Electrical & Electronics Engineering

(Detailed Syllabus of 8th Semester)

L: Lecture, T: Tutorial, P: Practical, C: Credit

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Examination and Marks				Credits L+(T+P)/2
				L	T	P	PRE***		ESE*	Total Marks	
							Mid Sem	TA**			
01	EEE4234	EEE	Electrical Drives	3	1	0	30	20	50	100	4
02	EEE4235(1-5)	EEE	Professional Elective –IV (EEE Annexure – IV)	3	1	0	30	20	50	100	4
03	OPE42(01-38)		Open Elective (OE Annexure – I)	3	0	0	30	20	50	100	3
04	EEE4236	EEE	Electrical Drives Lab	0	0	3	0	30	20	50	2
05	EEE4237	EEE	Major Project	0	0	10	0	50	50	100	7
06	PFD4208	Humanities	Professional Development	0	0	1	0	15	10	25	1
			TOTAL	**9**	**2**	**14**	**90**	**155**	**230**	**475**	**21**

*Teacher Assessment, **End Semester Examination, ***Progress Review Examination

Professional Elective -IV (EEE Annexure - IV)

Sr. No	Courses	Name of the Courses
1	EEE4235 (1)	Extra High Voltage AC & DC Transmission System
2	EEE4235 (2)	Sensors & Transducers
3	EEE4235 (3)	Advance Electrical & Electronics Measurement
4	EEE4235 (4)	Power System Economics & Control Techniques
5	EEE4235 (5)	Installation Maintenance & Testing of Electrical Equipment

Open Elective (OE Annexure – I)

Sr. No	Courses	Board of Studies	Name of the Courses
1	OPE4201	CIE	Disaster Management
2	OPE4202	CIE	Construction Management
3	OPE4203	CIE	Ecology and Sustainable Development
4	OPE4204	CSE	Bio Informatics
5	OPE4205	CSE	Software Technology
6	OPE4206	CSE	Internet & Web Technology
7	OPE4207	CSE	Business Analysis & Optimization
8	OPE4208	CSE	IT Industry Management

9	OPE4209	CSE	IT Industry Entrepreneurship
10	OPE4210	CSE	Evolutionary Computations
11	OPE4211	CSE	E-Commerce & Strategic IT
12	OPE4212	CSE	Decision Support & Executive Information
13	OPE4213	CSE	Information Theory & Control
14	OPE4214	EEE	Distributed Generation
15	OPE4215	EEE	Non-Conventional Energy Sources
16	OPE4216	EEE	Energy Auditing & Management
17	OPE4217	HSS	Innovation, Entrepreneurship & Leadership
18	OPE4218	HSS	Technology Management
19	OPE4219	HSS	Knowledge Entrepreneurship
20	OPE4220	HSS	Finance Management
21	OPE4221	HSS	Project Planning, Management & Evaluation
22	OPE4222	HSS	Intellectual Property Rights
23	OPE4223	HSS	Engineering Economics
24	OPE4224	HSS	Human Relations Management
25	OPE4225	HSS	Entrepreneurship Development
26	OPE4226	HSS	Personnel Management & Industrial Engineering
27	OPE4227	MEE	Safety Engineering
28	OPE4228	MEE	Value Engineering
29	OPE4229	MEE	Energy Conservation & Management
30	OPE4230	MEE	Thermal Treatment of Metal and alloys
31	OPE4231	MEE	Simulation of Physical Processes
32	OPE4232	MEE	TQM and Reliability Engineering
33	OPE4233	MEE	Non Traditional Machining Techniques
34	OPE4234	MME	Nanotechnology
35	OPE4235	MME	Introduction to Nano-Technology applications
36	OPE4236	MME	Material Characterization
37	OPE4237	MME	Materials Management
38	OPE4238	MME	Manufacturing Strategies

Semester: VIII **Branch: Electrical and Electronics Engineering**
Subject: Electric Drives **Code: EEE4234**

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Course Description:

The course deals with the variable-speed drives and motion control systems which are used in many industrial processes such as in conveyors, machine tools, pumps, compressors, mining drives, electric vehicles, ship propulsion, wind energy systems, aircraft actuators, servo drives and automation systems, to name a few. The course stresses the basic understanding of characteristic of machines driven from appropriate power electronic converters and controllers. Steady-state torque-speed characteristics of drives driven by power electronic converters, representation of drive dynamics, and design drive control systems will be covered.

Course Objective:

The course aims to impart the knowledge and skills about the following to the students:

1. Introduction to different types of drives and applications in various industries.
2. To know the characteristics of various motors and loads.
3. To gain the knowledge about operation of dc motor speed control using converters and choppers.
4. To understand the modes of operation of a drive in various applications.
5. To enable the students, identify the need and choice of various drives.
6. To acquire the knowledge of different speed control methods in ac motors using thyristor based control schemes.

Syllabus:

UNIT-1: Fundamentals of Electric Drives: Electric Drive and its parts, advantages of electric drives, Selection of electric drives, classification of electric drives, Fundamental of torque equations, Speed-torque conventions and multi-quadrant operations, constant torque and constant power operation.

UNIT-2: Dynamics of Electric Drives:

Load torque: Components, nature, classification and examples, Dynamics of motor-load combination, Steady state stability of electric drives, Transient stability of electric drives.

Selection of Motor Power rating: Thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty. Load equalization

UNIT-3: Control of Electric Drives:

Control of Electric Drives: Modes of operation, Speed control, Close loop control of drives, Purpose and types of electric braking, braking of DC, three phase induction and synchronous motors

Dynamics During Starting and Braking:

Calculation of acceleration, time and energy loss during starting of dc shunt and three phase induction motors, methods of reducing energy loss during starting. Energy relations during braking, dynamics during braking

UNIT-4: Power Electronic Control of DC Drives:

Single phase and three phase controlled converter fed separately excited dc motor drives (continuous conduction only), dual converter fed separately excited dc motor drive, rectifier control of dc series motor. Supply harmonics, power factor and ripples in motor current, Chopper control of separately excited dc motor and dc series motor.

UNIT-5: Power Electronic Control of AC Drives:

Three Phase induction Motor Drive: Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cyclo-converter based) static rotor resistance and slip power recovery control schemes.

Three Phase Synchronous motor: Self controlled scheme

Special Drives: Switched Reluctance motor, Brushless dc motor. Selection of motor for particular applications

Text Books:

1. Fundamentals of Electric Drives - G.K. Dubey -Narosa publishing House.
2. Modern Power Electronics and AC Drives- B.K. Bose, Prentice Hall

Reference Books:

1. Electric Drives, - M. Chilkin - Mir Publishers, Moscow.
2. Fundamentals of Electric Drives- Mohammed A. El-Sharkawi- Thomson Asia, Pvt. Ltd. Singapore.
3. Electric Drives- N.K. De and Prashant K. Sen- Prentice Hall of India Ltd.
4. Electric Drives: Concepts and Applications- V. Subrahmanyam- Tata McGraw Hill
5. A First Course on Electric Drives- S.K. Pillai- New Age International.
6. Fundamental of Industrial Drives- B.N. Sarkar -Prentice Hall of India Ltd.

Course Outcomes:

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

1. Conceptualize the basic drive system and analyze different types of load.
2. Analyze the motor behavior during starting & braking.
3. Develop control circuitry and devices for control of motor.
4. Estimate the motor rating for different conditions of load.
5. Design the convertor circuits for control purpose along with different configurations.
6. Use convertor control to drive on the basis of energy efficiency.

Semester: VIII Branch: Electrical and Electronics Engineering
Subject: EHV AC & DC Transmission System Code: EEE4235 (1)

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Course Description:

The subject curriculum focuses on introduction to various AC and DC transmission systems. It focuses on the advantages of EHV AC transmission systems. Students would also acquire knowledge about HVDC Transmission systems. This course gives idea about modern trends in HVDC Transmission and its application, understanding about the overvoltage and its effects on power system. In addition, complete analysis of harmonics and basis of protection for HVDC Systems is also covered.

Course Objectives:

The course aims to impart the knowledge and skills about the following to the students:

1. EHV ac-dc transmission system components.
2. Fundamentals of ac-dc links.
3. Converters operation and their dynamic characteristics.

Syllabus:

UNIT-1: Introduction to EHV Transmission and Comparison of AC and DC Transmission Systems: Parameters of EHV Lines, Resistance of conductors, Bundle conductors, Inductance of EHV Line configurations, line capacitance, Sequence Inductance and capacitance, Line parameters for modes of propagation, resistance and Inductance of Ground returns

UNIT-2: Over voltage in EHV systems caused by switching operations:

Origin of over voltage and their types, Short circuit current and Recovery voltage in the circuit breaker, over voltage caused by interruption of inductive current, Interruption of capacitive currents, Calculation of switching surges, single phase equivalents, distributed parameter of line, generalized equations for single phase representation, Generalized equation of three phase systems, Inverse Fourier transform for the general case, Reduction of switching surges on EHV systems.

UNIT-3: H.V.D.C. Transmission:

General considerations, evolution of HVDC, Comparison between AC and DC transmissions, Power Handling Capabilities of HVDC Lines, Basic Conversion principles, Static converter configuration.

UNIT-4: HVDC Link:

Types of HVDC links, Control of HVDC link, Converter control characteristics, Firing angle control and extinction angle control, Applications of HVDC transmission, Power modulation and power control of HVDC lines, Multi-terminal DC links and systems, Series, parallel and series-parallel systems, their operation and control.

UNIT-5: Transient over voltages & Harmonics in HVDC systems:

Over voltages due to disturbances on DC side, over voltages due to DC and AC side line faults, introduction to harmonics, generation of harmonics, design of AC filters, DC filters, carrier frequency and RI noise.

Text Books:

1. EHV AC & HVDC Transmission Systems - Rao S (Khanna Pub.)
2. HVDC Power Transmission Systems – Padiyar K.R (New age International Ltd.).

Reference Books:

1. EHVAC Transmission Engineering – Begemudre R.D (Willy Eastern Ltd.).
2. High voltage direct current transmission, Arrilaga J., (Peter Pereginver Ltd London, U.K.1983)
3. Direct current transmission-vol.1, Kimbark, E.W., (Wiley Interscience, New York, 1971).

Course Outcomes:

After completion of this course module, students will able to:

1. Apply the concept of EHV AC & DC transmission.
2. Analyze the working of converters.
3. Analyze the harmonics generation
4. Design of AC filters – DC filters to mitigate the harmonics.

Semester: VIII Branch: Electrical and Electronics Engineering
Subject: Sensors and Transducers Code: EEE4235 (2)

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Course Description:

Sensors and Transducers are an important ingredient for any industry. They provide information from the real world in the form of different signals. This course is therefore designed to deal with different kinds of sensors and transducers which are involved in any industrial setup.

Course Objectives:

1. To make students familiar with the constructions and working principle of different types of sensors and transducers.
2. To make students aware about the measuring instruments and the methods of measurement and the use of different transducers.

Syllabus

UNIT-1: Mechanical and Electromechanical sensors

Definition, principles of sensing and classification. Resistive (potentiometric) type sensor, Strain Gauges, gauge factor, variation with temperature, Inductive sensors: common types- reluctance change type, mutual inductance change type, transformer action type, Ferromagnetic plunger type, proximity measurement.

LVDT: Construction, materials, input-output relationship, I/O curve, discussion.

UNIT-2: Capacitive, Piezoelectric and Tachometric sensors:

Capacitive sensors: types, calculation of sensitivities, proximity measurement, Piezoelectric elements sensors, Stretched Diaphragm type

Tachometers – Stroboscopes, Encoders, seismic accelerometer, Measurement of vibration.

UNIT-3: Industrial Weighing Systems and Thermal Sensors

Industrial weighing systems : Link–lever mechanism, Load cells – pneumatic, piezoelectric, elastic and magneto-elastic types - their mounting, pressductor, different

designs of weighing systems, conveyors type, weigh feeder type.

Thermal sensors: Resistance change type, Thermister, Thermo-emf sensors, Thermocouple.

UNIT-4: Magnetic Sensors

Magnetic sensors: Sensors based on Villari effect for assessment of force, torque, rpm meters, proximity measurement. Hall effect and Hall drive, performance characteristics. Geiger counters, Scintillation detectors

UNIT 5: Smart Sensors

Introduction to smart sensors, general architecture of smart sensor, Design of smart sensor, Applications: Optical sensor, infrared detector array, accelerometer, integrated multisensor.

Text Books:

1. Sensors and Transducers - D Patranabis (PHI, 2nd ed.)
2. Measurement Systems: Application and Design - E. A. Doebelin (Mc Graw Hill, New York)

Reference Books:

1. Instrument Transducers - H. K. P. Neubert (Oxford University Press, London)
2. A Course in Electronic Measurements and Instrumentation – A. K. Sawhney (Dhanpat Rai & Co. (P) Limited 2015)
3. Mechatronics: Electronic control systems in mechanical and electrical engineering – W. Boltan (Longman, Singapore, 1999)

Course Outcomes:

On completion of this course, the student will be able to accomplish the following competencies:

1. Converting a physical parameter into an electrical quantity by use of suitable transducers

2. Classify the transducers and explain with examples, including those for measurement of temperature, strain, motion, position and light

3. Selection of proper sensor comparing different standards and guidelines to make sensitive measurements of physical parameters like pressure, flow, acceleration, etc

4. Predict correctly the expected performance of various sensors

5. Locate different type of sensors used in real life applications and paraphrase their importance

Semester: VIII Branch: Electrical and Electronics Engineering
Subject: Advance Electrical & Electronics Measurements Code: EEE4235 (3)
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Course Description:

The subject curriculum focuses on introduction to various measuring instruments for electrical & electronics measurements. The syllabus covers all advanced measuring instruments. The subject covers the analog and digital measurements methods. The syllabus deals with the different types of transducers, recorders, PLC systems. The topics to be covered are data acquisition systems, PLC module, PLC programming & its functions

Course Objectives:

On completion of the course, the students would be skilled enough to work with the following points

1. To understand the concept of Current transformer and Potential transformer.
2. To provide students the fundamental knowledge about the error presents in instruments.
3. To provide students with the fundamental knowledge of different types of Transducer and their application.
4. To provide students with the fundamental knowledge about the PLC and their programming.

Syllabus:

UNIT-1: Philosophy of Measurement

Accuracy & Precision, errors in measurement, "types of measuring Instruments with brief detail.Errors in measurement, general and statistical analysis of errors, Instrument transformers, errors of CTs and PTs, methods of reduction of errors of instrument transformers, Testing of CTs (Absolute and Silabee's methods), Testing of PTs: Absolute and method using wattmeter.

UNIT-2: Passive and Active Electrical Transducers

Resistive, capacitive, inductive, piezoelectric, photovoltaic, Hall effect transducers, selection of transducers, transducers characteristics, semiconductor photo-diode, photo transistor, frequency generating transducers, pressure inductive transducers,

LVDT, differential output transducer, thermistor, strain gauge, measurement of angular and linear velocity using electrical transducers, reluctance pulse pick-ups, AC tacho-generators.

UNIT-3: Analog & Digital measurement of Electrical Quantities

Review of various instruments for measurement of voltage and current Electro dynamo Meter and induction wattmeter's Measurement of power in single phase and –three phase Systems, errors and remedies in wattmeter and, energy meter, instrument transformers And their application in theextension of instrument range, introduction to measurement of Speed and frequency.

Digital Measurement of Electrical Quantities:Concept of digital measurement, digital measurement of voltage, current, power, power factor and frequency: power analyzer, harmonics analyzer.

UNIT-4: Data Acquisition System and Recorders:

Introduction of DAS, Objective of DAS, Signal conditioning of inputs, single and multi-channel DAS, Computer based DAS, Sample and hold, Multiplexing, D/A, A/D conversion general description of Data loggers, Digital transducers, optical encoders, resistive digital encoders, shaft encoders. Recorders: Introduction, Strip chart recorders, General description of XY recorders, galvanometer type recorders, potentiometric recorders.

UNIT-5: Basic of PLC, Programming and Functions:

Basic ladder diagram, General PLC Programming Procedure, Devices to which PLC Input and Output Modules are connected.Programming On-Off inputs to produce On-Off outputs, Relation of Digital Gate Logic to Contact / Coil Logic, Creating Ladder diagrams from process control descriptions. Basic PLC Functions, Register Basics, PLC Time Functions, PLC Counter Functions.

Text Books:

1. Electronic Measurements and Instrumentation: K. Lal Kishore, Pearson.
2. Electrical and Electronics Measurements and Instrumentation: Purkait, B Biswas, S. Das and C. Koley, McGraw hill.

Reference Book:

1. E.W. Golding, & F.C. Widdis, Electrical measurement & Measuring Instruments, A.H. Whealer& Co. Pvt. Ltd., India
2. A.K. Sawhney, Electrical & Electronic Measurement & Instrumentation, Dhanpat Rai& Sons, India.
3. W.D. Cooper, Electronic Instrumentation and Measurement technique, prentice hall.

Course Outcomes:

After completion of this course module, students will able to:

1. Select proper Transducer for measurement of various Electrical quantities.
2. Find errors and calibrate the instruments.
3. Write programs for different processes using PLC.

Semester: VIII Branch: Electrical and Electronics Engineering
Subject: Power System Economics & Control Techniques Code: EEE4235 (4)

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Course Description:

Unlike the knowledge of conventional operation of power systems, understanding the restructured power systems requires basic knowledge of electrical engineering, power systems, and also the economics. This course is intended to provide a comprehensive treatment towards understanding of the new dimensions associated with the power systems. The course will initially bring out the differences between the conventional power system operation and the restructured one. Before tackling taxing issues involving techno-commercial solutions, the course will prepare a background with fundamentals of microeconomics. The design of power markets and market architectural aspects will be discussed next. Efficient pricing of transmission network usage is a must to bring economic efficiency in the power market operation. These issues will follow next. There will be separate modules on Genco bidding strategies and market power with mitigation techniques.

Course Objectives:

1. To introduce the restructuring of power industry and market models.
2. To impart knowledge on fundamental concepts of congestion management.
3. To analyze the concepts of location wise marginal pricing and financial transmission rights.
4. To illustrate about various power sectors in India

Syllabus:

UNIT-1: Introduction to restructuring of power industry and Fundamental of Economics

Introduction, Reasons for restructuring / deregulation of power industry, Understanding the restructuring process, Introduction to issues involved in deregulation, Reasons and objectives of deregulation of various power systems across the world. Consumer behaviour, Supplier behaviour, Market equilibrium, Short-run and Long-run costs, Various costs of production, Relationship between short-run and long-run average costs.

UNIT-2: The Philosophy of Market Models and Transmission Congestion Management

Introduction. Market models based on contractual arrangements, Comparison of various market models, Electricity vis-à-vis other commodities, Market architecture.

Transmission Congestion Management: Introduction, Classification of congestion management methods, Calculation of ATC, Non-market methods, Market based methods, Nodal pricing, Inter-zonal Intra-zonal congestion management, Price area congestion management.

UNIT-3: Pricing of transmission network usage and loss allocation

Introduction to transmission pricing, Principles of transmission pricing, Classification of transmission pricing methods, Rolled-in transmission pricing methods, Marginal transmission pricing paradigm Composite pricing paradigm, Merits and de-merits of different paradigms, Debated issues in transmission pricing, Introduction to loss allocation, Classification of loss allocation methods.

UNIT-4: Locational Marginal Prices (LMP) and Financial Transmission Rights (FTR)

Fundamentals of locational marginal pricing, Lossless DCOPF model for LMP calculation, Loss compensated DCOPF model for LMP calculation, ACOPF model for LMP calculation. Introduction to Financial Transmission Rights, Risk Hedging Functionality Of financial Transmission Rights, Simultaneous feasibility test and revenue adequacy, FTR issuance process, Treatment of revenue shortfall, Secondary trading of FTRs, Flow Gate rights, FTR and market power.

UNIT-5: Market power and generators bidding

Attributes of a perfectly competitive market, The firm's supply decision under perfect competition, Imperfect competition Market power, Financial markets associated with electricity markets, Introduction to optimal bidding by a generator company, Optimal bidding methods.

Text Books:

1. NPTEL Cource-Restructured Power Systems, A. R. Abhyankar, S. A. Khaparde, Available: http://nptel.iitm.ac.in/courses/108101005/

2. Fundamentals of Power System economics Daniel Kirschen and Goran Strbac, John Wiley & Sons Ltd, 2004

Reference Books:

1. Regulation in infrastructure SeNices: Progress and the way forward - TERI, 2001
2. Paper "The real challenges in Power sector Restructuring: Instilling Public Control Through TApn, Prayas Energy Group, Energy for Sustainable Development, September 2001, www.DravaSDune.org
3. Privatization or Democratization The Key to the Crises in the Electricity Sector - The Case of Maharashtra 2002, www.prayaspune.org
4. Maharashtra Electricity Regulatory Commission Regulations and Orders – www.mercindia.com
5. Various publications, reports and presentations by Prayas, Energy Group, Pune
6. Central Electricity Regulatory Commission, Regulations and Orders - www.cercind.ora
7. Electricity Act 2003 and National Policies - www.Dowermin.nic.in
8. Sally Hunt, "Making Competition Work in Electricity, 2002, John Wiley Inc
9. Electric Utility Planning and Regulation, Edward Kahn, American Council for Energy Efficient Economy
10. Market Operations in Electric Power Systems Forecasting, Scheduling and Risk Management.
11. Making competition work in electricity Sally Hunt, John Wiley & Sons, Inc., 2002
12. Power system restructuring and deregulation by Loi Lei Lai Wiley India

Course Outcomes:

After completion of this course module, students will able to:

1. This course is intended to provide a comprehensive treatment towards understanding of the new dimensions associated with the power systems.
2. The course will bring out the differences between the conventional power system operation and the restructured one. The course will prepare a background with fundamentals of microeconomics.
3. In this course the design of power markets and market architectural aspects, the changes in operational aspects with new operational challenges like congestion management and ancillary service management will be elaborated.
4. One of the outcomes of the course is also efficient pricing of transmission network usage operation and Genco bidding strategies and market power with mitigation techniques.

Semester: VIII Branch: Electrical and Electronics Engineering
Subject: Installation Maintenance & Testing of Electrical Equipment
Code: EEE4235 (5)

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Course Description:

Introduction to testing and maintenance strategies, DC and AC testing of insulation of electrical equipment, Testing, commissioning, and maintenance of rotating machines, Testing, commissioning and maintenance of transformer, Trouble shooting of Switchgear, Circuit Breaker of equipments.

Course Objectives:

1. To perform testing of various electrical equipment as per standard procedure and analyze results
2. To understand the process of commissioning
3. To appreciate and evaluate various maintenance methods / techniques
4. To suggest the remedial action to improve life of electrical equipment

Syllabus:

UNIT -1: Overview of Site Management, Electrical Safety

Introduction to Site activities; Civil works, Erection, Testing & Commissioning, Operation and Maintenance, Type and Scope of Maintenance, Advantages of programmed preventive maintenance, Safety management, Electrical shocks, Recommended safety precautions against electrical shocks in LV and HV installations, Safety procedure during commissioning phase and Operation & maintenance phase.

UNIT -2: Transformer I.M.T.

Important steps in maintenance of power transformer, maintenance schedule for attended and unattended transformer, causes of troubles and failure of power transformer, Dispatch and shipping, inspection, storage, procedure of filling oil in transformer tank, drying out, various commissioning tests on a power transformer, typical maintenance schedule for transformer up to 1000 KVA and above 1000KVA, transformer oil filtration.

UNIT -3: Switchgear, Circuit Breaker I.M.T.

Introduction to switchgears and equipment's in substation and their functions, Type tests, routine test and commissioning tests, high/low voltage ac circuit breakers (Air, Oil, Vacuum, SF6) possible troubles, causes and remedial actions for outdoor circuit breakers, maintenance of CB (Air, Oil, Vacuum, SF6), Trouble shooting of substation equipments.

UNIT -4: Rotating Machines I.M.T.

Standard designation for cooling and degree of protection, Installation and commissioning of introduction motor and rotating machines, drying out of electrical rotating machines, installation resistance measurements, Mechanical maintenance of rotating machines, Care, servicing and maintenance of motor, Troubles, causes, remedies and protective devices during respective abnormal condition in low voltage induction motor, Testing of induction motors.

UNIT -5: Hotline Maintenance

Meaning and advantages of hot-line maintenance. Special type non conducting materials used for preparing tools for Hot line maintenance, Tools, Various types of Hot- line operations, safety during Hot line maintenance.

Text Books:

1. Testing, commissioning, operation and maintenance of Electrical equipments – S. Rao, 6th Edn. Khanna Publishers.

2. Installation, commissioning & maintenance of Electrical Equipments - Tarlok Singh, S.K. Katariya & Sons

Reference Books:

1. Installation maintenance and testing vol. I & II B.V.S. Rao

2. Electrical Power Equipment maintenance& testing - Paul Gill, CRC Press

3. Electrical Equipment Handbook : Trouble Shooting & Maintenance- Philip Kiameh, Mc Graw Hill

Course Outcomes:

After learning the course, the students will be able to:

1. Undertake installation, commissioning and maintenance of various electric equipments.
2. Prepare maintenance schedule of different equipments & machines
3. Prepare trouble shooting chart for various electric equipments machines and domestic appliances
4. Prepare procedure of different types of earthings for different types of electrical installations
5. Familiar about electric safety regulations and rules during maintenance

Semester: VIII **Branch: Electrical and Electronics Engineering**
Subject: Distributed Generation **Code: OPE4214**

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Course Description:

The subject curriculum focuses on introduction to various distributed generation systems, micro grids, smart grids and their control. Technical topics are divided in three sections. The first section introduces microgrid components and discusses the main types of micro sources. The second sections focus on energy storage technologies. The third section includes system integration such as power electronics interfaces; dc and ac architectures; economics, operation, stabilization, and control; reliability aspects; grid interconnection, and microgrids as part of "smart" grids. This course also aims at preparing students to conduct research or helping them to improve their research skills.

Course Objectives:

1. To understand various distributed generation systems
2. To understand the micro grids and their control schemes
3. To understand various developments happening in the field of Smart Grids

Syllabus:

UNIT-1: Distributed generation – Introduction

Integration of distributed generation to Grid – Concepts of Micro Grid - Typical Microgrid configurations - AC and DC micro grids - Interconnection of Microgrids - Technical and economic advantages of Microgrid -

Challenges and disadvantages of Microgrid development

Smart Grid: Evolution of Electric Grid - Definitions and Need for Smart Grid, opportunities, challenges and benefits of Smart Grids

UNIT-2: Distributed Generations (DG)

Concept of distributed generations, topologies, selection of sources, regulatory standards/ framework, Standards for interconnecting Distributed resources to electric power systems: IEEE 1547. DG installation classes, security issues in DG implementations. Energy storage elements: Batteries, ultra-capacitors, flywheels.

Captive power plants.

UNIT-3: Impact of Grid Integration

Requirements for grid interconnection, limits on operational parameters, voltage, frequency, THD, response to grid abnormal operating conditions, islanding issues. Impact of grid integration with NCE sources on existing power system: reliability, stability and power quality issues.

UNIT-4: Microgrids

Concept and definition of microgrid, microgrid drivers and benefits, review of sources of microgrids, typical structure and configuration of a microgrid, AC and DC microgrids, Power Electronics interfaces in DC and AC microgrids, communication infrastructure, modes of operation and control of microgrid: grid connected and islanded mode, Active and reactive power control, protection issues, anti-islanding schemes: passive, active and communication based techniques.

UNIT-5: Power Quality Issues in Microgrids

Power quality issues in microgrids- Modelling and Stability analysis of Microgrid, regulatory standards, Microgrid economics, Introduction to smart microgrids.

Text Books:

1. Ali Keyhani, Design of Smart Power Grid Renewable Energy Systems, ISBN: 978-0-470-62761-7, Wiley
2. James Momoh, Smart Grid: Fundamentals of Design and Analysis, ISBN: 978-0-470-88939-8, Wiley

Reference Books:

1. R. C. Durgan, M. F. Me Granaghen, H. W. Beaty, “Electrical Power System Quality”, McGraw-Hill
2. Remus Teodorescu, Marco Liserre, Pedro Rodriguez, Grid Converters for Photovoltaic and Wind Power Systems, ISBN: 978-0-470-05751-3, Wiley
3. S. Chowdhury, S.P. Chowdhury and P. Crossley, Microgrids and Active Distribution Networks, ISBN 978-1-84919-014-5, IET, 2009

Course Outcomes:

After completion of this course module, students will able to:

1. Explain the concept of distributed generations.
2. Understand the working principles micro grids, its classifications.
3. Learn about smart grids along with the power quality issues in micro grids, regulatory standards etc.

Semester: VIII **Branch: Electrical and Electronics Engineering**
Subject: Non-conventional Energy Sources **Code: OPE4215**

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Course Description:

The subject curriculum focuses on the study of fundamentals of operating principle of a range of non-conventional energy resources, materials used, characterization, and key performance characteristics. The technologies looked at will include, Solar energy, Wind, Batteries, Fuel cells, and Geothermal conversion. The advantages and limitations of these technologies in comparison to conventional sources of energy will also be examined.

Course Objectives:

1. To understand the operating principle of non-conventional energy resources.
2. To understand the working principle and application of geothermal conversion.
3. To analyze and compare advantages and limitations of conventional and non-conventional energy sources.
4. To compare the different type of renewable energy sources.
5. To get overall idea on different types of battery and fuel cells.

Syllabus:

UNIT-1: Introduction

Renewable Energy Technologies, Energy Usage by Humans: Estimate of Impact on Atmosphere, Conventional Sources of Energy, Non-Conventional Sources of Energy: An overview, Energy Consumption, Details of Energy usage in each sector, Consequences of Energy Consumption.

UNIT-2: Solar Energy and Applications

The Sun to Earth Transaction, The Solar Energy Budget, Electromagnetic Radiation: Solar Spectrum, Solar flat plate collector, Solar Concentrator, Solar Energy: The Semiconductor, the p-n junction, Solar Cell: Growing the single crystal and making the p-n junction, Interaction of p-n junction with radiation, Solar cell characteristics and usage, Solar cell construction, Solar Photo-catalysis.

UNIT-3: Wind Energy

Overview, Energy Considerations, Efficiency, Parts and Materials, Design Considerations.

UNIT-4: Geothermal Energy And Biomass

Ocean Thermal Energy: Conversion (OTEC), Geothermal Energy Technological aspects, Biomass Usage and Issues.

UNIT-5: Batteries and Fuel Cells

Basics, Testing and Performance, Lithium ion Batteries, Common Battery Structures and Types, Types of Fuel Cells, Fuel Processing for PEM Fuel Cells, Fuel Cells: Concept to Product, Characterization of Electrochemical Devices, Fuel Cells: Parts and Assembly, Super-capacitors, Flywheels, Magneto-hydrodynamic Power Generation.

Text Books:

1. Non-conventional Energy Sources: N.K. Bansal, Vikas Publishing House
2. Renewable Energy Sources and Emerging Technologies: D.P. Kothari, Prentice Hall

Reference Books:

1. Non-conventional energy sources: G.D. Rai.
2. Wind Energy Systems – G.L. Johnson (Prentice Hall, 1985)
3. Biomass Gasification Principles and Technology, Energy technology review No. 67, - T.B. Read (Noyes Data Corp. , 1981)
4. Biomass Renegerable Energy – D.O. Hall and R.P. Overeed (John Wiley and Sons, New York, 1987)

Course Outcomes:

After completion of this course module, students will able to:

1. Understand and analyze Solar cell characteristics, usage and construction.
2. Get overall idea about Photo-catalysis.
3. Get overall idea about ocean thermal energy conversion.
4. Understand and analyze Magneto-hydrodynamic Power Generation.

Semester: VIII **Branch: Electrical and Electronics Engineering**
Subject: Energy Audit and Management System **Code: OPE4216**

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Course Description:

The course provides an introduction to the role of Computers and Communication in Electrical Power Engineering. Energy Management Systems (EMS) and Supervisory Control and Data Acquisition (SCADA) are strongly linked and associated with each other.

This course provides an introductory course material for power system automation and recent advances in technological aspects of computers and communications in networking.

Course Objective:

1. To provide understand on the structure and functioning of energy management systems.
2. To train students on the auditing of management systems in general and energy management systems in particular.
3. To train students on energy analysis of organizations and on the development of energy baseline for organizations.
4. To impart basic knowledge to the students about current energy scenario, energy conservation and audit.
5. To inculcate among the students systematic knowledge and skill about assessing the energy efficiency, energy auditing and energy management.

Syllabus:

UNIT-1: Energy Auditing:

General philosophy and need of energy audit and management. Definition and objective of energy management, general principles of energy management, energy management skills, energy management strategy. Energy audit: need, types, methodology and approach. Energy management approach, understanding energy costs, bench marking, energy performance, matching energy usage to requirements, maximizing system efficiency, optimizing the input energy requirements, fuel and energy substitution.

UNIT-2: Procedures and Techniques

Data gathering: Level of responsibilities, energy sources, control of energy and uses of energy get Facts, figures and impression about energy /fuel and system operations, Past and Present operating data, Special tests, Questionnaire for data gathering. Analytical Techniques: Incremental cost concept, mass and energy balancing techniques, inventory of Energy inputs and rejections, Heat transfer calculations, Evaluation of Electric load characteristics, process and energy system simulation. Evaluation of saving opportunities: Determining the savings in Rs, Noneconomic factors, Conservation opportunities, estimating cost of implementation. Energy Audit Reporting: The plant energy study report- Importance, contents, effective organization, report writing and presentation.

UNIT 3: Energy Policy Planning and Implementation

Key Elements: Force Field Analysis, Energy Policy-Purpose, Perspective, Contents and Formulation. Format and Ratification, Organizing: Location of Energy Manager, Top Management Support, Managerial functions, Role and responsibilities of Energy Manager, Accountability. Motivating – Motivation of employees, Requirements for Energy Action Planning. Information Systems: Designing, Barriers, Strategies, Marketing and Communicating Training and Planning.

UNIT 4: Energy Balance & MIS

First law of efficiency and Second law of efficiency, Facility as an Energy system, Methods for preparing process flow, Materials and Energy Balance diagram, Identification of losses, Improvements. Energy Balance sheet and Management Information System (MIS) Energy Modeling and Optimization.

UNIT 5: Economic Analysis and Financial Management

Objectives, Investment needs appraisal and criteria, sources of funds. Anatomy of investment – Initial investment, Return on Investment, Economic life, Basic income equations. Tax considerations: Depreciation, types and methods of depreciation, Income tax Considerations. Financial analysis: Simple payback period, Return on investment (ROI), Net Present value (NPV), Internal Rate of Return (IRR), and Annualized cost, Time value of money, Cash flows, Discounting, Inflation Risk and sensitivity analysis, financing options. Pros and cons of the common methods of analysis.

Text Books:

1. Energy Management Systems: E. Handschin, Springer.
2. Real time control of electric power system: E. Handschin, Elsevier.

3. Energy management: WR Murphy, G. Mckay

Reference Books:

1. Electric power substation engineering: John D Mc Donald, CRC press.
2. Power generation, operation and control: A.J. Wood & Wollenberg (John Willey & sons)
3. Energy management handbook: W.C Turner
4. Control and automation of electric power distribution system: J.N. Green & R. Wilson (Taylor & Francis)

Course Outcomes:

After completion of this course module, students will able to:

1. Understand and analyze energy management system.
2. Get overall idea about energy audit and management system.
3. Understand and analyze Energy management Centres and their functions, architectures, recent Developments.
4. Utilize the techniques and skills of Energy Management System Auditing.
5. Utilize the techniques and skills of energy analysis of organizations and development of energy baseline of organizations.

Semester: VIII **Branch: Electrical and Electronics Engineering**
Subject: Electrical Drives Lab **Code: EEE4236**

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(A) Hardware Based Experiments:

1. To study speed control of separately excited dc motor by varying armature voltage using single- phase fully controlled bridge converter.
2. To study speed control of separately excited dc motor by varying armature voltage using single phase half controlled bridge converter.
3. To study speed control of separately excited dc motor using single phase dual converter (Static Ward-Leonard Control)
4. To study speed control of separately excited dc motor using MOSFET/IGBT chopper
5. to study closed loop control of separately excited dc motor
6. To study speed control of single phase induction motor using single phase ac voltage controller.
7. To study speed control of three phase induction motor using three phase ac voltage controller
8. To study speed control of three phase induction motor using three phase current source inverter
9. To study speed control of three phase induction motor using three phase voltage source inverter
10. To study speed control of three phase slip ring induction motor using static rotor resistance control using rectifier and chopper
11. To study speed control of three phase slip ring induction motor using static scherbius slip power recovery control scheme

Simulation Based Experiments (using MATLAB or any other software)

12. To study starting transient response of separately excited dc motor.
13. To study speed control of separately excited dc motor using single phase fully / half controlled bridge converter in discontinuous and continuous current modes.
14. To study speed control of separately excited dc motor using chopper control in motoring and braking modes.
15. To study starting transient response of three phase induction motor
16. To study speed control of three phase induction motor using (a) constant/V/F control (b) Constant Voltage and frequency control.

Semester: VII **Branch: Electrical and Electronics Engineering**
Subject: Professional Development **Code: PD4208**

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Course Description:

Today in the present world, society and organization can be developed that follow a process among the people of organization as an instrument in order to get new styles in proceeding, production and services and effective decision making and the comparison of organization with dynamic environment and competitive market which this process is beds for the developed employment skill. Entrepreneur and Knowledge Management Course aims to provide students with scientific and practical knowledge about entrepreneurship and knowledge management as well as the skills to turn such knowledge into practice. The learning outcomes are therefore designed to help the student acquire perspectives, skills and experiences necessary to take on an entrepreneurial role in future positions and activities. Knowledge Management may provide the experiences knowledge and experts. This function will create new abilities; increase the performance and the new innovation.

Course Objectives:

The objectives of this course are:

1. To provide an integrative and holistic understanding of the nature of entrepreneurship;
2. To make students understand the criticality of entrepreneurship survival, growth and sustainability;
3. To make students learn the factors that contribute to entrepreneurship success and failure;
4. To make students learn the role of creativity, knowledge and learning processes in entrepreneurship; and
5. To make students learn the knowledge management.

Syllabus:

UNIT-1 Entrepreneurship, Definition, Role and expectations, Entrepreneurial styles and types, Characteristics of the Entrepreneur, Functions of an Entrepreneur, Promotion of Entrepreneurship, Role of Socio-Cultural, Economic and Political Environment, Growth of Entrepreneurship in Pre and Post independence era, Constraints for the Growth of Entrepreneurial Culture.

UNIT-2 Entrepreneurial Motivation Theories, Entrepreneurial Competencies, Developing Competencies, Role of Entrepreneur, Development Programs, Assistance Programme for Small Scale UNITs, Institutional Framework, Role of SSI Sector in the Economy, SSI UNITs, Failure, Causes and Preventive Measures, Turnaround Strategies.

UNIT-3 Identification of Business Opportunity, Preparation of Feasibility Report, Financial and Technical Evaluation, Project Formulation, Common Errors in Project Formulation, Specimen Project Report, Ownership Structures, Proprietorship, Partnership, Company, Co-operative, Franchise.

UNIT-4 Corporate Entrepreneurship (Intrapreneurship), Concepts, Need, Strategies, Corporate Practices, Select Cases, Dynamics of Competition , Plans for Survival and Growth.

UNIT-5 Women Entrepreneurship, Need, Growth of women Entrepreneurship, Problems faced by Women Entrepreneurs, Development of women Entrepreneurship, Entrepreneurship in Informal Sector, Rural Entrepreneurship, Entrepreneurship in Sectors like Agriculture, Tourism, health case, Transport and allied services.

Text books:

1. Innovation and Entrepreneurship: Peter F. Drucker (Heinemann).

2. The art and Science of Entrepreneurship: Donald L. Sexton & Raymond W. Smilor (Ballinger pub. Co.).

3. Entrepreneurship and Venture Management, Clifford M. Baumback & Joseph R. Mancuso (Prentice hall).

Reference books:

1. Ram K. Vepa: How to succeed in small scale industry (Vikas Pub.)
2. Richard M. Hodgets: Effective small business management (Academic Press)
3. Dan Steinhoff & John F. Burgess: small business management – fundamentals (Mcgraw hill).
4. Small industries service institute (sisi), madras publication: guidelines to entrepreneurs for starting a small scale industry.

Course Outcomes:

1. Students are expected to understand Entrepreneurship and importance of Innovation.

2. Students are expected to know about different business opportunities and how to pursue them.

3. Students are expected to understand Importance of women entrepreneur ship and empowerment.