MOTHERHOOD UNIVERSITY

Roorkee-Dehradun Road, Village Karoundi Post Bhagwanpur, Tehsil-Roorkee, Uttrakhand, India

EVALUATION SCHEME – SEMESTER V – Electrical Engineering

Sr. No	Subject Code	Subject Name	Effective Teaching			Credits	Evaluation Scheme		
			L	T	P		Internal Assessment	External Assessment	Total Marks
			Hours/week						
THEORY									
1	MUPEE 501N	A.C Machines	4	-	-	3	20	50	70
2	MUPEE 502N	Sub-Station , Switchgear and Protection	3	-	-	4	20	50	70
3	MUPEE 503N	Installation and Maintenance of Electrical Equipment's	5	-	-	4	20	50	70
4	MUPEE 504N	Energy Management	5	-	-	4	20	50	70
5	MUPEE 505N	Industrial Electronics and Control of Drives	4	-	-	4	20	50	70
6	MUPEE 506N	Entrepreneurship Development and Management (E)	3	-	-	5	50	100	150
PRACTICAL/PROJECT									
7	MUPEE 551N	A.C Machines	-	-	2	2	30	50	80
8	MUPEE 552N	Sub-Station , Switchgear and Protection	-	-	2	2	30	50	80
9	MUPEE 553N	Installation and Maintenance of Electrical Equipment's	-	-	2	2	30	80	110
10	MUPEE 554N	Industrial Electronics and Control of Drives	-	-	2	2	30	50	80
11	MUPEE 555N	Industrial Training	-	-	2	2	50	50	100
12	MUPGP 551N	General Proficiency	-	-	1	1	25	-	25
13	MUPGP 552N	Industrial Exposure (Assessment at University Level)	-	-	1	1	25	-	25
		TOTAL	**24**	**-**	**12**	**36**	**370**	**630**	**1000**

NOTE:- Industrial Training of 30 days done after 4th semester would be evaluated in 5th Semester through Report and Viva Voice.

MUPEE501N	AC Machines	4L:0T:2P	3 Credits

Course Objectives

The objectives of the course is:
1. To understand the constructional features and working of different types of AC Machines.
2. To learn about the different applications of AC machines in real life.

Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
CO1	To understand the constructional features and working of Synchronous Machines along with the applications.	**K2**
CO2	To understand the constructional features and working of Induction Machines along with the applications.	**K3**
CO3	To understand the constructional features and working of Fractional Kilo Watt Motors along with the applications.	**K3**
CO4	To understand the constructional features and working of Special Purpose Machines along with its applications.	**K3**
CO5	To understand the applications of all types of AC Machines	**K3**

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create

Syllabus

UNIT 1. Synchronous Machines

Main constructional features of synchronous machine including commutator and brushless excitation system, Generation of three phase emf, Production of rotating magnetic field in a three phase winding , Concept of distribution factor and coil span factor and emf equation Armature reaction at unity, lag and lead power factor , Operation of single synchronous machine independently supplying a load - Voltage regulation by synchronous impedance method, Need and necessary conditions of parallel operation of alternators Synchronizing an alternator (Synchroscope method) with the bus bars, Operation of synchronous machine as a motor –its starting methods, Effect of change in excitation of a synchronous

motor, Concept and Cause of hunting and its prevention, Rating and cooling of synchronous machines Applications of synchronous machines (as an alternator, as a synchronous condenser)

UNIT 2. Induction Motors

Salient constructional features of squirrel cage and slip ring 3-phase induction motors , Principle of operation, slip and its significance ,Rotor resistance, inductance, emf and current 'Relationship between copper loss and the motor slip, Power flow diagram of an induction motor, Factors determining the torque, Torque-slip curve, stable , Effect of rotor resistance upon the torque slip relationship, Starting of 3-phase induction motors, DOL, star-delta, auto transformer, Causes of low power factor of induction motors, Testing of 3-phase motor on no load and blocked rotor test and to find efficiency, Speed control of induction motor. Harmonics and its effects cogging and crawling in induction motor.

UNIT 3. Fractional Kilo Watt (FKW) Motors

Single phase induction motors; Construction characteristics and applications, Nature of field produced in single phase induction motor, Split phase induction motor, Capacitors start and run motor, Shaded pole motor, universal motors, Single phase synchronous motor.

UNIT 4. Special Purpose Machines

Construction and working principle, characteristics and applications of stepper motor, Servomotor, Submersible Motor

RECOMMENDED BOOKS

1. Electrical Machines by SK Bhattacharya, Tata Mc Graw Hill, New Delhi
2. Electrical Machines by SK Sahdev, Uneek Publications, Jalandhar
3. Electrical Machines by Nagrath and Kothari, Tata Mc Graw Hill, New Delhi Electrical Engineering by JB Gupta, SK Kataria and sons, New Delhi
4. Electrical Machines by Samarjit Ghosh, Pearson Education (Singapore) Pvt., Ltd. 482, FIE Patparganj, Delhi 110092
5. Electrical Machines by DR Arora, Ishan Publications, Ambala City

MUPEE502N	Sub-Station , Switchgear and Protection	3L:0T:2P	4 Credits

Course Objectives

The objectives of the course is:
1. To get acquainted with the general outlay of Sub Station and understand the different types of equipment's in Subs Station.
2. To understand the faults in power system and develop the technique to do the fault analysis.

Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
CO1	To understand the general layout of different substations based on voltage levels along with the auxiliaries and equipment's.	**K2**
CO2	To understand the common types of faults in both overhead and underground systems.	**K2**
CO3	To comprehend the purpose of switch gear	**K2**
CO4	To understand the working principle of different types of protection devices like Fuses and Relays.	**K2**
CO5	To understand the need for different types of circuit breakers and the principle of arc extinction within them.	**K2**

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create

Syllabus

UNIT 1. Substations

Brief idea about substations - outdoor grid sub-station 500, 220, 132 KV, and 66 and33 KV;11 KV, outdoor pole and plinth mounted substations, Layout of 33/11 KV and 11KV/500V distribution substation and various auxiliaries and equipment associatedwith these.

UNIT2. Faults

Common type of faults in both overhead and underground systems, symmetrical/ unsymmetrical faults. Single line to ground fault, double line to ground fault, 3-phase to ground fault and open circuit. Simple problems relating to fault finding

UNIT 3. Switch Gears

Purpose of protective gear. Difference between switch, isolator and circuit breakers. Function of isolator and circuit breaker. Making capacity and breaking capacity of circuit breaker (only definition), Circuit breakers. Types of circuit breakers, construction and working of bulk and minimum oil circuit breakers, air blast circuitbreakers, vacuum circuit breaker, SF6 circuit breaker and circuit breaker rating
, Principles of Arc extinction blast circuit breakers in OCB and ACB. Constructionalfeatures of OCB, ACB, and their working, Method of arc extinction, Portable circuit breakers - MCB, MCCB, ELCB, for distribution and transmission system description only

UNIT 4. Protection Devices

Fuses; function of fuse. Types of fuses, HV and LV fuses, rewire-able, cartridge, HRC Earthing: purpose of earthing, method of earthing, Equipment earthing, Substation earthing, system earthing as per Indian Electricity rules. Methods of reducing earth resistance,

Relays: Introduction - types of relays. Electromagnetic and thermal relays, their construction and working Induction type over-current, earth fault relays, instantaneous over current relay Directional over-current, differential relays, their functions, Distance relays their functions, Idea of static relays and their applications.

UNIT 5. Protection Scheme

Relays for generator protection, Relays for transformer, protection including Buchholtz relay protection, Protection of feeders and bus bars, over current and earth fault protection. Distance protection for transmission system, Relays for motor protection. Protection of system against over voltages, causes of over voltages, utility of ground wire, surge absorber, Lightning arrestors, rod gap, horn gap, metal oxide type. Transmission Line and substation protection against over-voltages and lightning, Transient over voltage protection.

Note: Students may be taken to various Sub-stations/ Grid Stations. Students must be familiarized with present tariff system employed by State Electricity Boards

RECOMMENDED BOOKS

1. Testing, Commissioning , Operation and Maintenance of Electrical Equipment by S Rao, Khanna Technical Publication, New Delhi
2. Electrical Power – II by SK Sahdev, Uneek Publications, Jalandhar (Pb)
3. Electrical Power Systems by CL Wadhwa, Wiley Eastern Ltd., New Delhi
4. Textbook of Electrical Technology by BL Theraja, S Chand and Co., New Delhi
5. Electrical Power by Dr. SL Uppal, Khanna Publications, Delhi
6. A Course in Electrical Power by ML Soni, PV Gupta and Bhatnagar, Dhanpat Rai & Sons, New Delhi

MUPEE505N	Industrial Electronics and Control of Drives	4L:0T:2P	4 Credits

Course Objectives

The objectives of the course is:
1. To understand the various controlled and non-controlled devices with respect to their construction features
2. To understand the working principle of different types of controlled and non-controlled rectifiers**.**

Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
CO1	To understand the construction and working principle of a Silicon Controlled Rectifier	**K3**
CO2	To understand the working of controlled rectifier with various types of loads	**K2**
CO3	To understand the different types of choppers, Cyclo converters, dual converters, their operation and applications.	**K2**
CO4	To understand the different type of inverters and UPS system	**K2**
CO5	To understand the construction and working principle other components of thyristor family with applications.	**K2**

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create

Syllabus

UNIT 1. Silicon Controlled Rectifiers & Thyristor family

Introduction, Construction and working principles of an SCR, two transistor analogy and characteristics, specifications and rating, Methods of triggering a Thyristor, Commutation of Thyristors (Concept), Series and parallel operation of Thyristors, Protection of SCR, Snubber Circuit,Construction, working principles and V-I characteristics of DIAC, TRIAC, Basic idea about the selection of heat sinks for SCR and TRIACS,UJT, its Construction, working principles and V-I characteristics, UJT relaxation oscillator,Applications of SCR, TRIACS such as light intensity control, speed control of DC and universal motor, fan regulator, battery charger, temperature control.

UNIT 2. Controlled Rectifiers

Single phase half wave controlled rectifier with resistive load and inductive load, concept of freewheeling diode, Single phase half controlled full wave rectifier (No mathematical derivation), Single phase fully controlled full wave rectifier bridge, Single phase full wave centre tapped rectifier, Three phase full wave half controlled bridge rectifier, Three phase full wave fully controlled bridge rectifier

UNIT 3. Choppers, Dual Converters and Cyclo Converters

Choppers - introduction, types of choppers and their working principles, Quadrant operation and applications, Dual converters-introduction, working principles and applications, Cyclo - converters - introduction, types, working principles of simultaneous and non-simultaneous control and applications

UNIT 4. Thyristor Control of Electric Drives

DC drives control (Basic Concept) , Half wave drives, Full wave drives, Chopper drives, A C drives control Phase control, Variable frequency A.C. drives, Constant V/F application, Voltage controlled inverter drives , Constant current inverter drives, Cyclo convertors controlled AC drives, Slip control AC drives

UNIT 5. Inverters & Uninterrupted Power Supplies

Inverter-introduction, working principles, voltage and current driven series and parallel inverters and applications, UPS, Stabilizers, SMPS, UPS online, off line, Storage devices (batteries),Power Conditioners

RECOMMENDED BOOKS

1. Industrial Control Electronics. John Webb, Kevin Greshock, Maxwell, Macmillan International editions
2. Fundamentals of Power Electronics by S Rama Reddi, Narosa Publishing House Pvt. Ltd, New Delhi
3. Power Electronics, Circuits Devices and Applications by Mohammad H. Rashid
4. Power Electronics by PC Sen
5. Power Electronics by Dr. PS Bhimbra, Khanna Publishers, New Delhi
6. Industrial Electronics & Control by SK Bhattacharya & S Chatterji, New Age international Publications(P) Ltd, New Delhi
7. Industrial Electronics and Control of Drives by SK Sahdev, Uneek Publication, Jalandhar

MUPEE503N	**Installation and Maintenance of Electrical Equipment's**	**5L:0T:2P**	**4 Credits**

Course Objectives

The objectives of the course is:
1. To get students acquainted with the different mechanism followed while building up the transmission and distribution lines.
2. To give students an overview of the testing and commissioning of different types of underground cable.

Course Outcomes

At the end of the Course, Student will be able:		**Bloom's Level**
CO1	To understand the various procedure for installation of transmission lines.	**K2**
CO2	To understand the parts and design of underground cables with the laying mechanism	**K2**
CO3	To understand the cable joints, terminations and the process to carry out testing and commissioning of underground cable.	**K2**
CO4	To understand the types of maintenances of transmission and distribution system	**K2**
CO5	To understand the various procedure for installation of distribution lines.	**K3**

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create

Syllabus

UNIT 1. Tools and Accessories

Tools, accessories and instruments required for installation, maintenance and repair work Knowledge of Indian Electricity rules, safety codes, causes and prevention of accidents, artificial respiration of an electrocuted person, workmen's safety devices

UNIT 2. Installation Domestic Installation

Introduction, testing of electrical installation of a building, testing of insulation resistance to earth, testing of insulation and resistance between conductors continuity or open circuit test, short circuit test, testing of earthing, continuity, location of faults.

UNIT 3. Installation of transmission and distribution line

Erection of steel structures, connecting jumpers, tee-off points, joints and dead ends; crossing of roads, streets, power/telecommunication lines and railway line, clearances; earthing of transmission lines and guarding, spacing and configuration of conductors: Types of arrangement for suspension and strain insulators, bird guards, anti-climbing devices and danger plates; sizes of conductor, earthwire and guy wires, Testing and Commissioning. Laying of service lines, earthing, provision of service fuses, installation of energy meters,Laying of Underground Cables Inspection, storage, transportation and handling of cables, cable handling equipment,cable laying depths and clearances from other services such as: water pipes, sewerage, gas pipes, power and telecommunication cables and coordination with these services,

excavation of trenches, direct cable laying, laying of cable from the drum, laying of cable in the trenches, back filling of trenches with earth or sand, laying protective layer of bricks etc, laying of cables into pipes and conduits and within buildings, introduction to cable filling compounds, epoxy resins and hardeners, cable jointing and terminations, testing and commissioning.

Elementary idea regarding, inspection and handling of transformers; pole mounted substations, plinth mounted substations and grid substation, busbars, isolators, voltage and current transformers, lightning arrestors, control and relay panels, HT/LT circuit breakers, LT switches, installation of power/distribution transformers, dehydration. Earthing system, fencing of yard, equipment foundations and trenches etc..

Handling and inspection of electric motors and generators (AC and DC), drying out medium voltage distribution panels, testing and commissioning

UNIT 4. Maintenance Preventive, Predictive, Breakdown maintenance

Types of maintenance, maintenance schedules, procedures Maintenance of Transmission and Distribution System Authorized persons, danger notice, caution notice, permit to work, arranging of shutdowns personally and temporary earths, cancellation of permit and restoration of supply Patrolling and visual inspection of lines - points to be noted during patrolling from ground; special inspections and night inspections Location of faults using Magger, effect of open or loose neutral connections, provision of proper fuses on service lines and their effect on system, causes of dim and flickering lights

Maintenance of Distribution Transformers Transformer maintenance and points to be attended to in

respect of various items of equipment Checking of insulation resistance, transformer oil level BDV test of oil and measurement of earth resistance, maintenance of breathers and oil level indicators

Maintenance of Grid Substations Checking and maintenance of busbars, isolating switches, HT/LT circuit breakers, LT switches. Power transformers

Maintenance of Motors Over hauling of motors, preventive maintenance, trouble shooting of electric motors.

RECOMMENDED BOOKS

1. Testing, Commissioning, Operation and Maintenance of Electrical Equipment by S. Rao, Khanna Technical Publication, New Delhi
2. Preventive Maintenance of Electrical Apparatus by SK Sharotri, Katson Publishing House, Ludhiana

MUPEE504N	Energy Management	5L:0T:0P	4 Credits

Course Objectives

The objectives of the course is:
1. To get students acquainted with the need to conserve energy and describing the alternative methods to conserve energy.
2. To make students understand the need of Energy Audit and the procedure followed for the same.

Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
CO1	To understand the need for energy conservation	**K2**
CO2	To understand the energy conservation opportunities in distribution system focusing on electrical appliances.	**K2**
CO3	To understand the Energy Efficient Technology by emphasizing on the need of Energy efficient devices.	**K2**
CO4	To understand the process of Energy Audit along with the Environment Impact Assessment.	**K3**
CO5	To detail about the alternative sources of energy	**K2**

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create

Syllabus

Unit 1. Energy Management

Overview of energy management, need for energy conservation, Environmental Aspects Need for energy conservation with brief description of oil and coal crisis. Alternative sources of energy. Energy efficiency- its significance.

Unit 2. Energy Conservation

Energy conservation opportunity and measures. Energy conservation in Domestic sector- Lighting, Home appliances, Energy conservation in Industrial sector-Industrial lighting, Distribution system, Motor Pumps, Fans, Blowers etc. Energy conservation in Agriculture sector Tubewell pumps, Diesel-generating sets, Standby energy sources, Macro Level approach for energy conservation at design stage

Unit 3. Energy Efficient Devices

Energy efficient technology an overview, Need for energy efficient devices, Initial cost versus life cycle, cost analysis on life cycle basis Energy efficient motors as compared to standard motors.BIS standards for energy efficient motors, BIS salient design features, Efficiency as a function of load, safety margins, Energy efficient lighting system different sources, lumens/watt, LEDs, role of voltage on efficiency Distribution system- Optimum cable size, amorphous core transformer, role of power factor, use of compensating capacitors-manual and automatic, location of capacitors

Unit 4. Energy Audit

Energy audit methodology, Efficiency of energy conversion processes, monitoring system, Specific energy consumption –three pronged approach, fine tuning,technical up gradation, avoidable losses.

Case studies of energy audit of distribution system, AC motors, Industries,audit activities.

Unit 5. Environmental Impact Assessment

Need for environmental impact assessment , Standard format for assessment and its completion
Evaluation of the assessment

RECOMMENDED BOOKS

1. Manual on Energy Efficiency at Design Stage, CII Energy Management Cell
2. Manual on Energy Efficiency in Pumping System, CII Energy Management Cell
3. Manual on Variable Speed Drives for Energy Efficiency CII Energy ManagementCell
4. Energy Conservation-case studies in ceramic industry, sugar industry, fertilizer industry, cement industry. CII, Energy Management Cell etc.

MUPEE506N	**Entrepreneurship Development and Management**	**3L:0T:0P**	**5 Credits**

Course Objectives

The objectives of the course is:
1. To make students aware about the concept of entrepreneurship with suitable examples and make them vigilant about the opportunities available for a new entrepreneur.
2. To get students acquainted with the concept of management and develop employable skills by suitable activities.

Course Outcomes

At the end of the Course, Student will be able:		**Bloom's Level**
CO1	To understand the concept of Entrepreneurship and identify the barriers associated with it.	**K2**
CO2	To identify the business opportunities by scanning the various organizations and market surveys.	**K3**
CO3	To define and understand the importance of management and to evaluate the qualities of a leader in comparison to a manager.	**K4**
CO4	To identify the management scope in different areas like HR, Finance , Marketing and Sales	**K2**
CO5	To understand the various employable skills while preparing for employment to be a future engineer.	**K2**

K1 – Remember K2- Understand K3-Apply K4-Analyze K5 – Evaluate K6 – Create

Syllabus

A ENTREPRENEURSHIP

1. Introduction

Concept /Meaning and its need

- Qualities and functions of entrepreneur and barriers in entrepreneurship
- Sole proprietorship and partnership forms of business organizations
- Schemes of assistance by entrepreneurial support agencies at National, State,
- District level: NSIC, NRDC, DC:MSME, SIDBI, NABARD, Commercial Banks, SFC's TCO, KVIB, DIC, Technology Business Incubator (TBI) and Science and Technology Entrepreneur Parks (STEP)

2. Market Survey and Opportunity Identification

Scanning of business environment

- Salient features of National and State industrial policies and resultant business
- opportunities Types and conduct of market survey
- Assessment of demand and supply in potential areas of growth
- Identifying business opportunity
- Considerations in product selection

3. Project report Preparation

Preliminary project report

- Detailed project report including technical, economic and market feasibility
- Common errors in project report preparations
- Exercises on preparation of project report

4. Management

Introduction to Management

Definitions and importance of management

- Functions of management: Importance and Process of planning, organizing,staffing
- Directing and controlling Principles of management (Henri Fayol, F.W.Taylor)
- Concept and structure of an organization
- Types of industrial organizations
- a) Line organization.b) Line and staff organization. c) FunctionalOrganization.

5. Leadership and Motivation

a) Leadership Definition and Need

- Qualities and functions of a leader
- Manager Vs leader

- Types of leadership

b) Motivation Definitions and characteristics
- Factors affecting motivation
- Theories of motivation (Maslow, Herzberg, McGregor)

6. Management Scope in Different Areas

a) Human Resource Management Introduction and objective
- Introduction to Man power planning, recruitment and selection
- Introduction to performance appraisal methods

b) Material and Store Management Introduction functions, and objectives
- ABC Analysis and EOQ

c) Marketing and sales Introduction, importance, and its functions
- Physical distribution
- Introduction to promotion mix
- Sales promotion

d) Financial Management Introductions, importance and its functions
- Elementary knowledge of income tax, sales tax, excise duty, customduty and VAT

7. Miscellaneous Topics

a) Customer Relation Management (CRM) Definition and need
- Types of CRM

b) Total Quality Management (TQM) Statistical process control
- Total employees Involvement
- Just in time (JIT)

c) Intellectual Property Right (IPR) Introductions, definition and its importance, Infringement related to patents, copy right, trade mark.

B EMPLOYABLE SKILLS

8. Industrial Scenario Engineering: Education and expectations of competences from an engineer by employer, Personality types, characteristic and features for a successful engineer. Professional Engineer desirable values and ethics and their development. Relation between engineering profession, society and environment.

9.Preparing for Employment

Searching for job/job hunting
- Resume Writing
- Interview technique in personal interview telephonic interview, panelinterview,
- group interview, video conference.

Effective Communication Listening

- Speaking
- Writing
- Presentation Technique/Seminar
- Group discussion

Managing Self: Managers body, mind, emotion and spirit

- Stress Management
- Conflict resolution

10. Creativity, Innovation and Intellectual property right, Concept and need in present time for an engineer, Basic rules, laws and norms to be adhered by engineers during their working .addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organizations on visit. Approach extracted reading and handouts may be provided.

RECOMMENDED BOOKS

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; Aapga Publications, Panchkula (Haryana)
2. Entrepreneurship Development published by Tata McGraw Hill Publishing Company Ltd., New Delhi
3. Entrepreneurship Development in India by CB Gupta and P Srinivasan; Sultan Chand and Sons, New Delhi
4. Entrepreneurship Development - Small Business Enterprises by Poornima M Charantimath; Pearson Education, New Delhi
5. Entrepreneurship : New Venture Creation by David H Holt; Prentice Hall of India Pvt. Ltd., New Delhi.