



# MOTHERHOOD UNIVERSITY

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

## EVALUATION SCHEME – SEMESTER VI – Electrical Engineering

Sr. No	Subject Code	Subject Name	Effective Teaching			Credits	Evaluation Scheme		
			L	T	P		Internal Assessment	External Assessment	Total Marks
			Hours/week						
<b>THEORY</b>									
1	MUPEE601N	Utilization of Electrical Energy	4	-	-	3	25	50	75
2	MUPEE602N	Non-Conventional Energy Sources	4	-	-	4	25	50	75
3	MUPEE603N	SCADA, PLC & Microcontrollers	4	-	-	4	25	50	75
4	MUPEE604N	Application of Computer Software in Electrical Engg.	3	-	-	4	25	50	75
5	MUPEE605N	Employability Skills	2	-	-	1	25	50	75
<b>PRACTICAL/PROJECT</b>									
5	MUPEE651N	Utilization of Electrical Energy	-	-	3	3	25	50	75
6	MUPEE652N	Non-Conventional Energy Sources	-	-	2	2	25	75	100
7	MUPEE653N	SCADA, PLC & Microcontrollers	-	-	3	5	25	75	100
8	MUPEE654N	Application of Computer Software in Electrical Engg.	-	-	3	5	50	100	150
9	MUPEE655N	Project Work	-	-	6	3	50	100	150
10	MUPGP 651N	General Proficiency #	-	-	2	1	25	-	25
11	MUPGP 652N	Industrial Exposure (Assessment at University level) +	-	-	-	1	25	-	25
<b>TOTAL</b>			<b>17</b>	<b>-</b>	<b>19</b>	<b>36</b>	<b>350</b>	<b>650</b>	<b>1000</b>



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<b>MUPEE601N</b>	<b>Utilization of Electrical Energy</b>	<b>4L:0T:3P</b>	<b>3 Credits</b>
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## Course Objectives

The objectives of the course is:

- To plan and design an electrical layout using basic principles and handbooks.
- To select equipment, processes and components in different situations.

## Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
<b>CO1</b>	To understand the concept of Illumination and Laws Applicable to it.	<b>K3</b>
<b>CO2</b>	To develop an understanding of the phenomena of Electrical Heating and Welding.	<b>K1</b>
<b>CO3</b>	To comprehend the different law related to electrolysis and understand the principles of galvanizing and anodizing	<b>K2</b>
<b>CO4</b>	To understand the electrical circuits used in Refrigeration, Air Conditioning and Water Coolers.	<b>K1</b>
<b>CO5</b>	To understand the phenomena of Electrical Drives and Braking system involved in it.	<b>K1</b>

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

## Syllabus

### UNIT I

#### Illumination

- 1.1 Nature of light, visibility spectrum curve of relative sensitivity of human eye and wave length of light.
- 1.2 Definition: Luminous flux, solid angle, luminous intensity, illumination, luminous efficiency, depreciation factor, coefficient of utilization, space to height ratio, reflection factor, glare, shadow, lux.



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- 1.3 Laws of illumination – simple numerical.
- 1.4 Different type of lamps, construction and working of incandescent and discharge lamps – their characteristics, fittings required for filament lamp, mercury vapour sodium lamp, fluorescent lamp, halogen lamp, neon lamp, compact fluorescent lamp(CFL), LED Lamp, comparison of incandescent, fluorescent, CFL & LED.
- 1.5 Calculation of number of light points for interior illumination, calculation of illumination at different points, considerations involved in simple design problems. Illumination schemes, indoor and outdoor illumination levels.
- 1.6 Main requirements of proper lighting; absence of glare, contrast and shadow.
- 1.7 Awareness about time switches, street lighting, flood lighting, monument lighting and decorative lighting, light characteristics etc.

## UNIT II

### Electric Heating AND Electric Welding

- 2.1 Advantages of electrical heating
- 2.2 Heating methods:
  - 2.2.1 Resistance heating – direct and indirect resistance heating, electric ovens, their temperature range, properties of resistance heating elements, domestic water heaters and other heating appliances, thermostat control circuit.
  - 2.2.2 Induction heating; principle of core type and coreless induction furnace, their construction and applications.
  - 2.2.3 Electric arc heating; direct and indirect arc heating, construction, working and applications of arc furnace.
  - 2.2.4 Dielectric heating, applications in various industrial fields.
  - 2.2.5 Infra - red heating and its applications (construction and working of two appliances).
  - 2.2.6 Microwave heating and its applications (construction and working of two appliances).
  - 2.2.7 Solar Heating.
- 2.3 Calculation of resistance heating elements (simple problems).
- 2.4 Advantages of electric welding
- 2.5 Welding method
- 2.6 Principles of resistance welding, types – spot, projection, seam and butt welding, welding equipment
- 2.7 Principle of arc production, electric arc welding, characteristics of arc; carbon arc, metal arc, hydrogen arc welding method and their applications. Power supply requirement, Advantages of using coated electrodes, comparison between AC and DC arc welding, welding control circuits, welding of aluminum and copper.

## UNIT III

### Electrolytic Processes

- 3.1 Need of electro-deposition
- 3.2 Laws of electrolysis, process of electro-deposition - clearing, operation, deposition of metals, polishing and buffing
- 3.3 Equipment and accessories for electroplating



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- 3.4 Factors affecting electro-deposition
- 3.5 Principle of galvanizing and its applications
- 3.6 Principles of anodizing and its applications
- 3.7 Electroplating of non-conducting materials
- 3.8 Manufacture of chemicals by electrolytic process
- 3.9 Power supplies for electroplating

## UNIT IV

### **Electrical Circuits used in Refrigeration, Air Conditioning and Water Coolers**

- 4.1 Principle of air conditioning, vapour pressure, refrigeration cycle, eco friendly refrigerants.
- 4.2 Description of Electrical circuit used in
  - a) Refrigerator,
  - b) Air-conditioner, and Water cooler

## UNIT V

### **Electric Drive**

- 5.1 Advantages of electric drives
- 5.2 Characteristics of different mechanical loads
- 5.3 Types of motors used as electric drive
- 5.4 Electric braking
  - 5.4.1 Plugging
  - 5.4.2 Rheostatic braking
  - 5.4.3 Regenerative braking
- 5.5 General idea about the methods of power transfer by direct coupling by using devices like belt drive, gears, chain drives etc.
- 5.6 Examples of selection of motors for different types of domestic loads
- 5.7 Selection of drive for applications such as general workshop, textile mill, paper mill, steel mill, printing press, crane and lift etc. Application of flywheel.
- 5.8 Specifications of commonly used motors e.g. squirrel cage motors, slip ring induction motors, AC series motors, Fractional kilo Watt(FKW) motors.
- 5.9 Selection of motors for Domestic Appliances.

## UNIT VI

### **Electric Traction:**

- 6.1 Advantages of electric traction over other types of traction.
- 6.2 Different systems of electric traction, DC and AC systems, diesel electric system, types of services – urban, sub-urban, and main line and their speed- time curves
- 6.3 Different accessories for track electrification; such as overhead catenary wire, conductor rail system, current collector-pentagraph
- 6.4 Factors affecting scheduled speed



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- 6.5 Electrical block diagram of an electric locomotive with description of various equipment and accessories used.
- 6.6 Types of motors used for electric traction
- 6.7 Power supply arrangements
- 6.8 Starting and braking of electric locomotives
- 6.9 Introduction to EMU and metro railways
- 6.10 Train Lightning Scheme.

## **RECOMMENDED BOOKS**

1. Art and Science of Utilization of Electrical Energy by H Partap, Dhanpat Rai & Sons, Delhi.
2. Utilization of Electrical Energy by JB Gupta, Kataria Publications, Ludhiana
3. Utilization of Electrical Energy by Sahdev, Uneek Publication, Jalandhar
4. A Text Book. of Electrical Power by Dr. SL Uppal, Khanna Publications, Delhi
5. Modern Electric Traction by H Partap, Dhanpat Rai & Sons, Delhi
6. Utilization of Electrical Energy by OS Taylor, Pitman Publications



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<b>MUPEE602N</b>	<b>Non-Conventional Energy Sources</b>	<b>4L:0T:2P</b>	<b>2 Credits</b>
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## Course Objectives

**The objectives of the course is:**

- To encourage and motivate students to shift towards the non-conventional energy resources which is the need of the hour owing to climate change.
- To develop an understanding of the different types of non-conventional energy resources with respect to the process, infrastructure and the facilities at hand.

## Course Outcomes

<b>At the end of the Course, Student will be able:</b>		<b>Bloom's Level</b>
<b>CO1</b>	To develop an overview on the need to shift to non-conventional energy resource with respect to their importance and availability.	<b>K2</b>
<b>CO2</b>	To look and observe the different advancements in Solar Energy and the technology being utilized in the solar energy conversions with applications.	<b>K3</b>
<b>CO3</b>	To develop an understanding of the Wind as Well as Tidal Energy as an alternate for the conventional Sources of Energy.	<b>K2</b>
<b>CO4</b>	To understand the methods for obtaining clean energy through biogas and Geo Thermal Plants.	<b>K1</b>
<b>CO5</b>	To Understand the classification of various micro hydel power plants and the involved infrastructure.	<b>K2</b>

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

## Syllabus

### **Unit I Non-Conventional Sources of Energy: An overview**

Importance of Non-conventional sources of energy, Present Scenario, Future Prospects, Economic Criteria. Types of non-conventional energy sources.



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## Unit II Solar Energy

Physical Principle of the conversion of Solar radiation into heat, Photo-voltaic cell, Electricity generation, Solar water heaters, Solar Furnaces, Solar cookers, Solar Stills solar pumping.

## Unit 3. Wind Energy

Wind Energy Conversion, Wind mills, Electricity generation from wind- Types of wind mills, local control, energy storage 8. Geo-thermal and Tidal Energy (8 Periods) Geo-thermal sources, Ocean thermal electric conversion, open and closed cycles, hybrid cycles. Prime movers for geo-thermal energy conversion, Steam Generation and electricity generation.

## Unit 4. Bio-Energy

Bio-mass Conversion Technologies- wet and dry processes. Methods for obtaining energy from Biomass. Power Generation by using gasifiers.

## Unit5. Geo-Thermal and Tidal Energy

Geo-thermal sources, Ocean thermal electric conversion, open and closed cycles, hybrid cycles. Prime movers for geo-thermal energy conversion. Steam Generation and electricity generation.

## UNIT 6. Micro Hydel Plants

Small and Micro Hydro Electric Power Plants: An Overview

- Advantages and Disadvantages of Small and Micro Hydro Schemes
- Layout of a Micro Hydro Scheme
- Main Elements of a Micro Hydro Plant
- Water turbines
- Turbine Classifications, Characteristics and Selection
- Generators
- Specifications of Turbine, Generator and Governor System used in Small and Micro Hydro Electric Power Plants
- Overview of Automation, Control and Monitoring of Micro Hydro Electric Power Plants
- Efficiency and Limitations.
- Erection and Commissioning, Operation and Maintenance of Micro Hydro Electric Power Plants

## Unit 7. Chemical Energy Sources

Design and operating principles of a fuel cell, conversion efficiency, work output and emf of fuel cells, applications storage battery characteristics, types, applications, maintenance of batteries.

## RECOMMENDED BOOKS

1. Solar Energy – Principles of thermal collection and Storage SP Sukhatme, Tata McGraw Hill Publication, New Delhi.
2. Solar Energy Utilization; GD Rai; Khanna Publishers, New Delhi.
3. Reviews of Renewable Energy Sources, Vol. 3, Edited by MS. Sodha, S.S. Mathur, MAS Malik, TC Kandpal ; Wiley Eastern Limited, New Delhi.
4. Renewable Energy Sources and Conversion Technology by NK Bansal, Manfred Kleemann, Michael Meliss, Tata McGraw Hill Publishing Co. Ltd New Delh



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<b>MUPEE603N</b>	<b>SCADA, PLC &amp; Microcontrollers</b>	<b>4L:0T:3P</b>	<b>5 Credits</b>
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## Course Objectives

The objectives of the course is:

- To know the basics of Programmable Logic Controllers, their working and their programming.
- To design, modify and troubleshoot various control circuits being utilized with the Microcontrollers.

## Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
<b>CO1</b>	To understand the SCADA system being utilized in the dispatch center and understand the different Communication Channels.	<b>K2</b>
<b>CO2</b>	To understand the working of PLC as well as basic principles and operations of PLC along with the applications	<b>K3</b>
<b>CO3</b>	To develop an approach to understand the different Instructional sets like Timer and Counter.	<b>K2</b>
<b>CO4</b>	To understand the pin details, port structure of the Micro Controller Series (MCS)-51	<b>K2</b>
<b>CO5</b>	To understand the Assembly Language Programming with respect to Assemblers and Compilers.	<b>K1</b>

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

## Syllabus

### **UNIT I SCADA**

Introduction, role of SCADA in dispatch centre, operator console, VDUs, Types of communication channels in SCADA systems, RTUs, MTUs, data loggers, report generation, report analysis and actions.





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## **UNIT II Introduction to PLC**

What is PLC, concept of PLC, Building blocks of PLC, Functions of various blocks, and limitations of relays. Advantages of PLCs over electromagnetic relays. Different programming languages, PLC manufacturer etc. Working of PLC, Basic operation and principles of PLC, Architectural details.

## **UNIT III Instruction Set**

Basic instructions like latch, master control self-holding relays, Timer instruction like retentive timers, resetting of timers, Counter instructions like up counter, down counter, resetting of counters.

Ladder Diagram Programming: Programming based on basic instructions, timer, counter, sequencer, and comparison instructions using ladder program.

## **UNIT IV Micro Controller Series (MCS)-51 over View**

Pin details, I/o Port structure, Memory Organization, Special function registers Instruction Set Addressing Modes: Timer operation, Serial Port operation, Interrupts.

## **UNIT V Assembly language programming**

Assemblers and Compilers, Assembler Directives, Design and Interface, Examples like: keypad interface, 7-segment interface, LCD, stepper motor. A/D, D/A, RTC interface Introduction of PIC Micro controllers.

## **RECOMMENDED BOOKS**

1. Programmable Logic Controller by Job Dan Otter; P.H. International, Inc, USA
2. Introduction to PLCs by Gary Dunning. McGraw Hill
3. Module on PLCs and their Applications by Rajesh Kumar, NITTTR Chandigarh
4. Programmable Logic Controller and Microcontrollers by Gurpreet Kaur and SK Sahdev by Uneek Publications, Jalandhar
5. Module on "Allen Bradlag PIC (SLC 500), Institution set-1, by Rajesh Kumar, NITTTR, Chandigarh
6. Module on "PLC Applications based on SLC 5/03" By Rajesh Kumar, NITTTR Chandigarh
7. The 8051 Micro controller by 1 Scot Mackenzie, Prentice Hall International, London



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<b>MUPEE604N</b>	<b>Application of Computer Software in Electrical Engg.</b>	<b>3L:0T:3P</b>	<b>2 Credits</b>
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## Course Objectives

The objectives of the course is:

- To develop an understanding of the latest software advancement's in Electrical Engineering.
- To understand the applications of these software's in solving problems relevant to Electrical Engineering.

## Course Outcomes

At the end of the Course, Student will be able:		Bloom's Level
<b>CO1</b>	To understand the fundamentals of MATLAB in Electrical Engineering Domain	<b>K3</b>
<b>CO2</b>	To understand the Modelling in Simulink to develop Electrical problems and solve them.	<b>K3</b>
<b>CO3</b>	To understand the fundamentals of MI Power in Electrical Engineering Domain	<b>K2</b>
<b>CO4</b>	To understand the fundamentals of Multi Sim in Electrical Engineering Domain	<b>K2</b>
<b>CO5</b>	To develop Simulation Models in Multi Sim to solve the problems relevant to Electrical Engineering	<b>K3</b>

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

## Syllabus

### **Unit I MATLAB**

Basics of MATLAB Language Fundamentals

Syntax, operators, data types, array indexing and manipulation. Mathematics

Linear algebra, differentiation and integrals and other mathematical operations.

Graphics



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Two- and three-dimensional plots. Data Import and Analysis  
Import and export, preprocessing, visual exploration.

## **Unit II SIMULINK**

Getting Started with Simulink Modeling

## **Unit III MI POWER**

## **Unit IV MULTISIM**

Simulation

Component-Based Modeling Variant Systems

## **RECOMMENDED BOOKS**

1. MAT LAB by Rudra Pratap .
2. Lab Manuals of MAT LAB etc. Supplied by Companies.
3. Lab Manuals of various softwares like MULTI SIM/ MAT LAB etc. Supplied by Companies.



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<b>MUPEE 605N</b>	<b>Employability Skills</b>	<b>2L:0T:0P</b>	<b>1 Credit</b>
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## Course Objectives

The objectives of the course is:

- .To develop good soft skills in students to improve their employability chances and develop their personality.
- To enhance the employability skills of students.

## Course Outcomes

<b>At the end of the Course, Student will be able:</b>		<b>Bloom's Level</b>
<b>CO1</b>	To develop values and professional ethics amongst the students.	<b>K3</b>
<b>CO2</b>	To enhance the communication skills of students with perspective of reading, writing, speaking and listening.	<b>K3</b>
<b>CO3</b>	To develop leadership skills in the students so they have the necessary motivation to manage interpersonal relationship	<b>K4</b>
<b>CO4</b>	To develop self-management skills by focusing on Stress Management and Conflict Resolution.	<b>K3</b>
<b>CO5</b>	To write resumes and have the ability to participate in different formats of interview like Telephonic, Video and Group interview	<b>K4</b>

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## Syllabus

### Unit I

- Technical Education & Industrial scenario.
- Competency required of an engineer.



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## Unit II

- Professional Engineer desirable values and ethics and their development
- Relation between engineering profession, society and environment

## Unit III

- Effective Communication ,Reading & Active Listening Skills
- Speaking and Writing
- Presentation Technique/Seminar
- Group discussion

## Unit IV

Managing project

- Leadership and Motivation
- Time management
- Resource management
- Interpersonal relationship

## Unit V

- Preparing for Employment
- Searching for job/job hunting , Resume & CV Writing
- Interview technique in personal interview telephonic interview, panel
- Interview, group interview, video conferencing

## Unit VI

- Self Management and Self awareness
- Stress Management and Conflict resolution

## Unit VII

- Creativity, Innovation and Intellectual property right
- Concept and need in present time for an engineer

## Unit VIII:

- Rules & Ethics
- Basic rules, laws and norms to be adhered by engineers during their working

## RECOMMENDED BOOKS

- Employability skills by Kapil Dev, Vishnu P. Singh Asian Pub. New Delhi
- Employability skills for Diploma students by Dr. S.K. Singh, Vayu Education, New Delhi