Vision of the Institution

To ignite the minds of the students through academic excellence so as to bring about social transformation and prosperity.

Mission of the Institution

- To expand the frontiers of knowledge through Quality Education.
- To provide valued added Research and Development.
- To embody a spirit of excellence in Teaching, Creativity, Scholarship and Outreach.
- To provide a platform for synergy of Academy, Industry and Community.
- To inculcate high standards of Ethical and Professional Behavior.

Vision of EEE Department

"Centre of Excellence in Education and Research in the field of Electrical and Electronics Engineering and to become the foremost academic department through its education and research programs"

Mission of EEE Department

- To develop innovative, efficient and proficient electrical engineers.
- To keep the curriculum industry friendly, with due regard to the University curriculum.
- To participate in large projects of National and International importance.
- To promote ethical and moral values among the students so as to make them emerge as responsible professionals.

Program Educational Objectives (PEOs)

PEO 1. To produce Electrical and Electronics Engineering graduates who have strong foundation in Mathematics, Sciences and Basic Engineering.

PEO 2. To provide intensive training in problem solving, laboratory skills and design skills to use modern engineering tools through higher education and research.

PEO 3. Ability to seek employment in a variety of engineering (or) engineering technology positions to specialize in specific areas of interest and work successfully in their chosen career aspirations.

PEO 4. To inculcate in students professional and ethical attitude, effective communication skills, teamwork skills, multidisciplinary approach, and an ability to relate engineering issues to broader social context through life-long learning.

Program Outcomes(POs) of EEE Department

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs) of EEE Department

PSO 1: The EEE program must demonstrate knowledge and hands-on competence in the application of electrical and electronics circuits in a rigorous mathematical

environment at or above the level of algebra and trigonometry.

PSO2: The EEE program must demonstrate that graduates can apply interdisciplinary project management techniques to electrical and electronics systems.

PSO 3: The EEE program must demonstrate that graduates can analyze, design and develop hardware and software for control systems, measurements, power electronics and power systems

S.No	Category	Sub. Code	Course Title	L	T	P	C	I	E	TM
1	PE		**Elective – V**	4	-	-	3	40	60	100
		EE3T0119	i.Demand side Energy Management							
		EE3T0219	ii.Power Quality and Custom Power Devices							
		EE3T0319	iii.High Voltage Testing Techniques							
2	OE		**Elective – VI**	4	-	-	3	40	60	100
		EE3T0419	i AI Techniques							
		EE3T0519	ii. Reactive Power Compensation&Management							
		EE3T0619	iii.Operations Research							
3		EE3D0119	Dissertation Phase-I	-	-	20	10	40	60	100
				8	**0**	**20**	**16**	**120**	**180**	**300**

II YEAR I SEMESTER ELECTRICAL POWER ENGINEERING
R19 SYLLABUS

BRANCH : EPE	II YEAR – I SEMESTER	REGULATION: R19		
SUB. CODE: EE3T0119		L	P	C
SUB.TITLE: DEMAND SIDE ENERGY MANAGEMENT (ELECTIVE – V)		4	0	3

Learning Objectives:

- To know the energy audit principles in power system.
- To know the energy economics associated with consumption of energy.
- To know the energy conservation in electric utility and industry.
- To know the lighting schemes and methods to conserve the energy.
- To understand the energy conservation aspect in space heating, ventilation, air Condition etc.

Unit-1 : Energy Audit and Energy management information systems: Energy audit: Definitions- Need-concepts-Types of energy audit; Energy management information systems: Introduction- Need-components-designing-using the system-identifying plant outages

Unit-2 : Energy Economics: Introduction-Cost benefit risk analysis-Payback period-Straight line depreciation-Sinking fund depreciation—Reducing balance depreciation-Net present value method-Internal rate of return method-Profitability index for benefit cost ratio

.

Unit-3 : Energy Conservation in Electric utilities and Industry: Electrical load management: Energy and load management devices-Conservation strategies; conservation in electric utilities and industry: Introduction-Energy conservation in utilities by improving load factor-Utility voltage regulation -Power factor improvement.

Energy –efficient electric motors: construction and technical features- life cycle-direct savings and payback analysis-efficiency factor or efficiency evaluation factor

Unit-4 : Electric Lighting: Introduction-Need for an energy management program-Building analysis-Modification of existing systems-Replacement of existing systems-priorities: Illumination requirement : Task lighting requirements-lighting levels-system modifications-non illumination modifications; System elements: light sources - characteristics of families of lamps-lamp substitution in an existing systems-selection of Higher efficiency lamps for a new system-Luminaries-ballasts-energy conservation in lighting.

Unit-5 : Space Heating ,Ventilation, Air-Conditioning(HVAC) and Water Heating: Introduction- Heating of buildings-Transfer of Heat-Space heating methods-Ventilation and air-conditioning- Insulation-Cooling load-Electric water heating systems-Energy conservation methods. Co-generation and storage: Combined cycle cogeneration-energy storage: pumped hydro schemes-compressed air energy storage(CAES)-storage batteries-superconducting magnetic energy storage (SMES).

Course Outcomes:

After completion of this course the students will be able to:

- Understand the principles and application of energy audit.
- Understand energy economics in utility systems.
- Understand the principle of energy conservation in lightning schemes.
- Apply energy audit principles in heating, ventilation and airconditioning etc.

Text Books :

1. Energy management Hand book by Wayne C.Turner,Johnwiley and sons publications
2. Electric Energy Utilization and Conservation by S C Tripath, TMH publishing company ltd.New Delhi

Reference Books :

1. Energy efficient electric motors selection and application by John C.Andreas
2. Hand book on Energy Audit and Management by AmitkumarTyagi,published by TERI(Tata energy research Institute)
3. Energy management by Paul W.O' Callaghan McGraw hill book company

BRANCH : EPE	II YEAR – I SEMESTER	REGULATION: R19		
SUB. CODE: EE3T0219		L	P	C
SUB.TITLE: POWER QUALITY AND CUSTOM POWER DEVICES (ELECTIVE – V)		4	0	3

Learning Objectives:

- To understand significance of power quality and power quality parameters.
- To know types of transient over voltages and protection of transient voltages.
- To understand harmonics, their effects, harmonic indices and harmonic minimization techniques.
- To understand long duration voltage variation and flicker
- To know power quality aspects in distributed generation.

Unit-1 Introduction

Overview of Power Quality - Concern about the Power Quality - General Classes of Power Quality Problems – Transients -Long-Duration Voltage Variations - Short-Duration Voltage Variations - Voltage Unbalance - Waveform Distortion - Voltage fluctuation - Power Frequency Variations - Power Quality Terms - Voltage Sags and Interruptions - Sources of Sags and Interruptions – Nonlinear loads.

Unit-2 Transient Over Voltages

Source of Transient Over Voltages - Principles of Over Voltage Protection - Devices for Over Voltage Protection - Utility Capacitor Switching Transients - Utility Lightning Protection - Load Switching Transient Problems - Computer Tools for Transient Analysis

Unit-3 Harmonic Distortion and solutions

Voltage vs. Current Distortion - Harmonics vs. Transients - Power System Quantities under Nonsinusoidal Conditions - Harmonic Indices – Sources of harmonics - Locating Sources of Harmonics – System Response Characteristics - Effects of Harmonic Distortion
Interharmonics Harmonic Solutions Harmonic Distortion Evaluation - Devices for Controlling Harmonic Distortion - Harmonic Filter Design - Standards on Harmonics

Unit- 4 Long Duration Voltage Variations

Principles of Regulating the Voltage - Device for Voltage Regulation - Utility Voltage Regulator Application - Capacitor for Voltage Regulation - End-user Capacitor Application - Regulating Utility Voltage with Distributed Resources – Flicker

Unit-5 Distributed Generation and Power Quality

Resurgence of Distributed Generation - DG Technologies - Interface to the Utility System - Power Quality Issues - Operating Conflicts - DG on Low Voltage Distribution Networks - Interconnection standards - Wiring and Grounding - Typical Wiring and Grounding Problems - Solution to Wiring and grounding Problems

Course Outcomes:

After completion of this course the students will be able to:

- Have the knowledge on causes of power quality, power quality parameters.

- Understand sources of transient over voltages and providing protection to transient over voltages.
- Understand effects of harmonics, sources of harmonics and harmonic minimization.
- Analyze long duration voltage variations and regulation of voltage variations.
- Describe power quality aspects in distributed generation and develop solutions to wiring and grounding problems.

Text Books:

1. Electrical Power Systems Quality, Dugan R C, McGranaghan M F, Santoso S, and Beaty H W, Second Edition, McGraw-Hill, 2002.
2. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M H J, First Edition, IEEE Press; 2000.
3. Guidebook on Custom Power Devices, Technical Report, Published by EPRI, Nov 2000.
4. Power Quality Enhancement Using Custom Power Devices – Power Electronics and Power Systems, Gerard Ledwich, ArindamGhosh, Kluwer Academic Publishers, 2002.

Reference Books :

1. Power Quality Primer, Kennedy B W, First Edition, McGraw-Hill, 2000.
2. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.
3. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad Reinhold, New York.
4. Power Quality c.shankaran, CRC Press, 2001.
5. Harmonics and Power Systems –Franciso C.DE LA Rosa-CRC Press (Taylor & Francis).
6. Power Quality in Power systems and Electrical Machines-EwaldF.fuchs, Mohammad A.S. Masoum-Elsevier
7. Power Quality, C. Shankaran, CRC Press, 2001.
8. Instantaneous Power Theory and Application to Power Conditioning, H. Akagiet.al., IEEE Press, 2007.
9. Custom Power Devices - An Introduction, ArindamGhosh and Gerard Ledwich, Springer, 2002.
10. A Review of Compensating Type Custom Power Devices for Power Quality Improvement, Yash Pal et.al., Joint International Conference on Power System Technology and IEEE Power India Conference, 2008. POWERCON 2008.

BRANCH : EPE	II YEAR – I SEMESTER	REGULATION: R19		
SUB. CODE: EE3T0319		L	P	C
SUB.TITLE: HIGH VOLTAGE TESTING TECHNIQUES (ELECTIVE – V)		4	0	3

Learning Objectives:

- To understand non destructive testing methods.
- To understand commercial and technical testing of different HV power applications.

Unit 1 :

Non Destructive Testing Techniques : Measurement of DC Resistivity – Dielectric loss and dielectric constant of insulating materials – Schering bridge method – Transformer ratio arm bridge for high voltage and high current applications – null detectors.

Unit 2 :

High Voltage Testing of Power Apparatus : Need for testing standards – Standards for porcelain/Glass insulators-Classification of porcelain/glass insulator tests – Tests for cap and pin porcelain/Glass insulators.

Unit 3 :

High voltage AC testing methods-Power frequency tests-Over voltage tests on insulators, Isolators, Circuit Breakers and power cables. Artificial Contamination Tests : Contamination flashover phenomena-Contamination Severity-Artificial contamination tests- Laboratory Testing versus in-Service Performance-Case study

Unit 4 :

Impulse Testing : Impulse testing of transformers, insulators, Surge diverters, Bushings, cables,circuit breakers.

Unit 5 :

Partial Discharge Measurement : PD equivalent model-PD currents-PD measuring circuits-Straight and balanced detectors-Location and estimation of PD in power apparatus.PD measurement by non electrical methods-Calibration of PD detectors. RIV Measurements : Radio Interference – RIV – Measurement of RI and RIV in laboratories and in field. Different test arrangements and their limitations.

Course Outcomes:

After completion of this course the students will be able to:

- Understand different testing procedures on electrical a) Insulating materials

b) Insulation Systems. c) Power apparatus.

- Learn the different testing techniques adopted on electrical power apparatus.

Text Books :

1. High Voltage Engineering – by E.KUFFEL and W.S.ZAENGL, Pergamon press, Oxford 1984.
2. High Voltage Engineering – by M.S.Naidu and V.Kamaraju, Tata McGraw Hill Publishing Company Limited, New Delhi – 2001

Reference Books :

1. Discharge Detection in H.V. Equipment – by KREUGER, F.H. Haywood London – 1964.
2. Hyltencavallius. N. High voltage laboratory planning Emile Haefely &Co. Ltd. Based Switzerland 1988.
3. Ryan H.M. and Whiskand: design and operation perspective of British UHV Lab IEE pre 133 H.V. Testing Techniques Halfly.

BRANCH : EPE	II YEAR – I SEMESTER	REGULATION: R19		
SUB. CODE: EE3T0419		L	P	C
SUB. TITLE: ARTIFICIAL INTELLIGENCE TECHNIQUES (ELECTIVE-VI)		4	0	3

Learning Objectives:

- To have knowledge on concept of neural network.
- To know different types of neural networks and training algorithms.
- To understand the concept of genetic algorithm and its application in optimization.
- To have the knowledge on fuzzy logic and design of fuzzy logic controllers.
- To know the applications of AI Techniques in electrical engineering.

Unit – 1: Introduction to Neural Networks

Introduction, Humans and Computers, Biological Neural Networks, Historical development of neural network, Terminology and Topology, Biological and artificial neuron models, Basic learning laws.

Unit- 2:Feed Forward Neural Networks

Introduction, Perceptron models: Discrete, continuous and multi-category, Training algorithms: Discrete and Continuous Perceptron Networks, Perceptron convergence theorem, Limitations and applications of the Perceptron model, Generalized delta learning rule, Feedforward recall and error back propagation training-Radial basis function algorithms-Hope field networks

Unit -3: Genetic algorithms &Modelling-Introduction-encoding-fitness function-reproduction operators-genetic operators-cross over and mutation-generational cycle-convergence of genetic algorithm

UNIT – 4:Classical and Fuzzy Sets

Introduction to classical sets - properties, operations and relations; Fuzzy sets, membership,Uncertainty, operations, properties, fuzzy relations, cardinalities, membership functions.Fuzzy Logic System Components-Fuzzification, Membership value assignment, development of rule base and decision making system, defuzzification to crisp sets, defuzzification methods.

UNIT-5: Application of AI Techniques: Design of PI controller for speed control of DC motor using neural networks and fuzzy logic-PWM Controllers -Selected harmonic elimination PWMSpace vector PWM using neural network.

Course Outcomes:

After completion of this course the students will be able to:

- Understand neural networks and analyze different types of neural networks.
- Design training algorithms for neural networks.
- Develop algorithms using genetic algorithm for optimization.
- Analyze and design fuzzy logic systems.
- Apply AI Techniques in electrical engineering.

Text Books :

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Pai – PHI Publication.

Reference Books:

1. Introduction to Artificial Neural Systems - Jacek M. Zuarda, Jaico Publishing House, 1997.
2. Modern Power Electronics and AC Drives –B.K.Bose-Pearson Publications.
3. Genetic Algorithms- David E Goldberg. Pearson publications.

BRANCH : EPE	II YEAR – I SEMESTER	REGULATION: R19		
SUB. CODE: EE3T0519		L	P	C
COURSE TITLE: REACTIVE POWER COMPENSATION & MANAGEMENT (ELECTIVE-VI)		4	0	3

Learning Objectives:

- To know the basic objectives of reactive power compensation.
- To know the types of compensation and their behavior.
- To know the mathematical modeling of reactive power compensating devices.
- To know the reactive power compensation has to be done at distribution side.
- To know the role of reactive power compensation at electric traction systems and Arc furnaces

Unit-1:Load Compensation

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

Unit-2: Reactive power compensation in transmission system:

Steady state -Uncompensated line – types of compensation – Passive shunt and series and dynamic shunt compensation – examples

Transient state - Characteristic time periods – passive shunt compensation – static compensations- series capacitor compensation –compensation using synchronous condensers – examples

Unit -3:Reactive power coordination:

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

Unit -4:Distribution side Reactive power Management:

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

User side reactive power management:

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

Unit-5: Reactive power management in electric traction systems and are furnaces:

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

Course Outcomes:

After completion of this course the students will be able to:

- Learn various load compensations.
- Obtain the mathematical model of reactive power compensating devices.
- Get application of reactive power compensation in electrical traction & arc furnaces.

Text Books:

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

Reference Books:

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

BRANCH : EPE	II YEAR – I SEMESTER	REGULATION: R19		
SUB. CODE: EE3T0619		L	P	C
COURSE TITLE: OPERATIONS RESEARCH (ELECTIVE-VI)		4	0	3

Learning Objectives:

- Students should know the dynamic programming to solve problems of discreet and continuous variables.
- Students should know the concept of non-linear programming
- Students should learn sensitivity analysis
- Student should knowl the real world problem and simulate it

Syllabus Contents:

Unit 1:

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

Unit 2

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

Unit 3:

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

Unit 4

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

Unit 5

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

Course Outcomes**:**

At the end of the course, the student should be able to

- Students should able to apply the dynamic programming to solve problems of discreet and continuous variables.
- Students should able to apply the concept of non-linear programming
- Students should able to carry out sensitivity analysis
- Student should able to model the real world problem and simulate it.

Text Books:

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008

Reference Books

1. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
2. Pannerselvam, Operations Research: Prentice Hall of India 2010
3. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010