNIT V

Power quality problems in distribution systems, harmonics. Loads that create harmonics, modelling, harmonic propagation, series and parallel resonances, mitigation of harmonics, passive filters, active filtering – shunt, series and hybrid and their control.

TEXT BOOKS

1. K R Padiyar, "FACTS Controllers in Power Transmission and Distribution", New AgeInternationalPublishers, 2007**.**
2. X P Zhang, C Rehtanz, B Pal, "Flexible AC Transmission Systems- Modelling and Control",Springer Verlag, Berlin, 2006.
3. N.G. Hingorani, L. Gyugyi, "Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems", IEEE Press Book, Standard Publishers and Distributors, Delhi, 2001.
4. K.S.Sureshkumar, S.Ashok , "FACTS Controllers & Applications", E-book edition, Nalanda Digital Library, NIT Calicut, 2003.

REFERENCE BOOKS

1. G. T.Heydt, "Power Quality", McGraw-Hill Professional, 2007.
2. T. J. E. Miller, "Static Reactive Power Compensation", John Wiley and Sons, Newyork, 1982.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DYNAMICS OF ELECTRICAL MACHINES

Course Code: **L/T/P/C: 3/0/0/3**

COURSE OBJECTIVES:

- Explain Performance characteristics of machine.
- Interpret the dynamics of the machine.
- How to determine stability of machine.
- Analyze the synchronous machine.
- Analyze different electrical machines with dynamic modelling.

COURSE OUTCOMES: At the end of this course, students will be able to

- Analyze the performance characteristics of all electric machines.
- Apply Knowledge of transformations for the dynamic analysis of machines
- Determine stability of the machines under small signal conditions
- Determine stability of the machines under transient conditions.
- Analyze synchronous machine.

UNIT I

Stability, Primitive 4 Winding Commutator Machine. Commutator Primitive Machine, Complete Voltage Equation of Primitive 4 Winding Commutator Machine.

UNIT II

Torque Equation. Analysis of Simple DC Machines using the Primitive Machine Equations, the Three Phase Induction Motor.Transformed Equations. Different Reference Frames for Induction Motor Analysis Transfer Function Formulation.

UNIT III

Three Phase Salient Pole Synchronous Machine,Parks Transformation- Steady State Analysis, Large Signal Transient. Small Oscillation Equations in State Variable Form, Dynamical Analysis of Interconnected Machines.

UNIT IV

Large Signal Transient Analysis using Transformed Equations,DC Generator /DC Motor System.

UNIT V

Alternator /Synchronous Motor System.

TEXT BOOKS

1. D.P. Sengupta & J.B. Lynn," Electrical Machine Dynamics", The Macmillan Press Ltd. 1980
2. R Krishnan "Electric Motor Drives, Modeling, Analysis, and Control", Pearson Education., 2001
3. P.C. Kraus, "Analysis of Electrical Machines", McGraw Hill Book Company, 1987
4. Boldia & S.A. Nasar,"Electrical Machine Dynamics", The Macmillan Press Ltd. 1992

5. C.V. Jones, “The Unified Theory of Electrical Machines”, Butterworth, London. 1967

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED DIGITAL SIGNAL PROCESSING

Course Code: **L/T/P/C: 3/0/0/3**

COURSE OBJECTIVES:

- Explain Characteristics of discrete time signals and systems
- Compare the difference between discrete-time and continuous-time signals.
- Apply and Understand Discrete Fourier Transforms (DFT).
- Illustrate various factors involved in design of digital filters.
- Summarize estimation of Power spectrum and the need for Power Spectrum estimation.

COURSE OUTCOMES: At the end of this course, students will be able to

- Analyze the time domain and frequency domain representations of discrete time signals and systems.
- Design techniques for IIR filters and its realization structures.
- Design techniques for FIR filters and its realization structures.
- Develop knowledge about the finite word length effects in implementation of digital filters.
- Estimate power spectrum of stationary random signals.

UNIT I

Discrete time signals, linear shift invariant systems, Stability and causality, Sampling of continuous time signals, Discrete time Fourier transform- Discrete Fourier series- Discrete Fourier transform, Z transform-Properties of different transforms.

UNIT II

Linear convolution using DFT, Computation of DFT Design of IIR digital filters from analog filters, Impulse invariance method, bilinear transformation method.

UNIT III

FIR filter design using window functions, Comparison of IIR and FIR digital filters, Basic IIR and FIR filter realization structures, Signal flow graph representations Quantization process and errors, Coefficient quantisation effects in IIR and FIR filters

UNIT IV

A/D conversion noise- Arithmetic round-off errors, Dynamic range scaling, Overflow oscillations and zero Input limit cycles in IIR filters, Linear Signal Models, all pole, all zero and Pole-zero models.

UNIT V

Power Spectrum estimation- Spectral analysis of deterministic signals, Estimation of power spectrum of stationary random signals, Optimum linear filters, Optimum signal estimation, Mean square error estimation, Optimum FIR and IIR Filters.

TEXT BOOKS

1. Sanjit K Mitra, "Digital Signal Processing: A computer-based approach ", TataMcGraw-Hill Edition 1998.
2. Dimitris G .Manolakis, Vinay K. Ingle and Stephen M. Kogon, "Statistical and Adaptive Signal Processing", McGraw Hill international editions.-2000

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ARTIFICIAL INTELLIGENCE TECHNIQUES

Course Code: **L/T/P/C: 3/0/0/3**

COURSE OBJECTIVES:

- Classify the difference between Biological Neuron and Artificial Neuron.
- Understand basic foundation in designing the Intelligent Systems.
- Differentiate between Neural Networks and Fuzzy Neural Networks
- Identify the Systems which are designed using Fuzzy and Neural Networks.
- Describe the importance of the Genetic Algorithm and its applications.

COURSE OUTCOMES: At the end of this course, students will be able to

- Describe the importance of designing the System with Artificial Neural Networks.
- Learn different types of fuzzification and defuzzification methods.
- Distinguish the various Neural Networks Architectures.
- Identify a system using Fuzzy logic or Neural network.
- Analyze the parameters of Genetic Algorithm.

UNIT I

Biological foundations to intelligent Systems, Artificial Neural Networks, Single layer and Multi-Layer Feed Forward NeuralNetworks, LMS and Back Propagation Algorithm, Feedback networks and Radial Basis Function Networks.

UNIT II

Fuzzy Logic, Knowledge Representation and Inference Mechanism, Defuzzification Methods.

UNIT III

Fuzzy Neural Networks, few algorithms for learning parameters like Genetic Algorithm

UNIT IV

System Identification using Fuzzy and Neural Network

UNIT V

Genetic Algorithm, Reproduction cross over, mutation. Introduction to evolutionary program. Applications related to practical problems.

TEXT BOOKS

1. J M Zurada , “An Introduction to ANN”,Jaico Publishing House
2. Simon Haykins, “Neural Networks”, Prentice Hall
3. Timothy Ross, “Fuzzy Logic with Engg.Applications”, McGraw. Hill
4. Driankov, Dimitra, “An Introduction to Fuzzy Control”, Narosa Publication
5. Golding, “Genetic Algorithms”, Addison-Wesley Publishing Com

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DISTRIBUTED GENERATION

Course Code: **L/T/P/C: 3/0/0/3**

COURSE OBJECTIVES:

- Understand renewable energy sources.
- Gain understanding of the working of off-grid and grid-connected renewable energy generation schemes.
- Explain Micro-Grids modelling and Analysis
- Learn Protection methods for Microgrids.
- Discuss issues, Challenges and Limitations of Distributed Generation

COURSE OUTCOMES: At the end of this course, students will be able to

- Understand the planning and operational issues related to Distributed Generation.
- Acquire Knowledge about Distributed Generation
- Learn Micro-Grids modelling and Analysis
- Simulate case studies with Microgrids
- Illustrate Protection methods for Microgrids

UNIT I

Planning of DGs, Sitting and sizing of DGs optimal placement of DG sources in distribution systems, Grid integration of DGs Different types of interfaces, Inverter based DGs and rotating machine-based interfaces, Aggregation of multiple DG units.

UNIT II

Technical impacts of DGs, Transmission systems Distribution systems De-regulation Impact of DGs upon protective relaying, Impact of DGs upon transient and dynamic stability of existing. Distribution systems, Steady-state and Dynamic analysis.

UNIT III

Economic and control aspects of DGs Market facts, Issues and challenges Limitations of DGs, Voltage control techniques, Reactive power control, Harmonics Power quality issues, Reliability of DG based systems.

UNIT IV

Introduction to micro-grids: Types of micro-grids: autonomous and non-autonomous grids Sizing of micro-grids, Modelling & analysis of Micro-grids with multiple DGs, Micro-grids with power electronic interfacing units.

UNIT V

Transients in micro-grids, Protection of micro-grids, Case studies, Advanced topics.

TEXT BOOKS

1. H.Lee Willis, Walter G. Scott,"Distributed Power Generation – Planning and Evaluation", Marcel Decker Press.

REFERENCE BOOKS

1. M.GodoySimoes, Felix A.Farret, "Renewable Energy Systems – Design and Analysis with Induction Generators", CRC press.
2. Stuart Borlase."Smart Grid: Infrastructure Technology Solutions" CRC Press

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SMART GRIDS

Course Code: **L/T/P/C: 3/0/0/3**

COURSE OBJECTIVES:

- Understand concept of smart grid and its advantages over conventional grid
- Acquire knowledge of different Smart Sensors
- Learn wide area measurement techniques
- Illustrate Distributed Automation integrated with Smart techniques.
- List and compare different Wireless Sensor Networks in Smart Grid.

COURSE OUTCOMES: At the end of this course, students will be able to

- Appreciate the difference between smart grid & conventional grid
- Apply knowledge of different Smart Sensors in real time applications
- Formulate solutions in the areas of smart substations, and wide area measurements
- Illustrate Distributed Automation integrated with Smart techniques
- List and compare different Wireless Sensor Networks in Smart Grid

UNIT I

Introduction to Smart grid: What is Smart Grid, Concept of Smart grid, Definitions& International policies, Need of Smart Grid; Smart Appliances: LED Lighting, Sensors for Green Building, Electric Vehicles in Smart Grid Environment: Load shifting using Electric Vehicles, Control Equipment, Outage Management during Battery Degradation, Smart Sensors: WSN enabled Consumer Applications in Smart Grid, WSN enabled Demand Management for Residential Customers, Coordination of PHEV Charging/Discharging cycles.

UNIT II

Distribution Automation: Architecture and Communication, Information Technology and Communication, Wind Energy in the context of Smart Grid, Intelligent Wind Converters, Grid Interconnection Solutions, Grid Connected Solar Power Plants, V-I characteristics of PV Module, PV plants connected to Grid.

UNIT III

Micro-grid: Advantages, Architecture, DC links in Radial Distribution networks, Back to Back Voltage Source converter topology, DC Link Model, Network Constraints, DG units in Smart Grids, Control Strategies for DG units and Active loads.

UNIT IV

Low Voltage DC Microgrid: Solid State Lighting System, Intelligent Wireless Sensor Network and Its Sensors, Energy Conservation in Green Building.

UNIT V

Wireless Sensor Networks in Smart Grid: ZigBee, Wi-Fi, Z-wave, Wireless HART, Security and Privacy of WSN based Consumer Applications, ZigBee based Energy Management.

TEXT BOOKS

1. Krzysztof Iniewski, "Smart Grid Infrastructure& Networking" ,McGrawHill ,2014.
2. Clark W.Gellings, P.E. , "The Smart Grid Enabling Energy Efficiency and Demand Response" , The Fairmont Press, 2015.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER QUALITY LAB

Course Code: **L/T/P/C: 0/0/4/2**

COURSE OBJECTIVES:

- To provide the students deep insight of Power Quality problems
- To study the causes of PQ problems
- To familiarize the effects of voltage and current harmonics
- To study the switching transients.
- To describe the effects of voltage disturbances in a power system network

COURSE OUTCOMES: At the end of this course, students will be able to

- Demonstrate the effects Voltage & Current disturbances and Illustrate the effects of harmonics with the filter.
- Study the causes of voltage sag and its effect on electrical equipment
- Relate the effects of non-linear load in a three-phase circuit
- Interpret the effects of voltage flicker and ground loop and Study the harmonics effect on energy meter.
- Discriminate the power quality problems using simulation tools.

LIST OF EXPERIMENTS:

1. To study the effect of nonlinear loads on power quality.
2. To demonstrate the voltage and current distortions experimentally.
3. To reduce the current harmonics with filters.
4. To study the voltage sag due to starting of large induction motor.
5. To study the capacitor switching transients.
6. To study the effect of balanced nonlinear load on neutral current, in a three-phase circuit
7. To study the effect of ground loop.
8. To study the effect of voltage flicker.
9. To calculate the distortion power factor.
10. Study the effect of harmonics on energy meter reading.
11. To study effect of voltage sag on electrical equipment.
12. To obtain the current harmonics drawn by power electronics interface using Simulation

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

POWER SYSTEM PROTECTION LAB

Course Code: **L/T/P/C: 0/0/4/2**

COURSE OBJECTIVES:

- Knowledge in the area of power systems hardware.
- Analysis of characteristics of various relays.
- Analysis various types of faults and its protection.
- Knowledge of various power factor correction systems.
- Knowledge on the concepts of arc flash, load flow, short circuit, transient stability, relay coordination.

COURSE OUTCOMES: At the end of this course, students will be able to

- Know the power systems hardware.
- Analyse the characteristics of various relays.
- Design and analyse the transmission line.
- Analyse various types of faults and its protection.
- Perform load flows, short circuit analysis for power generation, transmission and distribution networks.

LIST OF EXPERIMENTS:

1. Tripping Characteristics of an MCB of 1Ampere rating
2. Tripping sequence of protective devices
3. Tripping characteristics of protective devices
4. Testing of Instantaneous Over Current relay
    a) Phase Faults
    b) Earth Faults
5. Testing of differential relay
6. Testing of Negative sequence Relay
7. Model of a Transmission Line with Lumped Parameters
8. Characteristics of Bimetallic Thermal Over Load relays
9. a) Testing of Over Voltage Relay
    b) Testing of Under Voltage Relay
10. Current time Characteristics of Induction Disc type relay
11. Short circuit Analysis
12. Protection of Motor, transformer and bus
13. Protection of generator in parallel configuration.
14. Transient Analysis

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

HVDC

Course Code: **L/T/P/C: 3/0/0/3**

COURSE OBJECTIVES:

- Covering Voltage source converter-based transmission
- Focusing on HVDC control
- Know about VSC HVDC control
- Analysis of harmonics and their rectification.
- Impact of AC system performance on DC system

COURSE OUTCOMES: At the end of this course, students will be able to

- Compare the differences between HVDC and HVAC transmission.
- Know about VSC transmission advantages.
- Cover the different control strategies.
- Identification of valve firing control schemes.
- Address the role of AC system faults on HVDC system.

UNIT I

HVDC Transmission: Introduction, equipment required for HVDC systems, Comparison of AC and DC Transmission, Limitations of HVDC transmission lines, reliability of HVDC systems, comparison of HVDC link with EHVAC link, HVDC convertors, HVDC –VSC transmission System: VSC system components, Control of Active and reactive power, Applications of VSC systems.

UNIT II

HVDC Convertors operation and analysis: Thyristors and their characteristics, silicon rectifiers IGBT's, HVDC voltage source converters principle and operation, 6 pulse convertor configuration, ideal communication process without gate control, DC output voltage, gate control of valves, analysis of voltage wave forms with overlap angle, analysis of communication circuits, equivalent circuit of rectifier, Inverter operation with overlap, Equivalent circuit of inverter, complete equivalent circuit of HVDC link, power factor and reactive power of converters, analysis of 12 pulse converter, power flow in HVDC links, Power flow and current control, power loss in DC systems, operation and analysis of VSC converters, VSC inverter operation, power flow in VSC-DC transmission, comparison between CSC(classical HVDC) and NSC-HVDC system.

UNIT III

HVDC Converter Control: AC transmission and its control , necessary of dc link control, rectifier control, inverter control, constant beta control, constant gamma control, compounding of rectifiers, current compounding of inverter, complete HVDC system characteristics, power reversal in DC link, voltage dependent current order limit (VDCOL), system control hierarchy,

individual phase control, cosine control of phase delay, linear control phase delay, equidistance pulse control, pulse frequency control, constant current control, inverter exhibition angle control, constant power control, control system for HVDC converter ,inverter operation problem, control of VSC converters.

UNIT IV

Harmonics in HVDC System: Harmonics due to converter, characteristic current harmonics in the 12 pulse converter, harmonics in VSC converter, harmonic model and equivalent circuit ,design of AC filters, single tuned and double tuned high pass filters, second order filters and C-Type filter, Reactive power considerations of AC filters, Active filters and their applications, filters with VSC-HVDC schemes.

UNIT V

Faults on AC side of converter station: 3-phase symmetrical fault and asymmetrical faults, commutation failure, DC circuit breaker, Multi Terminal HVDC system: series and parallel MTDC systems and their operation and control, AC-DC system interaction short circuit rates and its effects.

TEXT BOOKS

1. HVDC transmission by S Kamakshaiah and V Kamaraju, Tata McGraw Hills Publications.

REFERENCE BOOKS

1. K.R.Padiyar., HVDC Power Transmission System(English) 2nd edition.
2. Arillaga., High Voltage Direct Transmission,(London)Peter Peregrinus, 1981.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INDUSTRIAL LOAD MODELLING AND CONTROL

Course Code: **L/T/P/C: 3/0/0/3**

COURSE OBJECTIVES:

1. Understand the energy demand scenario
2. Understand the modeling of load and its ease to study load demand industrially.
3. Evaluate Electricity pricing models
4. Study Reactive power management in Industries.
5. Analysis and application of load management tools in Industries.

COURSE OUTCOMES: At the end of this course, students will be able to

1. Summarize the load control techniques in industries and its application
2. Understand different types of industrial processes and optimize the process using tools like LINDO and LINGO
3. Apply load management to reduce demand of electricity during peak time
4. Analyze the Integrated Load management for Industries
5. Analyze the reactive power management in industries.

UNIT I

Electric Energy Scenario-Demand Side Management-Industrial Load Management. Load Curves-Load Shaping Objectives-Methodologies- Barriers; Classification of Industrial Loads-Continuous and Batch processes -Load Modeling..

UNIT II

Electricity pricing – Dynamic and spot pricing –Models. Direct load control- Interruptible load control. Bottom up approach- scheduling- Formulation of load models. Optimization and control algorithms Case studies.

UNIT III

Reactive power management in industries-controls. Power quality impacts application of filters Energy saving in industries.

UNIT IV

Cooling and heating loads. load profiling-Modeling. Cool storage-Types- Control strategies-Optimal operation. Problem formulation Case studies.

UNIT V

Captive power units- Operating and control strategies. Power Pooling -Operation models. Energy banking. Industrial Cogeneration. Selection of Schemes Optimal Operating Strategies. Peak load saving-Constraints-Problem formulation- Case study. Integrated Load management for Industries.

TEXT BOOKS

1. C.O. Bjork “Industrial Load Management - Theory, Practice and Simulations", Elsevier, the Netherlands,1989.
2. C.W. Gellings and S.N. Talukdar, “Load management concepts,” IEEE Press, New York, 1986, pp. 3-28.
3. Y. Manichaikul and F.C. Schweppe ," Physically based Industrial load", IEEE Trans. on PAS, April 1981.
4. H. G. Stoll, "Least cost Electricity Utility Planning”, Wiley Interscience Publication, USA, 1989.
5. I.J.Nagarath and D.P.Kothari, .Modern Power System Engineering., Tata McGraw Hill publishers, New Delhi, 1995.
6. IEEE Bronze Book- “Recommended Practice for Energy Conservation and cost effective planningin Industrial facilities”, IEEE Inc, USA.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SCADA SYSTEMS AND APPLICATIONS

Course Code: **L/T/P/C: 3/0/0/3**

COURSE OBJECTIVES:

- Knowledge on smartgrid concepts and information on necessity of SCADA in power systems.
- The concepts of SCADA communication systems.
- Integration of smart devices for substation automation.
- Description of Energy management systems and framework.
- Exposure on Distribution automation and management systems.

COURSE OUTCOMES: At the end of the course, the student will be able to

- Describe the basic tasks of Supervisory Control Systems (SCADA) as well as their typical applications**.**
- Acquire knowledge about SCADA architecture, Remote Terminal Unit (RTU), HMI Systems etc.
- Knowledge about single unified standard architecture IEC 61850.
- Apply Open standard communication protocols.
- Learn and understand about SCADA applications in transmission and distribution sector, industries etc.

UNIT I

Introduction to SCADA: Data acquisition systems, Evolution of SCADA, Communication technologies. Monitoring and supervisory functions, SCADA applications in Utility Automation, Industries SCADA

UNIT II

Industries SCADA System Components: Schemes- Remote Terminal Unit (RTU), Intelligent Electronic Devices (IED), Programmable Logic Controller (PLC), Communication Network, SCADA Server, SCADA/HMI Systems

UNIT III

SCADA Architecture: Various SCADA architectures, advantages and disadvantages of each system - single unified standard architecture –IEC 61850.

UNIT IV

SCADA Communication: various industrial communication technologies -wired and wireless methods and fiber optics. open standard communication protocols.

UNIT V

SCADA Applications: Utility applications- Transmission and Distribution sector- operations, monitoring, analysis and improvement. Industries - oil, gas and water

TEXT BOOKS

1. Stuart A. Boyer: “SCADA-Supervisory Control and Data Acquisition”, Instrument Society of AmericaPublications, USA,2004.
2. Gordon Clarke, Deon Reynders: “Practical Modern SCADA Protocols: DNP3, 60870.5 and RelatedSystems”, Newnes Publications, Oxford, UK,2004.
3. William T. Shaw, “Cybersecurity for SCADA systems”, PennWell Books, 2006.
4. David Bailey, Edwin Wright, “Practical SCADA for industry”, Newnes, 2003.
5. Wiebe, “A guide to utility automation: AMR, SCADA, and IT systems for electric power”,PennWell 1999.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BUSINESS ANALYTICS
(OPEN ELECTIVE)

Course Code: **L/T/P/C: 3/0/0/3**

UNIT I

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

UNIT II

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

UNIT III

Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes.

Descriptive Analytics, predictive analytics, predicative Modelling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization.

UNIT IV

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

UNIT V

Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making. Recent Trends in: Embedded and collaborative business intelligence, Visual data

recovery, Data Storytelling and Data journalism.

Reference Books:

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FTPress.
2. Business Analytics by James Evans, persons Education.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INDUSTRIAL SAFETY

(OPEN ELECTIVE)

Course Code: **L/T/P/C: 3/0/0/3**

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of

electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

Reference Books:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winterkorn, Hans, Chapman & Hall London.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

BUSINESS ANALYTICS

(OPEN ELECTIVE)

Course Code: **L/T/P/C: 3/0/0/3**

UNIT I

Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models.

UNIT II

Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming.

UNIT III

Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT

UNIT IV

Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.

UNIT V

Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation.

Reference Books:

1. H.A. Taha, Operations Research, An Introduction, PHI,2008
2. Wagner, Principles of Operations Research, PHI, Delhi,1982.
3. J.C. Pant, Introduction to Optimization: Operations Research, Jain Brothers, Delhi,2008
4. Hitler Libermann Operations Research: McGraw Hill Pub.2009
5. Pannerselvam, Operations Research: Prentice Hall of India2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India2010

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COST MANAGEMENT OF ENGINEERING PROJECTS

(OPEN ELECTIVE)

Course Code: **L/T/P/C: 3/0/0/3**

Unit I

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

Unit II

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

Unit III

Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis.

Unit IV

Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

Unit V

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Simulation, Learning Curve Theory.

Reference Books:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi.
2. Charles T. Horngren and George Foster, Advanced Management Accounting.
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting.
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher.

5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co.Ltd.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

COMPOSITE MATERIALS

(OPEN ELECTIVE)

Course Code: **L/T/P/C: 3/0/0/3**

UNIT I

INTRODUCTION: Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT II

REINFORCEMENTS: Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

UNIT III

Manufacturing of Metal Matrix Composites: Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

UNIT IV

Manufacturing of Polymer Matrix Composites: Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

UNIT V

Strength: Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

Text Books:

1. Material Science and Technology – Vol 13 – Composites by R.W.Cahn – VCH, West Germany.
2. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition,2007.

Reference Books:

1. Hand Book of CompositeMaterials-ed-Lubin.
2. Composite Materials –K.K.Chawla.
3. Composite Materials Science and Applications – Deborah D.L.Chung.
4. Composite Materials Design and Applications – Danial Gay, Suong V. Hoa, and Stephen W.Tasi.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

WASTE TO ENERGY

(OPEN ELECTIVE)

Course Code: **L/T/P/C: 3/0/0/3**

Unit I

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

Unit II

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

Unit III

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

Unit IV

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

Unit V

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

Reference Books:

1. Non-Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd.,1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd.,1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd.,1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGLISH FOR RESEARCH PAPER WRITING

Course Code: **L/T/P/C: 2/0/0/2**

Course objectives:

- To state how to put research on paper
- To demonstrate how to write an abstract
- To apply the process of research
- To appraise the key skills involved in writing the title, abstract, introduction and review of literature
- To compose a paper which is good and has the qualities of acceptance and publication

Course Outcomes:

- Will be able to understand how to write a research paper
- Will outline the drafting of an abstract
- Will acquire the skills of various elements of research
- Will be in a position to write a good paper
- Will result in increasing the chance of publication

Unit 1: Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

Unit 2: Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction.

Unit 3: Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

Unit 4: 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 5: 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 Conclusion.

Unit 6: Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission.

Reference Books:

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. Ian Wallwork , English for Writing Research Papers, Springer New York Dordrecht

Heidelberg London, 2011.

Course Code: **L/T/P/C: 2/0/0/2**

Course Objectives:

- 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.

Course Outcomes:

- Capacity to integrate knowledge and to analyze, evaluate and manage the different public health aspects of disaster events at a local and global levels, even when limited information is available.
- Capacity to describe, analyze and evaluate the environmental, social, cultural, economic, legal and organizational aspects influencing vulnerabilities and capacities to face disasters.
- Capacity to work theoretically and practically in the processes of disaster management (disaster risk reduction, response, and recovery) and relate their interconnections, particularly in the field of the Public Health aspects of the disasters.
- Capacity to manage the Public Health aspects of the disasters.
- Capacity to obtain, analyze, and communicate information on risks, relief needs and lessons learned from earlier disasters in order to formulate strategies for mitigation in future scenarios with the ability to clearly present and discuss their conclusions and the knowledge and arguments behind them.

Unit I

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

Unit II

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

Unit III

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

Unit IV

Disaster Preparedness and Management: Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

Unit V

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

Unit VI

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

Reference Books:

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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

SANSKRIT FOR TECHNICAL KNOWLEDGE

Course Code: **L/T/P/C: 2/0/0/2**

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*:*

- Understanding basic Sanskrit alphabets and Understand tenses in Sanskrit Language.
- Enable students to understand roots of Sanskrit language.
- Students learn engineering fundamentals in Sanskrit.
- Students can attempt writing sentences in Sanskrit.
- Ancient Sanskrit literature about science & technology can be understood

Unit 1: Alphabets in Sanskrit, Past/Present/Future Tense, Simple Sentences

Unit 2: Order, Introduction of roots, Technical information about Sanskrit Literature

Unit 3: Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

Reference Books:

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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

VALUE EDUCATION

Course Code: **L/T/P/C: 2/0/0/2**

Course Objectives:

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character
- To understand the significance of human conduct and self-development
- To enable students to imbibe and internalize the value and Ethical behaviour in personal and professional lives.

Course outcomes: Students will be able to

- Knowledge of self-development
- Learn the importance of Human values
- Developing the overall personality
- Student will be able to realize the significance of ethical human conduct and self-development
- Students will be able to inculcate positive thinking, dignity of labour and religious tolerance.

Unit 1: Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non- moral valuation, Standards and principles, Value judgement.

Unit 2: Importance of cultivation of values, Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline

Unit 3: Personality and Behavior Development - Soul and Scientific attitude, Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship, Happiness vs suffering, love for truth, Aware of self-destructive habits, Association and Cooperation, Doing best for saving nature.

Unit 4: 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

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
INDIAN CONSTITUTION

Course Code: **L/T/P/C: 2/0/0/2**

Course Objectives:

- 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.
- To understand the role and functioning of Election Commission of India.

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.
- Discuss the significance of Election Commission of India.

Unit 1: History of Making of the Indian Constitution: History Drafting Committee, (Composition & Working).

Unit 2: Philosophy of the Indian Constitution: Preamble Salient Features.

Unit 3: 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 4: Organs of Governance: Parliament-Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

Unit 5: 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 6: 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.

Reference Books:

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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PEDAGOGY STUDIES

Course Code: **L/T/P/C: 2/0/0/2**

Course Objectives:

- 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.
- Establishing coordination among people in order to execute pedagogy methods.
- To study pedagogy as a separate discipline.

Course Outcomes: Students will be able to understand

- What pedagogical practices are being used by teachers in formal classrooms in developing countries?
- What pedagogical practices are being used by teachers in informal classrooms in developing countries?
- Synergy from the work force.
- 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 1: Introduction and Methodology: Aims and rationale, Policy background, Conceptual framework and terminology Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions**.** Overview of methodology and Searching.

Unit 2: Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.

Unit 3: Evidence on the effectiveness of pedagogical practices, Methodology for the in-depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.

Unit 4: Professional development: alignment with classroom practices and follow- up support, Peer support, Support from the head teacher and the community, Curriculum and assessment, Barriers to learning: limited resources and large class sizes

Unit 5: Research gaps and future directions: Research design, Contexts, Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.

Reference Books:

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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

STRESS MANAGEMENT BY YOGA

Course Code: **L/T/P/C: 2/0/0/2**

Course Objectives:

- To achieve overall Good Health of Body and Mind.
- To lower blood pressure and improve heart health.
- To become non-violent and truthfulness.
- To increase the levels of happiness.
- To eliminate all types of body pains.

Course Outcomes: Students will be able to

- Develop healthy mind in a healthy body thus improving social health also improve efficiently.
- Develop body awareness. Learn how to use their bodies in a healthy way. Perform well in sports and academics.
- *Will balance, flexibility,* and stamina, strengthen *muscles* and connective tissues enabling good *posture*.
- Manage stress through breathing, awareness, meditation and healthy movement.
- Build concentration, confidence and positive self-image.

Unit 1: Definitions of Eight parts of yog. (Ashtanga)

Unit 2: Yam and Niyam. Do`s and Don't's in life. Ahinsa, satya, astheya, bramhacharya and aparigraha Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

Unit 3: Asan and Pranayam, Various yog poses and their benefits for mind & body. Regulaization of breathing techniques and its effects-Types of pranayam

Reference Books:

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

Course Code: **L/T/P/C: 2/0/0/2**

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
- To differentiate three types of happiness (Sukham)
- To describe the character traits of a spiritual devotee

Course Outcomes:

- Study of Shrimad- Bhagwad-Gita wiil 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
- To develop self-developing attitude towards work without self-aggrandizement
- To develop tranquil attitude in all favorable and unfavorable situations
- To develop high spiritual intelligence

Unit 1: Neetisatakam-Holistic development of personality

- Verses- 19,20,21,22 (wisdom)
- Verses- 29,31,32 (pride & heroism)
- Verses- 26,28,63,65 (virtue)
- Verses- 52,53,59 (dont's)
- Verses- 71,73,75,78 (do's)

Unit 2: Approach to day to day work and duties.

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

Reference Books:

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

Sansthanam, New Delhi.