

## **Sixth Semester**

### **UTILIZATION OF ELECTRICAL ENERGY (DEE-601)**

**Discipline core (DC): Credit 3(3-0-0)**

#### **Objective:**

This subject assumes importance in view of the fact that an electrical technician has to work in a wide spectrum of activities wherein he has to make selection from alternative schemes making technical and economical considerations; e.g. to plan and design an electrical layout using basic principles and handbooks, to select equipment, processes and components in different situations. The contents have been designed keeping the above objectives in view. Besides giving him basic knowledge in the topics concerned, attempts have been made to ensure that the knowledge acquired is applied in various fields as per his job requirements.

#### **COURSE OUTLINE:**

1. Illumination: (12 Periods)
  - 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.
  - 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.
4. Electrolytic Processes (10 Periods)
  - 4.1 Need of electro-deposition
  - 4.2 Laws of electrolysis, process of electro-deposition - clearing, operation, deposition of metals, polishing and buffing
  - 4.3 Equipment and accessories for electroplating
  - 4.4 Factors affecting electro-deposition
  - 4.5 Principle of galvanizing and its applications
  - 4.6 Principles of anodizing and its applications
  - 4.7 Electroplating of non-conducting materials
  - 4.8 Manufacture of chemicals by electrolytic process
  - 4.9 Power supplies for electroplating
5. Electrical Circuits used in Refrigeration, Air Conditioning and Water Coolers (10 Periods)

- 5.1 Principle of air conditioning, vapour pressure, refrigeration cycle, eco-friendly refrigerants
- 5.2 Description of Electrical circuit used in
  - a) Refrigerator,
  - b) Air-conditioner, and
  - c) Water cooler
- 6. Electric Drive (20 Periods)
  - 6.1 Advantages of electric drives
  - 6.2 Characteristics of different mechanical loads
  - 6.3 Types of motors used as electric drive
  - 6.4 Electric braking
    - 6.4.1 Plugging
    - 6.4.2 Rheostatic braking
    - 6.4.3 Regenerative braking
  - 6.5 General idea about the methods of power transfer by direct coupling by using devices like belt drive, gears, chain drives etc.

### **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

### **Micro Hydel and Non-conventional Energy Sources (DEE-603)**

#### **Open Elective (OE): Credit 4(3-0-2)**

**Objective:** Energy is a crucial input in the process of economic, social and industrial development. High energy consumption has traditionally been associated with higher quality of life, which in turn is related to Gross National Product (GNP). Since the conventional energy resources are under depletion, it is high time to tap the non conventional energy sources like solar and bio- energy. Uttarakhand is rich in hydro energy and lot of potential for self employment exists in setting up Micro Hydro plant. This subject is included to take care of special need of the state.

### **COURSE OUTLINE:**

- 1. Micro Hydel Plants
  - 1.1 Small and Micro Hydro Electric Power Plants: An Overview
  - 1.2 Advantages and Disadvantages of Small and Micro Hydro Schemes
  - 1.3 Layout of a Micro Hydro Scheme
  - 1.4 Main Elements of a Micro Hydro Plant
  - 1.5 Water turbines
  - 1.6 Turbine Classifications, Characteristics and Selection
  - 1.7 Generators
  - 1.8 Specifications of Turbine, Generator and Governor System used in Small and Micro Hydro Electric Power Plants

## 2. Micro Hydro Electric Power Plants: Automation, Control and Case Studies

### 2.1 Power Generation in Micro Hydro Electric Power Plants

### 2.2 Automation, Control and Monitoring of Micro Hydro Electric Power Plants

### 2.3 Efficiency and Limitations

### 2.4 Case Studies

## 3. Micro Hydro Electric Power Plants: Erection and Commissioning, Operation and Maintenance

### 3.1 Erection

### 3.2 Commissioning

## 4. Non-Conventional Sources of Energy

Importance of Non conventional sources of energy, Present Scenario, Future Prospects, Economic Criteria

### 5. Solar Energy

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

### 6. Bio-energy

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

### 7. 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

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.

### 9. 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.

## **PLC & MICROCONTROLLERS (DEE-603)**

### **Open Elective (OE): Credit 4(3-0-2)**

**Objective:** A diploma holder when employed in automated industrial process controls or in automated power station will be required to know the basics of Programmable Logic Controllers, their working and their programming. In industry, many manufacturing processes demand a sequence of operation, which are to be performed repetitively. Early automation systems were mechanical in design, timing and sequencing being effected by gears and cams. Slowly these design concepts were

replaced by electrical drives which were controlled by relays and now by programmable logic controllers (PLCs). A PLC is a solid state device, designed to operate in noisy industrial environments and can perform all logic functions.

### **COURSE OUTLINE:**

#### 1. Introduction to PLC

What is PLC, concept of PLC, Building blocks of PLC, Functions of various blocks, limitations of relays. Advantages of PLCs over electromagnetic relays. Different programming languages, PLC manufacturer etc.

#### .2. Working of PLC

##### 2.1 Basic operation and principles of PLC

##### 2.2 Architectural details processor

##### 2.3 Memory structures, I/O structure

##### 2.4 Programming terminal, power supply

#### 3. Instruction Set

##### 3.1 Basic instructions like latch, master control self holding relays.

##### 3.2 Timer instruction like retentive timers, resetting of timers.

##### 3.3 Counter instructions like up counter, down counter, resetting of counters.

#### 4. Ladder Diagram Programming

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

#### 5. Applications of PLCs

##### 5.1 Assembly

##### 5.2 Packaging

##### 5.3 Process controls

##### 5.4 Car parking

##### 5.5 Doorbell operation

##### 5.6 Traffic light control

##### 5.7 Microwave Oven

##### 5.8 Washing machine

##### 5.9 Motor in forward and reverse direction

##### 5.10 Star-Delta, DOL Starters

##### 5.11 Paint Industry

##### 5.12 Filling of Bottles

##### 5.13 Room Automation

#### 6. Micro Controller Series (MCS)-51 Over View

##### 6.1 Pin details

##### 6.2 I/o Port structure

##### 6.3 Memory Organisation

##### 6.4 Special function registers

#### 8. Assembly language programming

##### 8.1 Assemblers and Compilers

##### 8.2 Assembler Directives

#### 9. Design and Interface

Examples like: keypad interface, 7- segment interface, LCD, stepper motor. A/D, D/A, RTC interface

10. Introduction of PIC Micro controllers
11. Application of Micro controllers like in relays, buzzer working machine, oven

## **LIST OF PRACTICALS**

### **PLCs**

1. Components/sub-components of a PLC, Learning functions of different modules of a PLC system
2. Practical steps in programming a PLC (a) using a Hand held programmer (b) using computer interface
3. Introduction to step 5 programming language, ladder diagram concepts, instruction list syntax
4. Basic logic operations, AND, OR, NOT functions
5. Logic control systems with time response as applied to clamping operation
6. Sequence control system e.g. in lifting a device for packaging and counting
7. Use of PLC for an application( teacher may decide)

### **Micro Controllers**

1. Familiarization of Micro Controllers (8051) kit
2. Testing of general input/output on Micro controller board
3. Development of Electrical, Instrumentation applications using 8051 micro-controller
4. Use of Microcontroller

## **RECOMMENDED BOOKS**

1. Programmable Logic Controller by Job Dan Otter; P.H. International, Inc, USA
2. Introduction to PLCs by Gary Dunning. McGraw Hill

## **Thermo fluid (DEE-603)** **Open Elective (OE): Credit 4(3-0-2)**

### **COURSE OUTLINE:**

#### **Unit-I**

Introduction and application areas of thermo-fluid sciences, Property, system, and surroundings. Enthalpy and internal energy, state and equilibrium, processes and cycles, Laws of thermodynamics, reversible, irreversible processes, heat and work, Formation of steam, dryness fraction, specific volume, specific enthalpy, specific entropy of saturated and superheated steam, simple numerical problems.

#### **Unit-II**

Introduction to three modes of heat transfer (conduction, convection and radiation) and their governing equations, one dimensional steady state conduction. Thermal conductivity, thermal resistance, convective heat transfer coefficient, critical radius of insulation, Principle laws of thermal radiation, Kirchhoff's law, Stefan Boltzmann's law, emissivity, absorptivity, reflectivity and transitivity, simple numerical problems.

#### **Unit-III**

Properties of Fluid: Mass, density, weight density (specific weight), specific volume,

specific gravity, viscosity (kinematic & dynamic viscosity), surface tension, compressibility and their units, Newtonian fluids. Pressure: Intensity of pressure, pressure head, Pascal's law with, atmospheric pressure, gauge pressure, vacuum pressure, absolute pressure. Measurement of pressure: Piezometer, simple manometer, differential manometer, inverted differential manometer. Loss of Energy in pipe flow: Loss of head during flow through pipelines, major & minor losses, Darcy's and Chezy's formula (without proof), loss of head in pipe due to sudden enlargement, sudden contraction, bend, elbow, obstruction (without Proof), power transmission through pipes, simple numerical problems.

#### Unit-IV

Types of fluid flow. Steady & unsteady, uniform & non-uniform. Laminar & turbulent flows.

Reynold number and its significance, rate of flow, continuity equation, Bernoulli's theorem (without proof) and its limitations; discharge through venturimeter, pitot tube; and small orifice, vena contracta, coefficient of contraction( $C_c$ ), coefficient of velocity( $C_v$ ), coefficient of discharge( $C_d$ ), coefficient of resistance( $C_r$ ), simple numerical problems

#### Unit-V

Hydraulic machines: Introduction, selection of turbines, performance and Complex Number parameters, Complex Number of turbines: specific speed, unit speed. Unit discharge. Unit power, and efficiency, working principle and application of hydraulic coupling. Rotary air compressors, simple numerical problems.

#### **Text books/ Reference Books:**

1. Engineering thermodynamics by P. K. Nag
2. Fundamentals of Thermodynamics by Sonntag, Borgnakke, Van Wylen
3. Fluid Mechanics and Hydraulic Machines by A. R. Bas
4. Hydraulic and Hydraulic Machines by Bansal

### **Automatic Control System (DEE-602)**

#### **Discipline core (DC): Credit 4(3-0-2)**

**Objective:** To understand concepts of the mathematical modeling, feedback control and stability analysis in Time and Frequency domains.

1. To obtain models of dynamic systems in transfer function and state space forms
2. To understand the common control schemes.
3. To analyze the system response and stability in both time-domain and frequency domain

#### **DETAILED CONTENTS**

1. Control System-Function Element & Components:

Terminology, functional block diagram of open loop and closed loop control system examples, effect of feedback on system performance, servomechanism, Modeling of a control system component-dc and ac tachometers, ac and dc servomotor.

2. Block Diagram and Transfer Function:

Transfer function of Physical system, Block diagram algebra, block diagram reduction technique, Signal flow graphs, Rules for drawing signal flow graphs, Mason's gain formula, drawing signal Flow graph from given block diagram, Order and type of the control systems.

### 3. Stability Analysis of Control Systems:

Basic concept and definition of stability, location of roots of characteristic equation, Routh-Hurwitz stability criterion, special cases for Routh-Hurwitz criteria, application of Routh-Hurwitz criterion.

### 4. Time and Frequency Response Analysis:

Transient and steady state response, standard test signals, time response specifications of second order system, frequency response specifications, Bode-plot, Procedure for drawing bode plot and determination of gain margin, phase margin and stability.

### 5. Compensation of Control System:

Different type of compensators- phase lead, phase lag, phase lag-lead. different types of controllers used in process industries-PD, PI and PID.

### **List of Practical:**

1. Characteristics of DC Servomotor.
2. AC Position control system.
3. DC Position control system.
4. ON/OFF Temperature Control system.
5. Step response of second order system.
6. Characteristics of AC Servomotor.
7. Characteristics of synchro pair .
8. Frequency response analysis of LEAD compensating network
9. Frequency response analysis of LAG compensating network
10. Temperature control system using PID.
11. Level control system.
12. Step response and frequency response of a given plant

### **Text Books :**

1. B.S.Manke "Linear Control System "Khanna Publishers, Delhi, Eight Edition:2005
2. I.J.Nagrath , M.Gopal, "Control System Engineering" New Age International Publishers, New Delhi

## **ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT (DEE-604)**

### **Discipline Electives (DE): Credit 3(3-0-0)**

**Objective:** In the present day scenario, it has become imperative to impart entrepreneurship and management concepts to students so that a significant percentage of them can be directed towards setting up and managing their own small enterprises. This subject focuses on imparting the necessary competencies and skills of enterprise set up and its management

#### **COURSE OUTLINE:**

##### **SECTION – A ENTREPRENEURSHIP**

###### **1. Introduction**

###### **1.1 Concept /Meaning and its need**

###### **1.2 Qualities and functions of entrepreneur and barriers in entrepreneurship**

###### **1.3 Sole proprietorship and partnership forms of business organisations**

###### **1.4 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**

###### **2.1 Scanning of business environment**

###### **2.2 Salient features of National and State industrial policies and resultant business opportunities**

###### **2.3 Types and conduct of market survey**

###### **2.4 Assessment of demand and supply in potential areas of growth**

###### **2.5 Identifying business opportunity**

###### **2.6 Considerations in product selection**

###### **3. Project report Preparation**

###### **3.1 Preliminary project report**

###### **3.2 Detailed project report including technical, economic and market feasibility**

###### **3.3 Common errors in project report preparations**

###### **3.4 Exercises on preparation of project report**

##### **SECTION –B MANAGEMENT**

###### **4. Introduction to Management**

###### **4.1 Definitions and importance of management**

###### **4.2 Functions of management: Importance and Process of planning, organising, staffing, directing and controlling**

###### **4.3 Principles of management (Henri Fayol, F.W. Taylor)**

###### **4.4 Concept and structure of an organisation**

###### **4.5 Types of industrial organisations**

###### **a) Line organisation b) Line and staff organisation c) Functional Organisation**

###### **5. Leadership and Motivation**

###### **a) Leadership**

###### **5.1 Definition and Need**



5.2 Qualities and functions of a leader

5.3 Manager Vs leader

5.4 Theories of motivation (Maslow, Herzberg, McGregor)

6. Management Scope in Different Areas

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

### **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

### **PROJECT WORK (DEE-605)** **Discipline core (DC): Credit 4(0-0-8)**

#### **Objective:**

Project work aims at developing skills in the students whereby they apply in totality the knowledge and skills gained through the course in the solution of a practical problem undertaken as a project work. The students have different aptitudes and strengths. Project work, therefore, should match the strengths of students. For this purpose, students should be asked to identify the type of project work, they would like to execute. It is also essential that the faculty of the respective departments may have a brainstorming session to identify suitable project assignments. The project assignment can be individual assignment or a group assignment. There should not be more than 3 students if the project work is given to a group. The students should identify themselves or be given project assignment at least two to three months in advance. The project work identified in collaboration with industry/field organization should be preferred.

Each teacher is expected to guide the project work of 5-6 students at a time. The project assignments may consist of:

- a) Projects related with repair and maintenance of machine parts
- b) Estimating and costing projects
- c) Design of components/ parts/ jigs / fixtures
- d) Projects related to quality control
- e) Project work related to increasing productivity
- f) Project connected with work study
- g) Projects relating to erection, installation, calibration and testing
- h) Projects related to wastage reduction
- i) Projects related to energy audit

**Employable skills (DEE-606)**  
**Discipline core (DC): Credit 2(0-0-4)**

**Objective:** Diploma holders are required to not only possess subject related knowledge but also soft skills to get good jobs and to rise steadily at their workplace. This subject is included to develop employability skills amongst the students

**DETAILED CONTENTS**

1. Industrial Scenario Engineering Education and expectations of competences from an engineer by employer
2. Personality types, characteristic and features for a successful engineer
3. Professional Engineer desirable values and ethics and their development. Relation between engineering profession, society and environment
4. Managing project
  - Leadership·Motivation
  - Time management
  - Resource management
  - Computer Software
  - Interpersonal relationship
  - Engineer economics and fundamentals
- 5.Effective Communication
  - Listening
  - Speaking
  - Writing
  - Presentation Technique/Seminar
  - Group discussion
- 6.Preparing for Employment
  - Searching for job/job hunting
  - Resume Writing
  - Interview technique in personal interview telephonic interview, panel interview, group interview, video conference
- 7.Managing Self
  - Managers body, mind, emotion and spirit
  - Stress Management
  - Conflict resolution
- 8.Continuing professional development
  - Organising learning and knowledge
  - Use of computer for organising knowledge resource
- 9.Creativity, Innovation and Intellectual property right
  - Concept and need in present time for an engineer
- 10.Basic rules, laws and norms to be adhered by engineers during their working

