

6.1 ELECTRICAL POWER UTILIZATION AND AUTOMATION

L P
Periods 6 2

RATIONALE

This subject assumes importance in view of the fact that an Electrical and Electronics 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. To orient the subject matter in the proper direction, visits to industrial establishments are recommended in order to familiarize the students with the new developments in different areas

DETAILED CONTENTS

1. Illumination: (16 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.

2. Electric Heating (14 Periods)

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)

3. Electric Welding (12 Periods)

3.1 Advantages of electric welding

3.2 Welding method

3.2.1 Principles of resistance welding, types – spot, projection, seam and butt welding, welding equipment

3.2.2 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

4. Electrolytic Processes (12 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 (12 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 Drives and Braking (10 Periods)

Types of Drives – Individual and Group – advantages and disadvantages – types of loads – load curves – problems on load curves – load equalization – fly wheel

– types of enclosures – bearings- noise and reduction methods of noise – motors for different applications – block diagrams of refrigerator and air conditioner – Electric braking- plugging of D.C. Motors and induction motor – problems – Rheostatic braking of D.C. Motors – Regenerative braking of D.C. motors and Induction motors.

7. Electric Traction (10 Periods)

Introduction – classification - speed time curves-Derivation for trapezoidal.

speed time curve- different types of train services, urban and sub-urban- factors affecting scheduled speed – problems on trapezoidal speed time curves – Mechanics of train movement - Tractive effort -Coefficient of adhesion - factors affecting the coefficient of

adhesion – problems on calculation of number of axles-Specific energy consumption – calculations - –overhead equipment - Booster transformer

8. SCADA

(10 Periods)

Introduction ,role of SCADA in dispatch centre, operator console, VDUs, types of communication channels in SCADA system ,RTUs, MTUs, data logger, report generation, report analysis and actions.

LISIT OF PRACTICALS

Students should be taken for (1)visit to nearest electrified railway track and railway station(2) visit to study the electric traction system (3) industrial visit to study the electric installation in a building, (4) visit to electrolysis process. They have to prepare report prepare a report. The evaluation of practical work will be made on the basis of report and presentation.

INSTRUCTIONAL STRATEGY

It is desired to give ample practical examples in the class while teaching this subject. Teacher must supplement his/her classroom teaching with aids such as models, charts, and video films from time to time. This subject requires demonstrations and exposure to actual workplace/industry/field. For this purpose, the subject teacher should do advance planning for visits/studies related to each topic in consultation with HOD and Principal of the polytechnic/institution.

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
7. Generation, Distribution and Utilization if Electrical Power by CL Wadhwa, Wiley Eastern Ltd., New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Periods)	Marks Allocation (%)
1	16	18
2	14	12
3	12	10
4	12	12
5	12	12
6	10	12
7	10	12
8	10	12
Total	96	100

6.2 POWER SYSTEM-II

2

L P
Periods 6 2

RATIONALE

In view of the complexities associated with the modern interconnected power stations, the responsibilities and the job requirements of a diploma pass out have become more complex than what they used to be earlier. He is required to work with modern electrical equipment and maintain reliability of supply. The course is designed to understand the concepts, principles involved in the construction and working of generating stations and protective switch gear system so that one can handle, install, maintain them and also take decisions at his/her level in different situations. 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

COURSE CONTENTS

1. Transmission Lines-

(Period 25)

Need for transmission lines-Transmission supply systems,Relative advantages of AC & DC Transmission, Choice of frequency, Choice of voltage,Effect of voltage, Empirical formula for determining the system voltage, Requirements of conductor material - Types of conductor-Solid-Stranded-Hollow- Bundled conductors -Relative merits of different types of conductors -Transmission parameters: Resistance,Inductance capacitance-skin effect, proximity effect, spirality effect-Determination of resistance of solid, ACSR and AAAC conductors using conductor tables-Determination of inductance of Round and Parallel Conductors ,Transposition of O.H. lines-Effect of transposition on Inductance calculations in transposed lines, Calculation of capacitance in round and parallel conductors -Use of conductor tables of determination of inductance and capacitance of transmission lines-Regulation and % Regulation-Approximate formula for Regulation-Short line calculation of Efficiency-Regulation-Sending end voltage-sending end p.f. for the given receiving end conditions -Regulation-Sending end voltage-sending end p.f. for the given receiving end conditions in medium transmission lines using Nominal π method-Nominal T method - Vector diagrams in the above methods-Charging current in lines-Ferranti's effect-Carona in transmission lines-Power loss due to corona-Effects of corona-Methods of reducing corona - Hot line technique - concept and application.

2. High voltage DC Transmission:

(Period 04)

HVDC projects in India and abroad- Advantages and disadvantages of HVDC transmission. Basics of protection of HVDC systems

3. Line structure for Transmission and Distribution:

(Period 25)

Requirements of line supports, Factors influencing the selection of line support-Types of lines supports-Foundation for poles Descriptive treatment- Cross arms for L.T and H.T lines

upto 33 KV- Pole guys- Conductors spacing and ground clearance-Methods of earthing-L.T., 11 KV and 33 KV lines-Max.earth resistance-Types of towers used for 132 KV and 220 KV /400kv lines spaces-Approximate ground clearance-Foundation to towers Earthing of towers Sag, Factors affecting sag, calculating sag. Disadvantages of loose span, stringing charts, Insulators, Requirements of insulators , Materials used , Types of Insulators, Voltage distribution across string of suspension Insulators, string efficiency, Flashover, Puncture, string efficiency, improving string efficiency, eliminating the ground capacitance, grading, static shielding ,Arcing horns and guard rings, Causes for failure of insulators

4. Substations and Cables

(Period 15)

Definition and classification of sub-stations, Relative merits of indoor and outdoor substations Equipment in sub-stations Bus-bars, Insulators, Switch gear, Transformer, Protective relays, Meters, Lightning arrestors, Cables, Fire fighting equipment, Bus bar arrangements - Typical sketches Typical layouts and sketches of 33/11KV SS, 132/11 KV, Earthing adopted in 132/11KV, 33/11 KV Cables, Comparison between O.H. Lines and underground cables, Classification of cables, Insulation resistance of cables, Specifications of cables

5. Distribution Systems

(Period 08)

Primary and secondary distribution, Feeders, distribution and service mains, Classification of Distribution systems, Radial and Ring system of Distribution, A.C. Distribution - single phase, Steps in voltage drop calculation.

6. Protection of transmission lines and Feeders

(Period 12)

Protection of Transmission Lines and Feeders, Transmission line and feeder protection Pilot wires, protection of transmission lines using distance and impedance relays. Combined protection using definite distance and time distance relays – Protection of radial feeders, parallel feeders, ring main feeders using time graded fuses directional relays. Types of lightning arrestors –Working and applications of rod gap, sphere gap, horn gap, valve type, thyrite type and lead oxide.

7. Lightning Arrestors, Neutral grounding and their applications

(Period 07)

Surge Protection- Need for Surge Protection Surge types and causes of surges –Scheme of surge protection with diagram. Various types of LA"s – Value type, Thyrite type -Necessity of neutral grounding, its merits and de-merits- Methods of Grounding the neutral.

LIST OF PRACTICALS

Visit to power station/substation for the conduct of following practical work:

1. Testing of the dielectric strength of transformer oil and air
2. Study of different types of circuit breakers and isolators
3. Plot the time current characteristics of over current relay
4. Perform the overload and short circuit test of MCB as per IS specifications
5. Plot the time-current characteristics of Kit-Kat fuse wire

6. Taking reading of current on any LT line with clip on meter
7. To study Ferranti's effect
8. To study voltage distribution for single layer and three layer cable.
9. To study Ring main distribution system

SUGGESTION

INSTRUCTIONAL STRATEGY

Since this is a descriptive and practice oriented subject, it is suggested that visits to different types of generating stations and substations be arranged and various equipment, accessories and components explained to the students. 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.

RECOMMENDED BOOKS

1. Principle of Power systems - V.K. Mehta
2. Electrical power - S.L. Uppal
3. Text book of Elect. Power - Soni, Gupta Bhatnagar
4. Electrical Power - JB Gupta
5. Electrical power Systems - CL Wadhwa
6. HVDC Power Transmission system Technology - KR Padiyar

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allocation (%)
1	25	30
2	04	06
3	25	25
4	15	12
5	08	08
6	12	12
7	07	07
Total	96	100

6.3 MICRO CONTROLLERS AND EMBEDDED SYSTEM

L T P

Periods/ Weeks 6 - 3

RATIONALE

Embedded systems and Micro-controllers have also assumed a great significance in the electronic and consumer goods industry and are a very vital field. The subject aims expose students to the embedded systems besides giving them adequate knowledge of Micro controllers.

DETAILED CONTENTS

1. Microcontroller series (MCS) – 51 Overview (25 Periods)
 - Architecture of 8051Microcontroller
 - Pin details
 - I/O Port structure
 - Memory Organization
 - Special Function Registers (SFRS)
 - External Memory
2. Instruction Set; Addressing Modes, Instruction types (16 Periods)
 - Timer operation
 - Serial Port operation
 - Interrupts
3. Assembly/ C language programming (16 Periods)
 - Assembler directives
 - Assembler operation
 - Compiler operations
 - De bugger
 - Simulator
4. Design and Interface (14 Periods)
 - keypad interface, 7- segment interface, LCD, stepper motor. A/D, D/A, RTC interface with programming.
5. Embedded Systems (25Periods)

Introduction, Embedded design concept, Brief description and architecture of AVR and PIC, Application of embedded system such as washing machines, photocopier, cars etc., case study of embedded system. General Idea of

Robotics, Different types of Robots, Their working principles and elements used in robotics.

LIST OF PRACTICALS

1. Familiarization with Micro Controllers (8051) kit
2. Familiarization with Assembly Language Programming
3. C Language Programming- (PC Based)
4. Testing of general input/output on Micro controller board
5. Development of Electrical, Instrumentation applications using 8051 micro-controller
6. Programming for LCD interface.
7. Programming for A/D converter, result on LCD.
8. Programming for D/A converter, result on LCD.
9. Programming for serial data transmission from PC to Kit or Vice versa.
10. Programming to Interface Sensors

RECOMMENDED BOOKS

1. B. B. Brey: The Intel Microprocessors, Architecture, Programming and Interfacing, Pearson Education.
2. Liu Gibson: Microcomputer Systems: The 8086/8088 Family- Architecture, Programming And Design , PHI
3. D. V. Hall: Microprocessors and Interfacing, TMH.
4. Mazidi and Mazidi: The 8051 Microcontroller and Embedded Systems, Pearson Education.
5. Ayala Kenneth:- The 8051 microcontroller, Third Edition, Cengage Learning
6. A. V. Deshmukh: Microcontroller (Theory and Application), TMH.

7. Raj Kamal: Embedded Systems- Architecture, Programming and Design, TMH, New Delhi.

8. V. Udayashankara and M. S. Mallikarjunaswamy: 8051 Microcontroller, TMH, New Delhi.

9. Digital Electronics by Malvino Leach, Tata McGraw-Hill Publishing, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allocation (%)
1	25	25
2	16	20
3	16	20
4	14	10
5	25	25
Total	96	100

6.4 COMPUTER NETWORK

L P

Periods/Weeks 6 3

RATIONALE

Virtually every computer is connected, or has the potential to be connected, to other computers. When connected locally, they provide vital services such as print servers, file servers, CPU servers and when connected externally, offer access to the Internet, world-wide-web and electronic mail. Millions of people worldwide have been exposed to the World Wide Web of computers and the information they provide.

The explosion in the use of such technologies and the long-established use of local area networks has made the study of computer networks and the underlying communication technology as important as the more traditional foundations of computer science such as computer architecture, operating systems and programming.

The future of computer technology is in computer networks. Global connectivity can be achieved through computer networks. A diploma holder in computer engineering should therefore understand the function of networks. Knowledge about hardware and software requirements of networks is essential. It provides an introduction to fundamental concepts in the design and implementation of computer communication networks, their protocols, and applications.

DETAILED CONTENTS

UNIT 1 Introduction Concepts: (12 periods)

Goals and Applications of Networks, Network structure and architecture, Models of network computing, OSI reference model, services, Network Topology Design - Peer-to-peer Network. Server Client Network, LAN, MAN and WAN, Network Services.

UNIT 2 Physical Layer: (18 periods)

Physical Layer Transmission Media, Switching methods. Channel Allocations, LAN 8 protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.

UNIT 3 Network Layer: (18 periods)

Network Layer - Point - to Pont Networks, routing, Congestion control and Internetworking -TCP / IP, IP packet, IP address: Concept of physical and logical addressing - Different classes of IP addressing, special IP address - Sub netting and super netting - Loop back concept, IPv4 and IPv6.

UNIT 4 Network Architecture and connectivity: (18 periods)

ARC net specifications, Ethernet Specification and Standardization: 10 Mbps (Traditional Ethernet), 10 Mbps (Fast Ethernet) and 1000 Mbps (Gigabit Ethernet), Introduction to Media Connectivity (Leased lines, ISDN, PSTN, RF, VSAT, Optical and IPLC)

Network connectivity Devices : NICs, Hubs, Repeaters, Multiplexers, Modems, Routers and Protocols, Firewall, ATM, VOIP and Net-to-Phone Telephony, Laws and Protocols

UNIT 5 Network Trouble Shooting Techniques (12 Periods)

Trouble shooting process, Trouble Shooting Tools: PING, IPCONFIG, IFCONFIG, NETSTAT, TRACEROUT, Wireshark/ Dsniffer/ Pcop

UNIT 6 Transport and Application Layer: (18 periods)

Transport Layer - Design issues, connection management, session and Layer-Design issues, remote procedure call. Presentation Layer- Design issues, Data compression techniques, cryptography. Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals.

LIST OF PRACTICALS

- 1) To study and implement Star, Bus and Ring Topology
- 2) To study & Implement the cable designs in Networking
- 3) To study & Implement the Peer-Peer and client server Network.
- 4) Study of synchronous and asynchronous Serial Communication
- 5) Study and Implementation of PC to PC with IEEE 802.3 and RS- 232 cable.
- 6) To study and demonstrate the performance of token bus and token ring protocols through simulation
- 7) Implementation and study of Stop and Wait, Go Back N and Selective Repeat protocols
- 8) Ethernet LAN protocol to create scenario and Study the performance of CSMA/CD (Carrier Sense Multiple Access with Collision Detection) and compare with CSMA/CA Protocol.
- 9) Study of addressing in TCP/IP and the concept of Ping command.
- 10) Study and demonstration of Subnet calculation of IP address
- 11) Study and Implementation of Distance Vector Routing algorithm
- 12) Study of Data Encryption, Decryption and CRC techniques.

Required Software

- Windows Server/Linux Server

Required Tools and Supplies

- 1) Crimping tool, crone Tool, Cable tester,
- 2) RJ 45 connectors, RJ-11, BNC, SCST
- 3) Coaxial Cable, UTP, STP, OFC cable
- 4) Screwdriver Kit
- 5) Switch/Hub
- 6) Manageable Switch

INSTRUCTIONAL STRATEGY

This subject deals with both theory and practicals. The students should be made to practically establish LAN with various hardware and software and their integration.

RECOMMENDED BOOKS

1. Computer Networks by Tanenbaum, Prentice Hall of India, New Delhi
2. Data Communications and Networking by Forouzan, (Edition 2nd and 4th),Tata McGraw Hill Education Pvt Ltd , New Delhi
3. Data and Computer Communication by William Stallings, Pearson Education, New Delhi
4. Local Area Networks by Peter Hudson
5. Understanding Local Area Network by Neil Jenkins
6. Area Networks by Stan Schatt, Prentice Hall of India, New Delhi
7. Network+ Lab manual,- BPB Publications -by Tami Evanson
8. Networking Essentials – BPB Publications New Delhi
9. Computer Network and Communications By V.K. Jain and Narija Bajaj, Cyber Tech Publications, New Delhi.
10. Linux – Install and Configuration Black Book by Dee Annleblanc and Issac Yates, IDG Books India Private Limited, Delhi.
11. Unleashed Linux by TechMedia Publishers, New Delhi
12. Computer Network by J.S. Katre, Tech-Max Publication, Pune

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1	12	10
2	18	20
3	18	20
4	18	20
5	12	10
6	18	20
TOTAL	96	100

6 EMPLOYABLE SKILLS

22 RATIONALE

L T P
Periods per week - - 2

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 (02 periods)
2. Personality types, characteristic and features for a successful engineer (02 periods)
3. Professional Engineer desirable values and ethics and their development. Relation between engineering profession, society and environment (02 periods)
4. Managing project (08 periods)
 - Leadership
 - Motivation
 - Time management
 - Resource management

- Computer Software
 - Interpersonal relationship
 - Engineer economics and fundamentals
5. Effective Communication (04 periods)
- Listening
 - Speaking
 - Writing
 - Presentation Technique/Seminar
 - Group discussion
6. Preparing for Employment (04 periods)
- Searching for job/job hunting
 - Resume Writing
 - Interview technique in personal interview telephonic interview, panel interview, group interview, video conference
7. Managing Self (03 periods)
- Managers body, mind, emotion and spirit
 - Stress Management
 - Conflict resolution
8. Continuing professional development (02 periods)
- Organising learning and knowledge
 - Use of computer for organising knowledge resource
9. Creativity, Innovation and Intellectual property right (03 periods)
- Concept and need in present time for an engineer
10. Basic rules, laws and norms to be adhered by engineers during their working (02 periods)

SUGGESTED DISTRIBUTION OF MARKS

Topic	Time Allotted (Periods)	Marks Allotted (%)
1	2	8
2	2	8
3	2	8
4	8	18
5	4	12
6	4	12
7	3	9
8	2	8
9	3	9
10	2	8
TOTAL	32	100

6.7 MAJOR PROJECT WORK

	L	P
Periods	-	8

OBJECTIVES

Upon completion of the Project work the student shall be able to apprehend the following:

- 1.1 Identify different works to be carried out in the Project.
- 1.2 Collect data relevant to the project work.
- 1.3 Carry out need literature survey.
- 1.4 Select the most efficient method from the available choices based on preliminary investigation.
- 1.5 Design the required elements of the project work as per standard practices.
- 1.6 Prepare the working modules / equipments required for the project work.
- 1.7 Estimate the cost of project, technological need, computer skills, materials and other equipments.
- 1.8 Prepare the plan and schedule of starting time and sequence of operations to be carried out at the various stages of the project work in detail.
- 1.9 Prepare of critical activities at the various stages of the project work.
- 1.10 Test for various conditions with different electrical input parameter if required.
- 1.11 Implement the given project work and record the results at various places.
- 1.12. Collect necessary information to procure necessary finance, and equipment.
- 1.13 Prepare a chart or model for the project.
- 1.14 Preparation of project report.

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 and Electronics 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 1 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: (Two, only one from one group)

SECTION A

1.1 Project Based on Electrical Machines and Equipment:

- 1.1.1 Design and Construction of a small transformer (100 VA to 1 kVA)
- 1.1.2 Fabrication of Automatic Star-Delta starter
- 1.1.3 Construction of Automatic Water level controller
- 1.1.4 Construction of Choke for fluorescent tubes
- 1.1.5 Design and construction of loading rheostats minimum 5kw
- 1.1.6 Design and construction of Geyser
- 1.1.7 Erection/installation and commissioning of rotating electrical machine
- 1.1.8 Design and assembly of contactor control circuit for various applications

SECTION B

1.2 Project Based on Electrical Power System:

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

1.2.6 To prepare a plan for augmentation of a nearby pole mounted sub station

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

SECTION C

1.3 Project Based Using Electronics Parts :

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 30V/1Ampere

1.3.7 Fabrication of online UPS

1.3.8 Inverter circuit 500 watt/1 KVA.

1.3.9 Solid State Control of Traffic Lights

1.3.10 To develop a computer network (LAN) in building

1.3.11 Lighting control by small circuit

1.3.12 Design of safety measures in intelligent building

SECTION D

1.4 Project Based on Electronic Manufacturing System :

1.4.1 Microprocessor based stepper motor control.

1.4.2 Speed control of DC Machines by Microprocessor/Microcontrollers

1.4.3 Temperature monitoring using Microprocessor/Microcontroller based systems.

1.4.4 Microprocessor/Microcontroller based liquid level indicator and control

1.4.5 Fabrication of PCB circuits using ORCAD/ EAGLE Software.

1.4.6 Fabrication of ON line/OFF line UPS of different ratings and inverters

1.4.7 Design, fabrication and testing of different types of experimental boards

1.4.8 Electronic Weighing Machines

SECTION-E

1.5 Project Based on Fabrication and Testing :

1.5.1 Voltage Stabilizer for Refrigerator, Air-Conditioner

1.5.2 Emergency Light using SCR

1.5.3 Automatic battery charger using SCR

1.5.4 Automatic street light/dressing table light

1.5.5 Inverter circuit 500 watt.

1.5.6 Microprocessor/Microcontroller Based A/D converter

1.5.7 Microprocessor/Microcontroller Based D/A converter

1.5.8 Inverter/Emergency light circuit using power transistors

1.5.9 SCR based automatic battery charger

1.5.10 SCR operated automatic water level controller

1.5.11 SCR based speed controller for DC shunt motor

1.5.12 Speed control circuit of DC shunt motor using SCR

Special Project: If a group of student develops a small entrepreneurial product, then other project is not to be done by them.

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	15	15	12	10	06	04
2.	Planning and execution of considerations	30	30	24	18	12	06
3.	Quality of performance	30	30	24	18	12	04
4.	Providing solution of the problems or production of final product	30	30	24	18	12	06
5.	Sense of responsibility	15	15	12	10	06	03
6.	Self expression/communication Skills	10	10	08	06	04	02
7.	Interpersonal skills/human Relations	10	10	08	06	04	02
8.	Report writing skills	15	15	12	07	06	04
9.	Viva voce	20	20	16	12	08	04
Total marks		175	175	140	105	70	35

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 \diamond 65	Very good
iii)	64 \diamond 50	Good
iv)	49 \diamond 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.

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.