Vision
Empowering the community of students of Department of Electrical Engineering with very high morals, values, ethics, skills and technical knowledge through a rich curriculum blending the equal proportions of theoretical and hands-on experience by a process of transformation via hard-work and perseverance, with a view to serving the society in the role of socially responsible engineers so as to look after the needs of the nation and to elevate the standard of living of the people by incorporating innovation and sustained research.

Mission
- To attract the students to pursue not only the under graduation, but also up to the research level, with the exquisite infrastructure, learned faculties, state-of-the-art laboratories etc., from the Indian and International diasporas.
- To foster the global standards in learning, teaching and research that owes to an overall development of the department, faculties and students within the university and from across the globe as well.
- To enhance the caliber of students to be the most sought for, by the industrial and research entities.
- To enable for a diversified and challenging career that is ensued by the highest degree of professionalism, entrepreneurship, managerial and administrative expertise.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO)
The core objectives of the M.E. programme in Power Systems are intended

PEO-1
To develop professional knowledge in power systems domain so as to have successful career in industries, research and academia.

PEO-2
To enhance analytical skills to solve challenging complex problems in power and energy sectors using modern tools and technologies.

PEO-3
To inculcate research attitude and lifelong learning among the students.
PEO-4

To demonstrate professional and ethical behavior and be engaged in executing projects in multidisciplinary environment for the benefit of society.

Programme Outcomes (PO)

PO-1

Ability to apply the enhanced knowledge in advanced technologies for modeling, analyzing and solving contemporary issues in power sector with a global perspective.

PO-2

Ability to critically analyze and carry out detailed investigation on multifaceted complex problems in area of Power Systems and envisage advanced research in thrust areas.

PO-3

Ability to identify, analyze and solve real-life engineering problems in the area of Power Systems and provide strategic solutions satisfying the safety, cultural, societal and environmental aspects/ needs.

PO-4

Ability for continued pursuance of research and to design, develop and propose theoretical and practical methodologies towards research and development support for the Power System infrastructure.

PO-5

Ability to develop and utilize modern tools for modeling, analyzing and solving various Engineering problems related to Power Systems.

PO-6

Willingness and ability to work in a team of engineers/ researchers with mutual understandings to take unsophisticated challenges, in the field of Power Systems, lead and motivate the group to inculcate multidisciplinary and collaborative approach.

PO-7

Willingness and ability to take up administrative challenges including the management of various projects of interdisciplinary nature and carry out the same in an efficient manner giving due consideration to societal, environmental, economical and financial factors.

PO-8

Ability to express ideas clearly and communicate orally as well as in writing with others in an effective manner, adhering to various national and international standards and practices for the documentation and presentation of the contents.

PO-9

Ability to engage in self-education and life-long learning to enable global competency.
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Note: * - Four weeks during the summer vacation at the end of II Semester.

COURSES OF STUDY AND SCHEME OF EXAMINATION (REGULATION – 2019)
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**PE – PROGRAM ELECTIVES**
1. State Estimation and Security Assessment of Power Systems
2. Smart Grid
3. Extra High Voltage AC and DC Transmission
4. Wind and Solar Systems
5. Electrical Power Distribution System
6. Power System Operation and Control
7. Energy Management and Energy Audit
8. Electric and Hybrid Vehicles
9. Restructured Power Systems
10. SCADA System and Applications
11. Power Quality
12. Artificial Intelligence Techniques
13. Power System Transients
14. FACTS and Custom Power Devices
15. Industrial Load Modeling and Control
16. Systems Theory

**OE-OPEN ELECTIVES**
1. Business Analytics
2. Industrial Safety
3. Operations Research
5. Composite Materials
6. Waste to Energy

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

- To introduce applications of computer in power system analysis.
- To understand the mathematical modelling of transmission line, transformer and synchronous machine.
- To study the importance of sparse matrix techniques for large scale power system.
- To impart in depth knowledge of various power flow studies in power system.
- To develop the computational algorithm to simulate balanced and unbalanced faults in power system.
- To understand the multi machine stability problem in power system.

Modelling of Power System

Elements of transmission network – overhead transmission line representation, transformer representation, synchronous machine representation - Distinction between steady state, quasi steady state and transient modelling of power system - Importance of power flow, short circuit and stability studies in the planning and operation of power system.

Sparsity Techniques


Power Flow Studies


Short Circuit Studies

Short circuit analysis of a multi-node power system using bus impedance matrix ZBUS - Building algorithm for ZBUS - Algorithm for symmetrical fault analysis using ZBUS - Development of voltage and current equations under unsymmetrical faults using symmetrical components and algorithm for unsymmetrical fault analysis using ZBUS.

Stability Studies

Mathematical model for stability analysis of multi machines - Computational algorithm for power system stability solution of swing equation - Modified Euler method and 4th order Runge-Kutta method.
REFERENCES:

COURSE OUTCOMES:
Students will be able to
1. Acquire knowledge about the modelling of power system components.
2. Ability to introduce the sparsity techniques in power system analysis.
3. Ability to develop computer program for various power flow studies.
4. Attain knowledge about the abnormal operation of power system under balanced and unbalanced conditions.
5. Understand the computational procedure for obtaining the swing curve.

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COURSE OBJECTIVES:
- To review the mathematical background of various power system components that enables the operator to construct efficient system model during various operating states is expected.
- To introduce the basics of dynamics and stability problems based on the modelling of synchronous machines
• To bring out the importance of various modelling of excitation and speed governing systems in detail.

• To facilitate extension of the existing techniques in understanding the fundamental concepts of active power flow control to ensure stability of dynamic systems.

• To make the students realize the significance of various methodologies and to study various remedial measures in ensuring a better reactive power flow control.

• To study various power system stabilizers in enhancing better dynamic control of the power system.

Introduction

Concept and importance of power system stability in the operation and design – distinction between transient and dynamic stability – complexity of stability problem in large system – necessity for reduced models – stability of interconnected systems

Machine Modelling and Machine Controllers


Modelling of Classical Power Plant Components


Active Power Flow Control

Small and large disturbances and deviations - UCTE load frequency control – primary, secondary and tertiary control - system modelling, inertia, droop, regulation, and dynamic frequency response - block diagram of the system dynamics and load damping - effect of governor droop on regulation - increasing load by adjusting prime mover power - spinning reserves - Under Frequency Load Shedding and operation in islanding.

Reactive Power Flow Control

Sensitivity coefficients - voltage and reactive power control - reactive power compensation - grid voltage and reactive power control methods – automatic high-side voltage control in power plants - grid hierarchical voltage regulation - Basic

REFERENCES:

COURSE OUTCOMES:
Students will be able to
1. Understand about various approaches in modelling of power system components and analyze for the dynamic operation of the power system
2. Handle modern speed governing and turbine systems for various classical power plants
3. Obtain improved skills with the detailed study of various IEEE type excitation systems for improved power system operation, stability, control and protection.
4. Ensure enhanced capability in adopting efficient engineering aspects for real power - frequency and reactive power – voltage controls of electrical energy generation and utilization.
5. Have clear understanding of managerial functions like planning, organizing, controlling various power system utilities.

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### Course Objectives:
- To gain a sound knowledge of scientific research for undertaking a valid study
- To explore the techniques of defining a research problem and investigate the various research designs, highlighting their main characteristics
- To understand the ethical issues of writing technical papers
- To provide an insight on intellectual property
- To address new and international developments in IPR.

Meaning of research problem, Sources of research problem, Criteria for selecting a research problem, Characteristics of a good research problem, Errors in selecting a research problem, Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentation

Effective literature studies approaches, analysis-Plagiarism, Research ethics, Effective technical writing, how to write report, Paper-Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee


### REFERENCES:
COURSE OUTCOMES:
Students will be able to:
1. Understand research problem formulation.
2. Analyze research related information
3. Follow research ethics
4. Understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
5. 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.
6. 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.

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COURSE OBJECTIVES:
- To introduce the students to the field of programming and usage of software packages related to power systems such as MI POWER, ETAP, PSCAD, C++, etc.
- To enhance the analyzing and problem solving skills of students.
- To deal with the practical aspects of the Core and Elective subjects offered in the Programme.
- To impart the practical insight of these subjects to the students through the actual implementation and analysis

List of Experiments:
1. 1. Formation of bus admittance and impedance matrices
2. 2. Load flow study based on Gauss - Seidal method
3. 3. Load flow study based on Newton-Raphson method
4. 4. Load flow study based on Fast Decoupled Load flow method
5. 5. DC load flow analysis
6. 6. Contingency analysis
7. 7. State estimation based on WLSE method
8. 8. Economic load dispatch
**COURSE OUTCOMES:**
Students will be able to:
1. Know concepts in problem solving
2. Develop programming in C++ language
3. Analyze simulation results and effective documentation
4. Exhibit professional behavior and competence
5. Acquire expertise in usage of modern software tools

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**EEPSCP17 POWER SYSTEM SIMULATION LAB**

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**COURSE OBJECTIVES:**
- To introduce the students to the field of programming and usage of software packages related to power systems such as MI POWER, ETAP, PSCAD, C++, etc.
- To enhance the analyzing and problem solving skills of students.
- To deal with the practical aspects of the Core and Elective subjects offered in the Programme.
- To impart the practical insight of these subjects to the students through the actual implementation, analysis and/or simulation.

**List of Experiments:**
1. Load frequency control of single area system
2. Load frequency control of two area system
3. Symmetrical short circuit study
4. Unsymmetrical short circuit study
5. Transient stability analysis
6. Optimal power flow analysis
7. Voltage stability study
8. Performance characteristic of buck-boost converter
9. Economic load dispatch based on Bmn co-efficients
COURSE OUTCOMES:

Students will be able to:
1. Know concepts in problem solving
2. Develop programming in C++ language
3. Analyze simulation results and effective documentation
4. Exhibit professional behavior and competence
5. Acquire expertise in usage of modern software tools

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EEPSPC21 POWER SYSTEM PROTECTION

COURSE OBJECTIVES:

- To explain the concept of power system protection.
- To detail the schemes for overcurrent protection.
- To describe the transformer protection schemes.
- To emphasize the protection of transmission lines.
- To acquire wide knowledge on Generator and Induction Motor Protection
- To introduce the automation of substation

Overcurrent Protection

Introduction-need for protective systems-nature and causes of faults-types of faults- effects of faults-protection requirements- protection zones- primary and back-up protection- directional protection- classification of protective relays-classification of protective schemes-operating principles and relay construction-Evolution of digital relays from electromechanical relays - Performance and operational characteristics of digital protection- Basic elements of digital protection

Overcurrent protection-types of overcurrent relay-over current protective schemes-protection of feeders and ring mains- directional over current relay-drawbacks of over-current relays- earth fault and phase fault protection - combined earth fault and phase fault protection scheme - phase fault protective scheme-directional earth fault relay- static over current relays
Transformer Protection


Protection of Transmission Lines

Distance protection- simple impedance relay- reactance relay- mho relay-comparison between distance relays- distance protection of a three-phase line- need for carrier-aided protection- unit type carrier aided directional protection- carrier-aided distance schemes for acceleration of zone II- carrier-based phase comparison scheme- Digital Line Differential Protection

Generator and Induction Motor Protection

Percentage differential protection scheme against stator phase and ground faults- transverse differential protection- protection against rotor faults- protection against abnormal operating conditions- unbalanced loading –over speeding- loss of excitation – loss of prime mover- induction motor protection- protection against phase faults and ground faults- protection against abnormal operating conditions from supply side and mechanical side

Substation Automation

Topology and functionality- system elements- system requirements- hardware implementation- communication methods- communication protocols and formats-network protocols- substation automation functionality- system configuration and testing- upgrading an existing substation- communication networks for power systems automation- introduction to IEC 61850 – advantages of IEC 61850- Recent Advances in Digital Protection of Power Systems.

REFERENCES:

COURSE OUTCOMES:
1. Obtain fundamental knowledge about various protection schemes.
2. Become proficient in overcurrent and transformer protection schemes.
3. Gain familiarity about the protection of transmission lines.
4. Acquire knowledge on Generator and Induction Motor Protection
5. Familiarize with the substation automation.
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EEPSPC22 POWER SYSTEM STABILITY

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**COURSE OBJECTIVES:**

- To distinguish between the different types of power system stability studies
- To understand the concept of small signal stability
- To study the various solution methodologies for transient stability analysis
- To analyse the voltage stability assessment methods

**Introduction to Power System Stability**

Basic concepts and definitions- classification of stability - Rotor angle stability, voltage stability and voltage collapse - Distinction between mid-term and long-term stability - Nature of system response during severe upsets-blackouts around the world – ill effects of instability.

**Small Signal Stability**


**Transient Stability Analysis**


**Voltage Stability Analysis**

Difficulties with reactive power transmission – Steady state stability analysis of two bus system using PV and QV curves – Voltage stability assessment using indices – Determination of weakest bus or weakest bus ordering vector – Large disturbance analysis – Phase balancing and power factor correction of unsymmetrical loads.
Methods of improving stability


REFERENCES:

COURSE OUTCOMES:
Students will be able to
1. Familiarize with the different types of stability in power systems.
2. Understand the significance about small signal stability analysis and its enhancement.
3. Gain knowledge on Transient stability analysis
4. Know the significance of voltage stability analysis.
5. Investigate the various methods to enhance transient stability

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EEPSCP26 ARTIFICIAL INTELLIGENCE APPLICATIONS TO POWER SYSTEMS LAB

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COURSE OBJECTIVES:
- To introduce the students to the field of programming and usage of AI techniques applied to power systems
- To enhance the programming and problem solving skills of students.
- To deal with the practical aspects of the Core and Elective subjects offered in the Programme.
List of Experiments:
1. ANN for load forecasting
2. Fuzzy Logic Controller for load frequency control
3. Genetic Algorithm based economic load dispatch
4. Particle Swarm Optimization based optimal placement of FACTS devices
5. ANN for fault analysis
6. Particle Swarm Optimization based environmental economic dispatch
7. ANN for economic load dispatch
8. ANN for price forecasting

COURSE OUTCOMES:
Students will be able to:
1. Know concepts in problem solving using AI techniques
2. Develop programming in MATLAB
3. Analyze simulation results and effective documentation
4. Exhibit professional behavior and competence
5. Acquire expertise in usage of modern software tools

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COURSE OBJECTIVES:
- To train the students in the field work related the Power Systems and to have a practical knowledge in carrying out Power Systems field related works.
- To train and develop skills in solving problems during execution of certain works related to Power Systems.
- To work on a technical topic related to Power Systems and acquire the ability of written and oral presentation
- To acquire the ability of writing technical papers for Conferences and Journals

Each student should individually undergo a training program in reputed industries in the field of Power Systems during the summer vacation (at the end of second semester for full – time / fourth semester for part – time) for a minimum stipulated period of four weeks. At the end of the training, the student has to submit a detailed report on the training he/she had, within ten days from the commencement of the third semester for Full-time / fifth semester for part-time.
The student will be evaluated, by a team of staff members nominated by Head of the department, through a viva-voce examination.

Further, each student will work for two periods per week guided by student counsellor. He/she will be asked to present a seminar of not less than fifteen minutes and not more than thirty minutes on any technical topic of student’s choice related to Power Systems and to engage in discussion with audience and will defend the presentation. A brief copy of the presentation also should be submitted. Evaluation will be done by the student counselor based on the technical presentation and the report and also on the interaction shown during the seminar.

**COURSE OUTCOMES:**
Students will be able to:
1. Face the challenges in the field with confidence.
2. Benefit by the training with managing the situation that arises during the execution of works related to Power Systems.
3. Get the training to face the audience and to interact with the audience with confidence.
4. Tackle any problem during group discussion in the corporate interviews.
5. Gain practical knowledge in carrying out Power Systems field related works.

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**COURSE OBJECTIVES:**

- To carry out thesis work Phase – I which is an integral part of the thesis consisting of problem statement, literature review, thesis overview and scheme of implementation.
- To attempt the solution to the problem by analytical/simulation/experimental methods and validate with proper justification.
METHOD OF EVALUATION:

The student undergoes literature survey and identifies the topic of thesis and finalizes in consultation with Guide/Supervisor and prepares a comprehensive thesis report after completing the work to the satisfaction of the supervisor.

The progress of the thesis is evaluated based on a minimum of three reviews. The review committee will be constituted by the Head of the Department.

A thesis report is required at the end of the semester.

The thesis work is evaluated based on oral presentation and the thesis report jointly by external and internal examiners constituted by the Head of the Department.

COURSE OUTCOMES:

Students will be able to:
1. Review quality of Literature survey and Novelty in the problem
2. Assess clarity of Problem definition and Feasibility of problem solution
3. Validate the relevance to the specialization
4. Acquire Knowledge on the clarity of objective and scope
5. Improve the quality of Written and Oral Presentation

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COURSE OBJECTIVES:

- To carry out Thesis work Phase – II which the remaining part of the thesis.
- To attempt the solution to the problem by analytical/simulation/experimental methods and validate with proper justification.

METHOD OF EVALUATION:

The progress of the thesis is evaluated based on a minimum of three reviews. The review committee will be constituted by the Head of the Department.

A thesis report is required at the end of the semester.

The thesis work is evaluated based on oral presentation and the thesis report jointly by external and internal examiners constituted by the Head of the Department.
COURSE OUTCOMES:
Students will be able to:
1. Identify the real world power system problems
2. Analyze, design and implement solution methodologies
3. Apply modern engineering tools for solution
4. Write technical reports following professional ethics
5. Develop effective communication skills to present and defend their research work to a panel of experts.

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PROGRAM ELECTIVES

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COURSE OBJECTIVES:
• To acquire fundamental knowledge in power system state estimation
• To gain knowledge in distribution system state estimation
• To perform observability analysis in the power system networks
• To obtain knowledge to assess the security of the electric power system
• To explore the strategies for power system operations enhancement
• To get conceptual aspects in power system state estimation and strategies to enhance the secure power system operations

Introduction

Power System State Estimation
Static state estimation: Active and reactive power bus measurements - Line flow measurements - Line current measurements – Bus voltage measurements - Measurement model and assumptions - Weighted least square state estimation algorithm- Maximum likelihood estimation - Decoupled formulation of WLS state
estimation- Fast decoupled state estimation - State estimation using DC model of power system- Weighted least absolute value state estimation - Comparison of state estimation algorithms.

**Network Observability Analysis**

**Distribution System State Estimation**
Distribution system state estimation- State of the art methods – Comparison of different DSSE algorithms- Developments in measurement system and DSSE design- Pseudo measurements- System architecture.

**Security Assessment and Security Enhancement**
Contingency analysis: Linearized AC and DC models of power systems for security assessment - Line outage distribution factors and generation shift factors for DC and linearized AC models - Single contingency analysis using these factors - Double line outage analysis techniques using bus impedance matrix and factors of bus admittance matrix- Fast contingency algorithms for nonlinear A.C. models- Contingency ranking and security indices-Correcting the generator dispatch for security enhancement using linearized DC models – Methods using sensitivity factors - Compensated factors - Optimization methods. Emergency and restorative control procedures.

**REFERENCES:**

**COURSE OUTCOMES:**
Students will be able to
1. Understand the conceptual aspects in power system state estimation.
2. Demonstrate various state estimation methods.
3. Be proficient to perform observability analysis.
4. Able to conduct distribution state estimation.
5. Realize the security assessment and enhancement strategies.
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**Course Objectives:**

- To familiarize with the fundamentals of smart grids
- To get exposed to Smart Grid technologies, functionalities and capabilities
- To study about the performance analysis tools for smart grid
- To know about the various stability assessment tools for smart grid
- To focus on smart metering and demand-side integration
- To familiarize with the application of FACTS and Energy storage devices in smart grid

**Introduction**

Motivation for smart grid - Smart grid Definition - benefits - Comparison of Traditional Grid and Smart Grid - Characteristics of a Smart Grid - Stakeholders in smart grid development - Smart grid technology framework, functionalities and capabilities - Cost Components for the Smart Grid: Transmission Systems and Sub-Stations End - Distribution End - Consumer End - Cost-Benefit Analysis

**Load Flow and Contingency Analysis for Smart Grid**

Introduction to Load Flow Studies - Challenges to Load Flow in Smart Grid - Weaknesses of the Present Load Flow Methods - Load Flow methodology for Smart Grid Design - DSOPF Application To The Smart Grid - Static Security Assessment (SSA) and Contingencies - Contingencies and Their Classification - Contingency Studies for the Smart Grid.

**Stability Assessment for Smart Grid**


**Smart Metering**

Introduction - Smart metering - Comparison of Conventional and smart metering - Benefits of smart meters - Functional block diagram of a smart meter-stages in Smart meter architecture - Communication infrastructure and protocols for smart metering - Demand side integration.
FACTS and Energy Storage in the Smart Grid


REFERENCES:

COURSE OUTCOMES:
1. Acquire knowledge on the concept of smart grids.
2. Implement Load flow and contingency methods for smart grid.
3. Identify stability assessment tools for smart grid.
4. Gain knowledge on smart metering infrastructure.
5. Realize the application of FACTS and energy storage devices in smart grid.

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COURSE OBJECTIVES:
- To introduce the extra high voltage AC and DC transmission.
- To learn about the properties of bundle conductors and voltage control using compensators.
- To introduce the HVDC transmission system with types, control and protection.
- To discuss about the design factors of lines and cables.
- To learn about the overvoltage problem in extra high voltage system.

**Introduction**

Introduction to EHV AC and DC transmission - Role of EHV AC Transmission - Standard Transmission Voltages - Power-Handling Capacity and Line Loss - comparison between HVAC and HVDC overhead and underground transmission schemes - Factors concerning choice of HVAC and HVDC transmission - Block diagram of HVAC and HVDC transmission schemes.

**EHV AC Transmission**

Properties of bundled conductors - Surface voltage gradient on single and multi-conductor bundles - Corona effects - Power loss - Charge voltage diagram with Corona - Noise generation and their characteristics - Corona pulses, their generation and properties (qualitative study only) - Problems of EHV AC transmission at power frequency - Voltage control using compensators - Cascade connection of components.

**HVDC Transmission**

Analysis of DC transmission systems - Harmonics on AC and DC sides and filters for their suppression - Multi terminal D.C. Transmission systems; application, types, control and protection - Parallel operation of A.C. and D.C. transmission - Voltage stability in AC/DC systems - Modern developments in HVDC transmission - HVDC systems simulation.

**EHV lines and Cable Transmission**


**Testing, Overvoltage and Design of EHV Systems**


**REFERENCES:**

COURSE OUTCOMES:
Students will be able to
1. Understand the basic comparison of HVAC and HVDC for overhead and underground transmission system.
2. Derive the surface voltage gradient of single, double, and more than three conductor bundles and expression for a charge voltage diagram for evaluation of the power loss.
3. Analyze the DC transmission system in case of harmonics and discuss about the multi terminal DC transmission system.
4. Gain Knowledge about the design factors about lines and cables.
5. Learn about protection of HVAC and HVDC systems.

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COURSE OBJECTIVES:

- To educate the students significantly the concept of wind energy system.
- To prepare students to excel in research in wind energy system.
- To impart knowledge in solar energy system through global, rigorous post graduate education.
- To make the students to understand the new developments in solar energy system.
- To provide students with a solid foundation in mathematical, scientific and engineering fundamentals required to solve wind and solar energy problems.
- To train students with good scientific and engineering knowledge so as to comprehend, analyze, design, and create novel products and solutions for the real time problems.

Introduction
Wind resources – Nature and occurrence of wind – Power in the wind – Wind characteristics – Principles of wind energy conversions – Components of wind energy conversion system (WECS) – Classification of WECS – Advantages and disadvantages of WECS.
Wind Electric Generators


Wind Power Management

Wind energy storage – Storage systems – Wind farms and grid connections – Grid related problems on absorption of wind – Grid interfacing arrangement – Simulation of wind energy conversion system – Operation, Control and technical issues of wind generated electrical energy – Inter connected operation – Hybrid systems.

Introduction to Solar Energy and Its Prospects


Photo Voltaic System


A basic photo voltaic system for power generation – Advantages and disadvantages of photo voltaic solar energy conversion –Application of solar photo voltaic system – components of PV systems- Design of PV systems- Power conditioning and storage arrangement – Maximum power point tracking - Introduction to string inverters.

REFERENCES:

COURSE OUTCOMES:

Students will be able to
1. Understand the basic concept of wind energy conversion system.
2. Impart knowledge on wind electric generators in power systems.
3. Develop skill to control the wind generated electrical energy.
4. Train to know about the various types of solar collectors and its storage.
5. Understand the basic knowledge of photo voltaic system.
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### COURSE OBJECTIVES:

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

  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

  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

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

### REFERENCES:

COURSE OUTCOMES:

Students will be able to
1. Gain Knowledge of power distribution system
2. Study of Distribution automation and its application in practice
3. Learn SCADA system
4. Know the optimal placement of switching devices
5. Learn about AI techniques applied to power systems

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COURSE OBJECTIVES:

- To bring out the need for operating the power system in a viable and affordable manner
- To get an overview of power system operation and control
- To emphasize on the development of algorithms suitable for efficient operation
- To point out the significance of unit commitment and hydro-thermal schedule
- To address the problems associated with interconnected networks, the need for maintaining co-ordinated actions and the use of controllers for smooth and satisfactory operation of power systems

Economic Operation of Power Systems

Optimal Power Flow


Hydrothermal Scheduling

Hydrothermal Coordination - hydroelectric plant models - Scheduling Problems - Short Term Hydro Thermal Scheduling - lambda-gamma method with losses - gradient approach - hydro units in series - pumped storage hydro scheduling - dynamic programming and linear programming base solution methods.

Unit Commitment


Automatic Generation Control

Basic generator control loops - speed governing system - isochronous governor - governors with speed-droop characteristics - speed regulation - load sharing by parallel generating units - control of power output of generating units - turbine model - generator load model - block diagram of an isolated power system - state space representation - fundamentals of automatic generation control - steady state analysis - concept of control area - AGC of two area interconnected power system - tie-line frequency bias control - bias for selection of bias factor - generation rate constraint - discrete integral controller for AGC.

REFERENCES:

COURSE OUTCOMES:
Students will be able to
1. Gain knowledge on economic load dispatch.
2. Solve optimal power flow problems using various solution methods.
3. Get exposed to hydro thermal scheduling.
4. Understand the significance of Unit Commitment
5. Focus on control aspects in power systems.
## Mapping with Programme Outcomes

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### COURSE OBJECTIVES:

- To familiarize about forms of Energy
- To learn the present energy scenario and the need for energy management
- To understand energy management concepts and various methods
- To understand the basic components of energy audit
- To learn the various techniques of energy audit and usage of instruments
- To analyse and report the outcome of energy audit

### Introduction


### Energy Management


### Energy Audit

Definition, Energy audit- need, Types of energy audit - Preliminary audit, detailed audit, methodology and approach - Instruments for energy audit - Energy saving calculations.

### Energy Assessment and Reporting


### Energy Economics

Energy economics - Depreciation - Financial analysis techniques - Discount rate, Payback period, Internal rate of return, Net present value, Life cycle costing –
Energy Service Company (ESCO) concept – Cumulative Sum (CUSUM) technique - ESCO contracts.

REFERENCES:

COURSE OUTCOMES:
Students will be able to
1. Understand and to acquire fundamental knowledge in the field of energy and on both the conventional and non-conventional energy technologies.
2. Acquire the capability and skills needed for the energy monitoring, auditing and management of Energy.
4. Understand the need for energy audit, types and Instruments for energy audit.
5. Capable for Report writing and presentation of energy audit.

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

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.

Introduction to electric components used in hybrid and electric vehicles - Configuration and control of DC Motor drives - Configuration and control of Permanent Magnet Motor drives - Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

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.

Introduction to energy management and their strategies used in hybrid and electric vehicles - Classification of different energy management strategies - Comparison of different energy management strategies - Implementation issues of energy strategies.

REFERENCES:

COURSE OUTCOMES:
Students will be able to:
1. Acquire knowledge about fundamental concepts, principles, analysis and design of hybrid and electric vehicles.
2. Learn about electric drives in vehicles / traction.
3. Familiarize with the different electrical components used in hybrid and electric vehicles.
4. Understand the models to describe hybrid vehicles and their performance.
5. Understand the different strategies related to energy storage systems.


### COURSE OBJECTIVES:

- To introduce the concept of restructuring the power industry and market models
- To impart knowledge on fundamental concepts of congestion management
- To know about transmission pricing
- To understand the concepts of different ancillary services
- To illustrate various power sector in India

### Introduction to Restructuring of Power Industry


### Transmission Congestion Management


### Transmission Open Access and Pricing


### Ancillary Services Management

General Description of some Ancillary Services—Frequency control—Reserves services—Reactive power and voltage control service—Black start capability service—
Scheduling and Dispatch Services- Synchronous Generators as Ancillary Service Providers – co-optimization of energy and reserve services.

Reforms in Indian Power Sector


REFERENCES:

COURSE OUTCOMES:
Students will be able to
1. Understand the difference between traditional and restructured power systems
2. Acquire knowledge about various congestion management methods.
3. Familiarize with electricity pricing and transmission open access.
4. Get knowledge about significant ancillary services.
5. Learn about the reform initiatives undertaken in Indian power sector.

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COURSE OBJECTIVES:

- To understand what is meant by SCADA and its functions
- To know SCADA communication
- To get an insight into its application

Introduction to SCADA-Data acquisition systems-Evolution of SCADA-Communication technologies- Monitoring and supervisory functions-SCADA applications in Utility –Automation

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

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

SCADA Communication-various industrial communication technologies - wired and wireless methods and fiber optics-Open standard communication protocols

SCADA Applications: Utility applications-Transmission and Distribution sector operations, monitoring, analysis and improvement-Industries - oil, gas and water-Case studies, Implementation, Simulation Exercises

REFERENCES:


COURSE OUTCOMES:

Students will be able to:

1. Describe the basic tasks of Supervisory Control Systems (SCADA) as well as their typical applications.
2. Acquire knowledge about SCADA architecture, various advantages and disadvantages of each system.
4. To learn about SCADA system components: remote terminal units, PLCs, intelligent electronic devices, HMI systems, SCADA server.
5. Learn and understand about SCADA applications in transmission and distribution sector, industries etc.,
### Mapping with Programme Outcomes

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### COURSE OBJECTIVES:

- Understand the different power quality issues to be addressed
- Understand the recommended practices by various standard bodies like IEEE, IEC, etc. on voltage & frequency, harmonics
- Understanding STATIC VAR Compensators


Harmonics-individual and total harmonic distortion RMS value of a harmonic waveform- Triplex harmonics-important harmonic introducing devices - SMPS-Three phase power converters - arcing devices saturable devices-harmonic distortion of fluorescent lamps-effect of power system harmonics on power system equipment and loads.

Modeling of networks and components under non-sinusoidal conditions transmission and distribution systems Shunt capacitors-transformers-electric machines-ground systems loads that cause power quality problems power quality problems created by drives and its impact on drive

Power factor improvement- Passive Compensation Passive Filtering, Harmonic Resonance - Impedance Scan Analysis- Active Power Factor Corrected Single Phase Front End, Control Methods for Single Phase APFC Three Phase APFC and Control Techniques, PFC Based on Bilateral Single Phase and Three Phase Converter

Static VAR compensators-SVC and STATCOM Active Harmonic Filtering-Shunt Injection - Filter for single phase, three-phase three-wire and three-phase four- wire systems d-q domain control of three phase shunt active filters uninterruptible power supplies constant voltage- Transformers series active power filtering techniques for harmonic cancellation and isolation- Dynamic Voltage Restorers for sag, swell and flicker problems. Grounding and wiring introduction NEC grounding
requirements-reasons for grounding typical grounding and wiring problems solutions to grounding and wiring problems

REFERENCES:

COURSE OUTCOMES:
Students will be able to:
1. Acquire knowledge about the harmonics, harmonic introducing devices and effect of harmonics on system equipment and loads
2. Develop analytical modeling skills needed for modeling and analysis of harmonics in networks and components
3. Introduce the active power factor correction based on static VAR compensators and its control techniques
4. Introduce the series and shunt active power filtering techniques for harmonics.
5. Find solutions to grounding and wiring problems

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COURSE OBJECTIVES:
- To give an insight to the students about the significance of soft computing techniques and artificial neural networks.
- To teach the importance, architecture, algorithm and application of artificial neural networks.
- To impart knowledge on fuzzy logic systems.
- To give exposure to genetic algorithm and swarm optimization methods.

Introduction and Artificial Neural Networks
Introduction of soft computing – Comparison of soft computing and hard computing – types and applications of soft computing techniques - Biological neural networks – Evolution of Neural Networks – Basic Models of Artificial Neural
Networks – Terminologies of ANNs – Learning and Training the neural network – McCulloch-Pitts neuron model- Perceptron Model – Back propagation network

**Associative Memory and Unsupervised Neural Networks**


**Fuzzy Logic System**


**Genetic Algorithm**


**Swarm Optimization**

Basic concept of Swarm intelligence - Ant colony optimization (ACO) - Particle swarm optimization (PSO) and Artificial Bee colony algorithm (ABC). Application of above algorithms in power system optimization problems.

**REFERENCES:**


**COURSE OUTCOMES:**

1. Understand the concept, architecture and algorithm of each AI technique
2. Familiarize with the application of various artificial neural networks.
3. Acquire knowledge about fuzzy logic systems.
4. Implement genetic algorithm for various power system optimization problems.
5. Get introduced to various swarm optimization methods.
Mapping with Programme Outcomes

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**POWER SYSTEM TRANSIENTS**

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**COURSE OBJECTIVES:**

- Learn the reasons for occurrence of transients in a power system
- Understand the change in parameters like voltage & frequency during transients
- To know about the lightning phenomenon and its effect on power system
  
  Fundamental circuit analysis of electrical transients-Laplace Transform method of solving simple Switching transients - Damping circuits – Abnormal switching transients, Three-phase circuits and transients - Computation of power system transients
  
  
  Interaction between lightning and power system-Influence of tower footing resistance and Earth Resistance-Switching: Short line or kilometric fault-Energizing transients – closing and-re-closing of lines-line dropping, load rejection – over voltages induced by faults
  
  Switching HVDC line travelling waves on transmission line-Circuits with distributed Parameters Wave Equation-Reflection, Refraction, Behavior of Travelling waves at the line terminations-Lattice Diagrams – Attenuation and Distortion-Multi-conductor system-and Velocity wave
  
  Insulation co-ordination: Principle of insulation co-ordination in Air Insulated substation (AIS) and Gas Insulated Substation (GIS) Co-ordination between insulation and protection level-Statistical approach- Protective devices-Protection of system against over voltages-lightning arresters –substation earthing

**REFERENCES:**


**COURSE OUTCOMES:**
Students will be able to:

1. Know about various transients that could occur in power system and their mathematical formulation
2. Design various protective devices in power system for protecting equipment and personnel
3. Coordinate the insulation of various equipment in power system
4. Model the power system for transient analysis
5. Understand the travelling wave phenomena

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**COURSE OBJECTIVES:**

- To learn the active and reactive power flow control in power system
- To understand the need for static compensators
- To develop the different control strategies used for compensation

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
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


Introduction to interline power flow controller - Modeling and analysis of FACTS - Controllers- Simulation of FACTS controllers- Power quality problems in distribution systems - harmonics, loads that create harmonics-modeling, harmonic -propagation, series and parallel resonances mitigation of harmonics-passive filters, active filtering – shunt , series and hybrid and their control

Voltage swells, sags, flicker, unbalance and mitigation of these problems by power line conditioners-IEEE standards on power quality.

REFERENCES:

COURSE OUTCOMES:
Students will be able to:
3. Develop analytical modeling skills needed for modeling and analysis of such Static VAR Systems.
4. Equip with basic procedure of FACTS controller Design.
5. Gain knowledge on IEEE standards on power quality.
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EEPSPEXX INDUSTRIAL LOAD MODELING AND CONTROL | L | T | P | C
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**COURSE OBJECTIVES:**

- To understand the energy demand scenario
- To understand the modeling of load and its ease to study load demand industrially
- To know Electricity pricing models
- Study Reactive power management in Industries


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

Reactive power management in industries-controls-power quality impacts-application of filters - Energy saving in industries- Cooling and heating loads

Load profiling-Modeling - Cool storage-Types - Control strategies - Optimal operation - Problem formulation - Case studies

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

**REFERENCES:**


COURSE OUTCOMES:
Students will be able to:
1. Know about load control techniques in industries and its application
2. Learn 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. Apply different energy saving opportunities in industries
5. Understand the concepts through case studies

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COURSE OBJECTIVES:
- To impart knowledge on basic design concept.
- To solve linear and non-linear state equations.
- To understand about the role of controllability and Observability.
- To educate on stability analysis.
- To learn about modal concepts.
- To get familiarised with design of state and output feedback controllers.

Basics of Design Concepts

State Variable Representation
**Controllability and Observability**

Effect of sampling on controllability, Observability, State and output feedback observers, Estimated state feedback-Stabilizability and Detectability-Test for Continuous time Systems- Time varying and Time invariant case- Reducibility-System Realizations.

**Stability Analysis**


**Modal Control**

Introduction-Controllable and Observable Companion Forms-SISO and MIMO Systems-The Effect of State Feedback on Controllability and Observability-Pole Placement by State Feedback for both SISO and MIMO Systems-Full Order and Reduced Order Observers.

**REFERENCES:**


**COURSE OUTCOMES:**

1. Learn the basic design concepts with examples.
2. Gain an enhanced knowledge about state space analysis.
3. Attain knowledge about time varying and time invariant feedback concepts.
4. Acquire conceptual knowledge about stability analysis.
5. Familiarize about modal control concepts.

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COURSE OBJECTIVES:

- Understand the role of business analytics within an organization.
- Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization.
- To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decisionmaking.
- To become familiar with processes needed to develop, report, and analyze business data.
- Use decision-making tools/Operations research techniques.
- Manage business process using analytical and management tools.
- Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace, etc.


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.


REFERENCES:

COURSE OUTCOMES:
Students will be able to
1. Demonstrate knowledge of data analytics.
2. Demonstrate the ability of think critically in making decisions based on data and deep analytics.
3. Demonstrate the ability to use technical skills in predicative and prescriptive modeling to support business decision-making.
4. Demonstrate the ability to translate data into clear, actionable insights.

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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.

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.


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, Electrical motors, Types of faults in machine tools and their general causes.
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

REFERENCES:

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

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

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

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

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

REFERENCES:

COURSE OUTCOMES:
Student should be able to
1. Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.
2. Students should able to apply the concept of non-linear programming
3. Students should be able to carry out sensitivity analysis.
4. Students should be able to model the real-world problem and simulate it.

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- Concepts in decision-making: relevant cost, differential cost, incremental cost, and opportunity cost.
- Objectives: costing system, inventory valuation, database creation, data provision for decision-making.

Project:
- Meaning
- Different types
- Why to manage
- Cost overruns centers
- Various stages of project execution: conception to commissioning
- Project execution as a 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 diagrams
- Project commissioning: mechanical and process

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

Total Quality Management and Theory of Constraints:
- Activity-Based Cost Management, Benchmarking, Balanced Score Card, and Value-Chain Analysis
- Budgetary Control, Flexible Budgets, Performance budgets, Zero-based budgets
- Measurement of Divisional profitability pricing decisions including transfer pricing


REFERENCES:
2. Charles T. Horngren and George Foster, Advanced Management Accounting, Pearson, 2007


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

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


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.

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.

REFERENCES:

AUDIT COURSES

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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 paperat very first-time submissionsyllabus.
Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness


Review of the Literature, Methods, Results, Discussion, Conclusions, the Final Check.

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

Skills that are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills that are needed when writing the conclusion.

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

REFERENCES:

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<tr>
<th>EEPSACXX</th>
<th>DISASTER MANAGEMENT</th>
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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.

Introduction

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

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

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.

Risk Assessment

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.

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<th>EEPSACXX</th>
<th>SANSKRIT FOR TECHNICAL KNOWLEDGE</th>
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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 the Sanskrit will be able to explode the huge knowledge from ancient literature.

REFERENCES:
1. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha - Vempati Kutumbashastri, Rashtriya Sanskrit Sansthanam, New Delhi Publication

COURSE OUTCOMES:
1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood.
3. Being a global language, will help to develop logic in students.

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<tr>
<th>EEPSACXX</th>
<th>VALUE EDUCATION</th>
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COURSE OBJECTIVES:
- Understand value of education and self-development
- Imbibe good values in students
- Let the should know about the importance of character


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

REFERENCES:
COURSE OUTCOMES

Students will be able to
2. Learn the importance of Human values
3. Developing the overall personality

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<th>EEPSACXX</th>
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COURSE OBJECTIVES:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- 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.
- 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.

History of Making of the Indian Constitution:

- History, Drafting Committee, (Composition & Working)

Philosophy of the Indian Constitution

- Preamble, Salient Features

Contours of Constitutional Rights & Duties


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.

Local Administration

- District’s Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.

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.
REFERENCES:
1. The Constitution of India, 1950 (Bare Act), Government Publication.

COURSE OUTCOMES:
Students will be able to:
1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. 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.

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.

Introduction and Methodology

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

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.

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.

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

COURSE OUTCOMES:
Students will be able to understand:
1. What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries.
2. What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners.
3. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.

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<th>EEPSACXX</th>
<th>STRESS MANAGEMENT BY YOGA</th>
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COURSE OBJECTIVES:
- To achieve overall health of body and mind
- To overcome stress

Definitions of Eight parts of yoga,(Ashtanga ) Yam and Niyam
1. Do’s and Don’t’s in life.
   i) Ahinsa, satya, astheya, bramhacharyaandaparigraha
   ii) Shaucha, santosh, tapa, swadhyay,ishwarpranidhan
2. Asan and Pranayam
   i) Various yoga poses and their benefits for mind & body
   ii) Regularization of breathing techniques and its effects-Types of pranayam

REFERENCES:
1. ‘Yogic Asanas for Group Tarining-Part-I” :Janardan Swami YogabhyasiMandal,Nagpur
2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, AdvaitaAshrama (Publication Department),Kolkata.

COURSE OUTCOMES:
Students will be able to:
1. Develop healthy mind in a healthy body thus improving social healthalso
2. Improve efficiency
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

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 (don’ts)
- Verses- 71,73,75,78 (do’s)

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.

Statements of basic knowledge. Shrimad Bhagwad Geeta:
- Chapter 2-Verses 56, 62, 68
- Chapter 12-Verses 13, 14, 15, 16,17, 18

Personality of Role model. Shrimad Bhagwad Geeta:
- Chapter 2-Verses 17, Chapter 3-Verses 36,37,42,
- Chapter 4-Verses 18,38,39
- Chapter 18 – Verses 37,38,63

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

COURSE OUTCOMES:
Students will be able to:
1. Study of Shrimad - Bhagwad- Geeta will help the student in developing his personality and achieve the highest goal in life
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity
3. Study of Neetishatakam will help in developing versatile personality of students