6.1 EMPLOYABILITY SKILLS – II

L	T	P
-	-	2

RATIONALE

The present day world requires professionals who are not only well qualified and competent but also possess good communication skills. Our diploma students not only need to possess subject related knowledge but also soft skills to get good jobs or to rise steadily at their work place. The objective of this subject to prepare students for employability in job market and survive in cut throat competition among professionals.

DETAILED CONTENTS

1. Oral Practice

i)	Mock interview	(05 hrs)
ii)	Preparing for meeting	(05 hrs)
iii)	Group discussion	(05 hrs)
iv)	Seminar presentation	(05 hrs)
v)	Making a presentation	(12 hrs)

a) Elements of good presentation
b) Structure and tools of presentation
c) Paper reading
d) Power point presentation

6.2 ENERGY MANAGEMENT

L	P
4	-

RATIONALE

One of the reasons for India not been able to catch up with the desired extent of modernization of industrial processes in light of challenges posed by multinationals is the non-availability of required energy supply. The solution primarily lies in tapping all possible energy generation sources but efficient use of available energy is also important. Energy management focuses on these aspects. This course will develop awareness amongst the diploma engineers and will enable them to practice the energy management techniques in whatever field they are engaged in.

DETAILED CONTENTS

1. Energy Management (8 hrs)

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

2. Energy Conservation (14 hrs)

    2.1 Energy conservation in Domestic sector- Lighting, Home appliances
    2.2 Energy conservation in Industrial sector-Industrial lighting, Distribution system, Motor Pumps, Fans, Blowers etc.,
    2.3 Energy conservation in Agriculture sector Tubewell pumps, Diesel-generating sets.
    2.4 Macro Level approach for energy conservation at design stage.

3. Energy Efficient Devices (20 hrs)

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

3.8 Calculation of size of capacitor, shunt capacitors, series capacitors
3.9 Construction and design characteristics of energy efficient motors. Losses in energy efficient motors

4. Energy Audit (16 hrs)

4.1 Energy audit methodology
4.2 Efficiency of energy conversion processes, monitoring system
4.3 Specific energy consumption –three pronged approach, fine tuning, technical up gradation, avoidable losses.
4.4 Case studies of energy audit of distribution system, AC motors, Industries. audit activities.

5. Environmental Impact Assessment (6 hrs)

5.1 Need for environmental impact assessment – definition of EIA, history of EIA
5.2 Standard format for assessment and its completion
5.3 Evaluation of the assessment.

INSTRUCTIONAL STRATEGY

While explaining the need and energy management, the teacher should give students home assignments bases on energy conservation. The students should be made familiar with the energy efficient devices, various approaches to conserve energy, energy auditing procedure etc. Beet learning will take place if students are given real life problems on energy audit.

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 Management Cell.
4. Energy Conservation-case studies in ceramic industry, sugar industry, fertiliser industry, cement industry. CII, Energy Management Cell etc

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr. No.	Topic	Time Allotted (hrs)	Marks Allocation
1.	Energy Management	08	15
2.	Energy Conservation	14	25
3.	Energy Efficient Devices	20	30
4.	Energy Audit	16	25
5.	Environmental Impact Assessment	06	5
Total		**64**	**100**

6.3 TRANSMISSION DISTRIBUTOR OF ELECTRICAL POWER

L	T	P
5	-	-

RATIONALE

Polytechnic passouts who get employment in State Electricity Boards/Corporations have to perform various activities in the field of generation, transmission and distribution of electrical power. The responsibilities and the job requirements of a diploma pass out have become more complex than what they used to be earlier due to complexities associated with the modern interconnected power stations. They are required to work with modern electrical equipment and maintain reliability of supply. The range of these activities vary from simple operation and maintenance of equipment, to administrative jobs including public relations. They should also be made aware of recent developments, current practices in the electricity departments, corporations and boards to keep them abreast with modern techniques in transmission and distribution of electrical power. The teaching of this subject requires reinforcement in the form of visits to substations, power stations and well designed laboratory experiences. A practice-oriented approach to the teaching of this subject is suggested.

DETAILED CONTENTS

1. Transmission Systems (24 hrs)

- Layout of transmission system, selection of voltage for H.T and L.T lines, advantages of high voltage for transmission both a.c and d.c criteria for selection a.c and d.c transmission on voltage levels, highest system voltages in India and in the world
- Comparison of different system: a.c versus d.c for power transmission, conductor material and sizes from standard tables
- Constructional features of transmission lines: concepts of short, medium and long trans suspension, terminal towers, types of supports, types of insulators, types of conductors, selection of insulators, conductors, earth wire and their accessories, transposition of conductors and string efficiency of suspension type insulators, bundle conductors.
- Mechanical features of line: Importance of sag, calculation of sag, effects of wind and ice related problems; Indian electricity rules pertaining to clearance, concept of ground clearance, electrical clearance, galloping of conductors, criteria for selection of towers based on spans, wind span, weight span, ground clearance, uplift and location etc.
- Sag – tension calculations, charts for ground - clearance and uplifts (introduction and concept)
- Electrical features of line: Calculation of resistance, inductance and capacitance without derivation in a.c. transmission line, voltage regulation, and concept of corona. Effects of corona and remedial measures
- Significance of corona, skin and ferranti effects

- Tower Accessories : No pates, phase- plates, anti – climbing devices, bird guard, earthing pipe
- Role of earth wire , shied angle, tower footing resistance
- Maintenance of EHV – transmission lines
- Transmission Losses

2. Distribution System (16 hrs)

- Lay out of HT and LT distribution system, constructional feature of distribution lines and their erection. LT feeders and service mains; Simple problems on a.c radial distribution system, determination of size of conductor
- Preparation of estimates of HT and LT lines (OH and Cables).
- Constructional features of LT (400 V), HT (11 kV) underground cables, advantages and disadvantages of underground system with respect to overhead system.
- Present losses in distribution system in India, Calculation of losses in distribution system, methods to reduce the losses in distribution system
- Faults in underground cables - determination of fault location by Murray Loop Test, Varley Loop Test

3. Power Factor: (06 hrs)

- Concept of power factor
- Reasons and disadvantages of low power factor
- Methods for improvement of power factor using capacitor banks, VAR Static Compensator (SVC)

4. Switch Gears (12 hrs)

- 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)
- Principles of Arc extinction in OCB and ACB, Constructional features of OCB, ACB and their working,
- Circuit breakers - types of circuit breakers, bulk and minimum oil circuit breakers, air blast circuit breakers, SF_6 circuit breakers
- Miniature circuit breakers - ACB, ELCB, MCB, for distribution and transmission system (Descriptive)
- GIS – Switch Gear including its advantages and disadvantages over conventional type of sub stations

5. Sub - Station Layout: Idea about indoor, outdoor and grid sub-stations. Study of layout of 220/132 KV, 66/33 KV – sub stations. (06 hrs)

6. Maintenance of Sub – Station Equipment: daily, weekly, ½ yearly, yearly maintenance schedule, major overhauling of sub – station equipment. (08 hrs)

7. Screening and Earthing of Sub Station: (08 hrs)

- Shielding and screening of sub – stations (concepts of over – voltages, lightening surges)
- Earthing: purpose of earthing, methods of earthing, equipment earthing, substation earthing, system earthing, as per Indian Electricity Rules. Methods of reducing earth resistance concept of earth mat, measurement of earth resistance.

Note: Visits to High Voltage and Grid sub – stations may be arranged for better understanding of sub – station equipment.

INSTRUCTIONAL STRATEGY

Since this is a descriptive and practice oriented subject, it is suggested that visits to different types of power generating stations and substations including grid stations be arranged and various equipment, accessories and component shown the students before the actual class room teaching and make them familiar with the equipment and accessories installed over there. Site engineers from field may be invited for delivering expert lectures on these topics. Help of Video Films may be taken to explain the layout; construction and working of different power equipment. There should be at least 3 visits during the semester. The students may be asked to prepare notes while on visit and submit the report and give seminar. In addition, viva-voce be conducted to evaluate the knowledge gained during the field visit.

RECOMMENDED BOOKS

1. Electrical Power System and Analysis by CL Wadhwa, 3rd edition, New Age International Publishers, New Delhi
2. Substation Design and Equipment by P.S. Satnam and PV Gupta, Dhanpat Rai and Sons, New Delhi
3. Electrical Power vol I&II by SK Sahdev, Uneek Publications, Jalandhar
4. Electrical Power System by VK Mehta, S Chand and Co., New Delhi
5. Electrical Power System by JB Gupta, SK Kataria and Sons, New Delhi
6. Electrical Power Distribution System by AS Pabla, Tata McGraw Hill, New Delhi
7. Electrical Power System by S Channi Singh, Tata McGraw Publishing Co. New Delhi
8. Testing, Commissioning , Operation and Maintenance of Electrical Equipment by S Rao, Khanna Technical Publication, New Delhi
9. Electrical Power Systems by CL Wadhwa, Wiley Eastern Ltd., New Delhi

10. Textbook of Electrical Technology by BL Theraja, S Chand and Co., New Delhi
11. Electrical Power by Dr. SL Uppal, Khanna, Publications, Delhi
12. A Course in Electrical Power by ML Soni, PV Gupta and Bhatnagar, Dhanpat Rai & Sons, New Delhi
13. Principles of Power Systems by VK Mehta, S Chand and Co., New Delhi
14. Preventive Maintenance of Electrical Apparatus by SK Sharotri, Katson Publishing House, Ludhiana

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr. No	Topic	Time Allotted (hrs)	Marks Allocation (%)
1	Transmission Systems	24	30
2	Distribution System	16	20
3	Power Factor	06	07
4	Switch Gears	12	15
5	Sub – Station Layout	06	08
6	Maintenance of Sub -Station	08	10
7	Screening and Earthing of Sub - Station	08	10
	Total	**80**	**100**

6.4 ELECTRICAL PROTECTION

L	T	P
5	-	-

RATIONALE

Polytechnic passouts who get employment in State Electricity Boards/Corporations have to perform various activities in the field of generation, transmission and distribution of electrical power. The responsibilities and the job requirements of a diploma pass out have become more complex than what they used to be earlier due to complexities associated with the modern interconnected power stations. Executive and supervisory control in power stations, transmission and distribution networks in addition to protection of electrical power station. The teaching of this subject requires reinforcement in the form of visits to substations, power stations and well designed laboratory experiences. A practice-oriented approach to the teaching of this subject is suggested.

DETAILED CONTENTS

1. Faults: (12 hrs)

   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 open circuit, simple problems relating to fault finding.

2. Instrument Transformers : (06 hrs)

   - CTs, PTs, / VTs, CVTs, their use, testing and maintenance criteria
   - Concept of wave traps, PLCC - equipment

3. Protection Devices (24 hrs)

   - Fuses, function of fuse, types of fuses, HV and LV fuses, rewire – able, cartridge and HRC
   - Relays:
     a) Introduction- types of relays. Electromagnetic and thermal relays, their construction and working
     b) Induction type over-current, earth fault relays, instantaneous over current relay
     c) Directional over-current, differential relays and their functions
     d) Distance relays and their functions
     e) Idea of static and numerical relays and their applications

4. Protection Scheme (16 hrs)

   - Relays for generator protection (including generator – transformer overall protection)

- Relays for transformer, protection including Buchholz relay protection
- Protection of feeders and bus bars, over current and earth fault protection.
- Distance protection for transmission system
- Relays for motor protection

5. Over-Voltage Protection (16 hrs)

- Protection of system against over voltages, causes of over voltages, utility of ground wire
- Lightning arrestors, rod gap, horn gap, metal oxide type.
- Transmission Line and substation protection against over-voltages and lightning

6. Under Voltage and Frequency Protection (06 hrs)

Concept of under voltage, under frequency, over frequency, protection of electrical system against these.

INSTRUCTIONAL STRATEGY

Since this is a descriptive and practice oriented subject, it is suggested that visits to different types of power generating stations and substations including grid stations be arranged and various equipment, accessories and components explained to the students before the actual class room teaching and make them familiar with the equipment and accessories installed over there. The protection schemes should be shown at the site and engineers from field may be invited for delivering expert lectures on these topics. Help of Video Films may be taken to explain the layout; construction and working of different power equipment. There should be at least 3 visits during the semester. The students may be asked to prepare notes while on visit and submit the report and give seminar. In addition, viva-voce be conducted to evaluate the knowledge gained during the field visit.

RECOMMENDED BOOKS

1. Electrical Power System and Analysis by CL Wadhwa, 3rd edition, New Age International Publishers, New Delhi
2. Substation Design and Equipment by P.S. Satnam and PV Gupta, Dhanpat Rai and Sons, New Delhi
3. Electrical Power vol I & II by SK Sahdev, Uneek Publications, Jalandhar
4. Electrical Power System by VK Mehta, S Chand and Co., New Delhi
5. Electrical Power System by JB Gupta, SK Kataria and Sons, New Delhi
6. Sub-Station Design by Satnam, Dhanpat Rai and Co., New Delhi
7. Electrical Power Distribution System by AS Pabla, Tata McGraw Hill, New Delhi

8. Electrical Power System by S Channi Singh, Tata McGraw Publishing Co. New Delhi
9. Testing, Commissioning , Operation and Maintenance of Electrical Equipment by S Rao, Khanna Technical Publication, New Delhi
10. Electrical Power Systems by CL Wadhwa, Wiley Eastern Ltd., New Delhi
11. Textbook of Electrical Technology by BL Theraja, S Chand and Co., New Delhi
12. Electrical Power by Dr. SL Uppal, Khanna, Publications, Delhi
13. A Course in Electrical Power by ML Soni, PV Gupta and Bhatnagar, Dhanpat Rai & Sons, New Delhi
14. Principles of Power Systems by VK Mehta, S Chand and Co., New Delhi
15. Preventive Maintenance of Electrical Apparatus by SK Sharotri, Katson Publishing House, Ludhiana

SUGGESTED DISTRIBUTION OF MARKS

Sr. No	Topic	Time Allotted (hrs)	Marks Allocation (%)
1	Faults	12	15
2	Instrument Transformers	06	08
3	Protection Devices	24	30
4	Protection Scheme	16	20
5	Over-Voltage Protection	16	20
6	Under Voltage and Frequency Protection	06	07
	Total	**80**	**100**

6.4 PROGRAMMABLE LOGIC CONTROLLERS AND MICROCONTROLLERS

L	P
4	4

RATIONALE

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. PLCs are widely used in all industries for efficient control operations. A diploma holder in industry is called upon to design , modify and troubleshoot such control circuits. Looking at the industrial applications of PLCs in the modern industry, this subject finds its usefulness in the present curriculum.

Microcontrollers have also assumed great significance in the field of electronics and comma goods industry, and thus considered to be an important field of engineering. This subject aims to expose the students to both of these and give them adequate knowledge of these topics.

DETAILED CONTENTS

1. Introduction to PLC (06 hrs)

   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 (08 hrs)

   - Basic operation and principles of PLC
   - Architectural details processor
   - Memory structures, I/O structure
   - Programming terminal, power supply

3. Instruction Set (08 hrs)

   - 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.
   - Arithmetic Instructions (ADD,SUB,DIV,MUL etc.)
   - MOV instruction
   - RTC(Real Time Clock Function)

- Comparison instructions like equal, not equal, greater, greater than equal, less than, less than equal

4. Ladder Diagram Programming (06 hrs)

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

5. Applications of PLCs (04 hrs)

- Assembly
- Packaging
- Process controls
- Car parking
- Doorbell operation
- Traffic light control
- Microwave Oven
- Washing machine
- Motor in forward and reverse direction
- Star-Delta, DOL Starters
- Paint Industry
- Filling of Bottles
- Room Automation

6. Micro Controller Series (MCS)-51 Over View (10 hrs)

- Pin details
- I/o Port structure
- Memory Organisation
- Special function registers

7. Instruction Set Addressing Modes (06 hrs)

- Timer operation
- Serial Port operation
- Interrupts

8. Assembly language programming (06 hrs)

- Assemblers and Compilers
- Assembler Directives

9. Design and Interface (04 hrs)

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

10. Introduction of PIC Micro controllers (04 hrs)

11. Application of Micro controllers (02 hrs)

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 with a study of Architecture of 8085 kit, basic sub systems and input output connectors, functions keys on micro controllers kit
2. Familiarization of Micro Controllers (8051) kit
3. Testing of general input/output on Micro controller board
4. Development of Electrical , Instrumentation applications using 8051 micro-controller

INSTRUCTIONAL STRATEGY

Introduce the subject and make the students familiar with applications of PLCs and Microcontrollers. The inputs shall start with theoretical inputs to architecture, instruction set, assembly language programming, Small projects may be identified, be designed and implemented. PLC ladder diagram and programming should be supplemented with visits to industry. More emphasis may be given to practical work.

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 PlC (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
8) The 8051 Micro controllers Architecture, programming and Applications by Ayala; Penram International
9) Process Control Instrumentation Technology by Johnson, Curits; EE Edition, Prentice Hall of India, New Delhi
10) Microcontrollers by Ayala
11) Microcontrollers by Mazidi
12) Microcontrollers by Neil Makanzie
13) Microcontrollers by Deshmukh

SUGGESTED DISTRIBUTION OF MARKS FOR FACILITATING THE PAPER SETTER

Sr. No	Topic	Time Allotted (hrs)	Marks Allocation (%)
1.	Introduction to PLC	6	10
2.	Working of PLC	8	15
3.	Instruction Set	8	10
4.	Ladder Diagram Programming	6	10
5.	Applications of PLCs	4	5
6.	Micro Controller Sense (MCS)-51 Over View	10	15
7.	Instruction Set Addressing Modes	6	10
8.	Assembly language programming	6	10
9.	Design and Interface	4	5
10	Introduction of PIC Micro controllers	4	5
11	Application of Micro controllers	2	5
	Total	**64**	**100**

6.6 ENTREPRENEURSHIP DEVELOPMENT AND MANAGEMENT

L	T	P
3	-	-

RATIONALE

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.

DETAILED CONTENTS

SECTION – A ENTREPRENEURSHIP

1. Introduction (14 hrs)

- Concept /Meaning and its need
- Qualities and functions of entrepreneur and barriers in entrepreneurship
- Sole proprietorship and partnership forms of business organisations
- 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 (10 hrs)

- 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 (08 hrs)

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

SECTION –B MANAGEMENT

4. Introduction to Management (04 hrs)

- Definitions and importance of management
- Functions of management: Importance and Process of planning, organising, staffing, directing and controlling
- Principles of management (Henri Fayol, F.W. Taylor)
- Concept and structure of an organisation
- Types of industrial organisations

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

5. Leadership and Motivation (03 hrs)

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 (06 hrs)

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, custom duty and VAT

7. Miscellaneous Topics (03 hrs)

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

Note: In addition, different activities like conduct of entrepreneurship awareness camp extension lecturers by outside experts, interactions sessions with entrepreneurs and industrial visits may also be organised.

INSTRUCTIONAL STRATEGY

Some of the topics may be taught using question/answer, assignment or seminar method. The teacher will discuss stories and case studies with students, which in turn will develop appropriate managerial and entrepreneurial qualities in the students. In addition, expert lecturers may also be arranged from outside experts and students may be taken to nearby industrial organisations 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
6. Handbook of Small Scale Industry by PM Bhandari
7. Principles and Practice of Management by L M Prasad; Sultan Chand & Sons, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	14	28
2	10	20
3	08	16
4	04	10
5	03	06
6	06	14
7	03	06
Total	**48**	**100**

6.7 MAJOR PROJECT WORK

L	P
-	6

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

For Students of Electrical Engineering Diploma Programme the project work can be grouped under the following four groups. A number of projects have been mentioned under each section. A student should take at least two projects both of which should not be from the same group. If more than two projects are taken to make up a total of 256 hours, then more than One may be taken from the same group as long as at least two groups are covered. A student is read to choose one project from each section.

Report for all the four project should be prepared and will give a seminar. The same will be assessed for internal and external assessment.

NOTE: Any one from each section:

SECTION A

1.1 **Electrical Machines and Equipment:**

1.1.1 Design and Construction of a small transformer (100 VA to 1 kVA)

1.1.2 Construction of hot air blower

1.1.3 Design and Fabrication of Automatic curtain operator

1.1.4 Fabrication of Automatic Star-Delta starter

1.1.5 Construction of Automatic Water level controller

1.1.6 Construction of Choke for fluorescent tubes

1.1.7 Design and construction of fan regulators (inductance type)

1.1.8 Design and construction of fan regulators (Resistance type)

1.1.9 Design and construction of loading rheostats

1.1.10 Design and construction of Desert coolers/room coolers

1.1.11 Rewinding of single phase Electric Motor up to 1 HP

1.1.12 Rewinding of motors of 3 phase upto 5 HP

1.1.13 Design and construction of Geyser

1.1.14 Rewinding of motors of small domestic appliances(exhaust fan/ceiling fan)

1.1.15 Erection/installation and commissioning of rotating electrical machine

1.1.16 Fault detection and repair of electrical/electronic instruments

1.1.17 Design and assembly of contactor control circuit for various applications

SECTION B

1.2 **Electrical Power:**

1.2.1 Drawing, estimating and costing of electrical installation of the institution from supplier's pole to the institution distribution board.

1.2.2 Drawing, estimating and costing of electrical installation of a workshop having a given number of electrically operated appliances/machines.

1.2.3 To study the laying of underground distribution cable for a small colony starting from main distribution pole

1.2.4 To study the erection erect a 5 pole span overhead line for a small distance for distribution of electrical energy. To energize it and prepare list of material and cost estimates.

1.2.5 Energy audit for the workshop of your institution and to suggest remedies to have low Electricity Bill

1.2.6 To provide a service connection to a consumer's premises for domestic purposes

1.2.7 To survey the load of given area in a village, small colony, calculate the effective load and find out the sizes of the cables/conductors for the proposed distribution system

1.2.8 Designing of light and fan scheme for a institutional or commercial building

1.2.9 To study the augmentation of a nearby pole mounted sub station

1.2.10 To prepare a proposal for substation of your institution, calculating the total load (estimating and costing)

SECTION C

1.3 Electronics Based Projects:

Fabrication of:

1.3.1 Voltage Stabilizer for refrigerator, air-conditioner

1.3.2 Emergency light using SCR

1.3.3 Power amplifier

1.3.4 Low cost intercom for home

1.3.5 Analog computer

1.3.6 Regulated power supply (+ 12V and + 6V) using 7812, 7912 and 7806, 7906

1.3.7 Automatic battery charger using SCR

1.3.8 Digital Clock

1.3.9 FM Radio Receiver

1.3.10 Burglar Alarm

1.3.11 Fabrication of UPS

1.3.12 Automatic street light/dressing table light

1.3.13 Mosquito Repeller

1.3.14 Inverter circuit 500 watt/1 KVA.

1.3.15 Solid State Control of Traffic Lights

SECTION D

1.4 **Fabrication and Testing of:**

1.4.1 Inverter/Emergency light circuit using power transistors

1.4.2 SCR based automatic battery charger

1.4.3 SCR operated illumination controller

1.4.4 SCR operated automatic water level controller

1.4.5 SCR based speed controller for DC shunt motor

1.4.6 Three phase full wave rectifier using power diodes

1.4.7 Timer circuit using 555-IC

1.4.8 SCR controlled rectifier circuit

1.4.9 Speed control circuit of DC shunt motor using SCR

1.4.10 Inverting and non-inverting amplifiers using OP AMP(741)

1.4.11 Comparator circuits using OP AMP (741)

1.4.12 Project using PLC

1.4.13 Project relating to Microprocessor

1.4.14 Project relating to Microcontroller

Note: The quality of end-product and process adopted by the students in its execution should be taken into consideration along with other parameters while evaluating the students

A suggestive criteria for assessing student performance by the external (personnel from industry) and internal (teacher) examiner is given in table below:

Sr. No.	Performance criteria	Max. marks	Rating Scale				
			Excellent	Very Good	Good	Fair	Poor
1.	Selection of project assignment	10	10	8	6	4	2
2.	Planning and execution of considerations	10	10	8	6	4	2
3.	Quality of performance	20	20	16	12	8	4
4.	Providing solution of the problems or production of final product	20	20	16	12	8	4
5.	Sense of responsibility	10	10	8	6	4	2
6.	Self expression/communication skills	5	5	4	3	2	1
7.	Interpersonal skills/human relations	5	5	4	3	2	1
8.	Report writing skills	10	10	8	6	4	2
9.	Viva voce	10	10	8	6	4	2
Total marks		**100**	**100**	**80**	**60**	**40**	**20**

The overall grading of the practical training shall be made as per following table.

In order to qualify for the diploma, students must get “Overall Good grade” failing which the students may be given one more chance to improve and re-evaluated before being disqualified and declared “not eligible to receive diploma”. It is also important to note that the students must get

more than six "goods" or above "good" grade in different performance criteria items in order to get "Overall Good" grade.

	Range of maximum marks	Overall grade
i)	More than 80	Excellent
ii)	79 <> 65	Very good
iii)	64 <> 50	Good
iv)	49 <> 40	Fair
v)	Less than 40	Poor

Important Notes

1. **The internal and external examiner must follow these criteria and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.**

2. **The criteria for evaluation of the students have been worked out for 100 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.**

3. **The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the student's performance as per the above criteria.**

4. **It is also proposed that two students or two projects, which are rated best, be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.**

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

The students must submit Project Report

It is proposed that the institute may organize an annual exhibition of the project items prepared by the students and invite leading Industrial organisations in such an exhibition. It is also proposed that two students or two projects, which are rated best, be given merit certificate at the time of annual day of the institute. It would be better if specific industries are approached for instituting such awards.