# SARDAR PATEL UNIVERSITY, BALAGHAT

Academic session 2020-21 & Onwards

**Three Year Diploma in Electrical Engineering (EE)**

**DEE601**

**ENERGY CONSERVATION AND MANAGEMENT**

**COURSE CONTENT**

**Unit I**

Energy Scenario- Various types of renewable and non-renewable energy, energy consumption and use pattern, energy consumption and environment.

Energy Management and audit-Energy Management and its objectives, energy audit, need of energy audit, types of energy audit, energy auditing instruments.

**Unit II**

Waste heat recovery- Sources of waste heat, advantages of waste heat 12 recovery, commercial waste heat recovery devices -Recuperators, Heat regenerators, heat pumps etc. Agricultural use of waste heat.

Heating ventilation and air conditioning-Definition of Heating, ventilation and 10 air conditioning, Energy saving opportunities in Heating ventilation and air conditioning, Conducting Audit in Heating ventilation and air conditioning.

**Unit III**

Role of maintenance in energy conservation-Types of maintenance- breakdown, predictive & preventive, maintenance and energy conservation. Demand side management –Benefits, Demand side management Techniques, implementation of Demand side management programme,Tariff options of Demand side management. energy efficient electric drives, use of variable speed drives. Power factor improvement-Causes of low power factor, advantages of power factor improvement, methods of power factor improvement.

**Un** in various sectors-

**it** - For residential and commercial sector

**IV** - in transportation

En - in energy intensive industries Co-Generation

erg - benefits, types of co-generation.

y

co **Unit V**

nse Economic Analysis of energy conservation-Economic analysis of investment, Economic

rva analysis techniques, Risk analysis

tio

n **Refrence Books:**

1. Energy Conservation and Management by S. K. Soni and Manoj Nair, Satya Prakashan, New Delhi
2. Energy management- W.R.Murphy & G.M. ckey, Butter worths
3. Electrical Energy utilization & conservation – Dr. S.C.Tripathi

Four books published by BEE (Bureau of Energy Efficiency) Govt. of India for job.

# SARDAR PATEL UNIVERSITY, BALAGHAT

Academic session 2020-21 & Onwards

**Three Year Diploma in Electrical Engineering (EE)**

DEE602

**INSTALLATION, MAINTENANCE, TESTING**

**Unit I**

Installation - Types of heavy Electrical equipment, unloading accessories 5 Precautions. for unloading, installation of small and large machines of both static and rotating type. Installation of pole mounted transformer

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**Unit II**

Commissioning - Tests required before commissioning procedure to be adopted for commissioning the electrical equipment in respect of - (a) Mechanical fixture and alignment. (b) Electrical tests. (c) Initial precautions for starting.

**Unit III**

Earthing - Reasons of earthing, earthing system, earth lead and its size, permissible earth resistance for different installations, improvement of earth resistance, double earthing, earth resistance measurement, rules for earthing.

**Unit IV**

Insulation testing and maintenance - Instruments usrd for measuring 6 insulation resistance, reasons for deterioration of insulation resistance, improving insulation resistance, drying of insulation, Measurement of internal temperature of winding vacuum impregnation / filtering of insulating oil, testing of insulating oil Preventive maintenance and environmental pollution prevention.

**Unit V**

Preventive measures to control environmental pollution results due to production of smokes gases flow of waste material and automatic reactions 8in research stations, plants, electrical and electronic equipments and accessories

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**LIST OF EXPERIMENTS**

| S. No. | Name of Experiment |
|---|---|
| 1 | Maintenance of Overhead Lines. |
| 2 | Maintenance of switchgear OCB |
| 3 | Maintenance of distribution transformer in distribution system. |
| 4 | Routine / Preventive maintenance of induction motor in textile mills / industrial establishments. |
| 5 | (a) Shut down and energizing procedure.<br>(b) Accident report writing.<br>(c) Permit to work.<br>(d) Fire extinguisher. |
| 6 | Insulation oil testing. |
| 7 | Earth resistance testing. |
| 8 | Test report of electrical installation. |
| 9 | Maintenance schedule. |
| 10 | Trouble shooting. |
| 11 | Report on hot line maintenance. |

**Refrence Books:**


1. Electrical Installations work by T.G. Ffancist. E.L.B.S (Vth metric edition)
2. Electrical Installations Maintenance & fault location work book by T.T.T.I.(W.R.) Bhopal
3. Preventive maintenance Electrical equipment by Charies J Hurburt.
4. Commission of Electrical plant by RCH Richardson.
5. Operation and maintenance of Electrical Equipments Vol. I & Vol.I by B.V.S. Rao, Asia
6. Publishing or Media Promoter Publishers Pvt. Bombay.

# SARDAR PATEL UNIVERSITY, BALAGHAT

Academic session 2020-21 & Onwards

**Three Year Diploma in Electrical Engineering (EE)**

**DEE 603**

**ELECTRIC TRACTION**

**Unit I**

General Description of Electric Traction system in India- Electric Traction – advantage and Disadvantages, Choice of traction system in India.

**Unit II**

System of Track Electrification. Description of various systems - D.C., 1-Phase low A.C., 1-Phase high frequency, 3-Phase A.C. and Composite system. 25 K.V. A.C., 50 Hz System-Advantages and disadvantages.

**Unit III**

A.C. Electric Locomotive. Block diagram of A.C. electric locomotive Overhead equipment (O.H.E.) Pentagonal O.H.E.- catanery construction. OHE Supporting structure Current collection system, current collection gear for OHE, pole collection bow collection, pantograph collector.

**Unit IV**

Traction Mechanics. Speed time curve, Simplified speed time curve, Average speed and schedule speed, Tractive effort, Power of traction motor, Mechanics of train movement.

**Unit V**

Train signaling - System of train lighting, special requirements of train lighting, methods of obtaining unidirectional polarity and constant output. Battery System Failure of under frame generating equipment.

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Academic session 2020-21 & Onwards

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## LIST OF EXPERIMENTS

1 DRAW SPEED CURRENT CHARACTERISTIC OF D.C. SERIES MOTOR.

2 DRAW SPEED TOOQUE CHARACTERISTIC OF D.C. SERIES MOTOR.

3 STUDY OF VARIOUS METHODS FOR SPEED CONTROL OF D.C.

4 STUDY OF POLE AND BOW CURRENT COLLECTOR.

5 STUDY OF PENTAGRAPH CURRENT COLLECTOR.

6 STUDY OF METADYNE CONTROL SYSTEM.

**Refrence Books:**

| S.No. | Title | Author | Publisher |
|---|---|---|---|
| 1. | ELECTRIC TRACTION | A.T. DOVER | PITMIN & SONS |
| 2. | ELECTRIC TRACTION SYSTEM EQUIPMENT | D.W. HINGLE | PERGAMO PRESS |
| 3. | ELECTRIC TRACTION HAND BOOK. | R. BOOKS | PITMAN & SONS. |
| 4. | MODERN ELECTRIC TRACTION. | H. PRATAP | PRITAM BURAI & BROS. |

# SARDAR PATEL UNIVERSITY, BALAGHAT

Academic session 2020-21 & Onwards

**Three Year Diploma in Electrical Engineering (EE)**

**DEE603**
**PROGRAMMABLE LOGIC CONTROLLER**

**Unit I**

Introduction to PLC- What is PLC ,Technical Definition of a PLC Advantage of PLC Chronological Evolution of a PLC Type of PLC Block diagram PLC PLC Hardware, Timers & Counters, Relays Ladder logic diagram PLC Connection Electrical Wiring diagram JIC Wiring Symbols, Latches,Timer, Classification of Timer,PLC Counters, Operation of PLC Counter Counter Parameters.

**Unit II**

Advance Instruction & Programming Techniques- Introduction (a) Comparison Instruction (b) Discussions on Comparison Instruction "EQUAL" "NOTEQUAL" "LESS THEN" "LESS THEN OR EQUAL" "GRATER THEN" "MASKED COMPARISION FOR EQUAL".

**Unit III**

PLC Input-Output (I/O) Modules Power Supply Classification of Input OutputModules Input-Output System Sinking Sourcing Special Input Modules RTD Input Module Stepper Motor Control Module Thermocouple Input Module Power Supply Configuring Power Line conditioner Reliability, Safety and Redundance Filter.

**Unit IV**

PLC Applications- Distributed control system, (DCS Industrial control systems, (ICS) Programmable automation controller, (PAC). Industrial safety systems SCADA

**Unit V**

Industrial Automation & Selection of Programmable Logic Controllers-Introduction

Utility of automation Example of some simple Automated Systems Selection of PLC

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## LIST OF EXPERIMENTS

1. Develop a Simple Ladder Logic Program that will turn on an output X if input A and B or C is on

2. Develop a relay based Controller that will allow three switches in a room to control a single light
3. How temperature control system can be developed in a process industry
4. Develop a traffic control System
5. Speed control of Induction Motor

# SARDAR PATEL UNIVERSITY, BALAGHAT

Academic session 2020-21 & Onwards

**Three Year Diploma in Electrical Engineering (EE)**

**DEE 604P**
**MAJOR PROJECT**

The objective of the course 'Project' is

- Ø To provide students with a comprehensive experience for applying the knowledge gained so far by studying various courses.
- Ø To develop an inquiring aptitude and build confidence among students by working on solutions of small industrial problems.
- Ø To students an opportunity to do something creative and to assimilate real life work situation in institution.
- Ø To adapt students for latest developments and to handle independently new situations.
- Ø To develop good experiences power and presentation abilities in students

Students already have a glimpse of project work as they have worked on Minor Project Work in V semester. This gives the students an occasion to observe the work on real life projects and select some application area in which he/she will be undertaking project. External guide from industry can also be selected for project work along with an internal guide to prepare innovative and real projects. Students also have the flexibility of extending the minor project work into Major project, if the area has a scope for that.

The purpose of providing six hours per week is to orient the student's in-groups on the following objectives:

- Ø Provide general guidelines regarding execution of work.
- Ø Impart instructions regarding write-up work and preparation of project documents.
- Ø Sharing and solving common problems associated with execution of project work.
- Ø Monitor and evaluate the progress of project work.

The faculty and student should work according to following schedule:

1. Each student undertakes substantial and individual project in an approved area of the subject and supervised by member of staff.
2. The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty.
3. The project development must be carried out according to following steps and final write-up should have the same sequence.

- Ø Project objectives.
- Ø Requirement gathering.
- Ø Modeling of project should be done in any well- known modeling tools.
- Ø Analysis of Project.
- Ø Design of Project.
- Ø Implementation of project.
- Ø Testing on project.
- Ø Quality consideration of project.
- Ø Designing a small user manual.
- Ø Estimating the cost of the project.
- Ø Future scope and suggestions.

**ACTION PLAN FOR PROJECT WORK AND EVALUATION SCHEME # (SUGGESTIVE):**

| TASK/PROCESS | WEEK | EVALUTION |
|---|---|---|
| · Orientation of students by HOD/Project supervisor | 1st<br>2nd<br>3rd | - |
| · Literature survey and resource collection | 4th to 6th | Seminar-I |
| · Selection and finalization of topic before a committee* | 7th to 11th | - |
| · Detailing and preparation of project (Modeling, Analysis and Design of Project work) | 12th | - |
| · Development Stage | 13th | - |
| · Testing, improvements, quality control of project | 14th | - |
| · Acceptance testing | 15th | Seminar-II |
| · Report writing | | |
| · Presentation before a committee | | |

*Committee comprises of HOD, all project supervisors including external guide from industry (if any).

# the above marking scheme is suggestive, it can be changed to alternative scheme depending on the type of project, but the alternative scheme should be prepared in advance while finalizing the topic of project before a committee and explained to the concerned student as well.

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## LIST OF SUGGESTED TOPICS

| S. No. | Name of Topic |
|---|---|
| 1 | Solar power generating station |
| 2 | Wind power generating station |
| 3 | Load dispatch techniques in modern power system |
| 4 | Energy auditing of small industrial / commercial / residential / office building |
| 5 | Estimation and costing of wiring of industrial / commercial / residential / office building |
| 6 | Load survey |
| 7 | Software based projects |
| 8 | Industry based projects |

**The faculty and student should work according to following schedule:**

i) Each student undertakes substantial and individual project in an approved area of the subject and supervised by a member of staff.

ii) ii) The student must submit outline and action plan for the project execution (time schedule) and the same be approved by the concerned faculty.

iii) iii) At all the steps of the project, students must submit a written report of the same.

# SARDAR PATEL UNIVERSITY, BALAGHAT

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**Three Year Diploma in Electrical Engineering (EE)**

**DEE 605P**

**Industrial Training/Technical Training**

**SCHEME OF STUDIES**

Duration: 2 weeks after the V semester in the summer break, Assessment in VI semester.

**SCHEME OF EXAMINATION**

For the assessment of industrial training undertaken by the students, following components
are considered with their weightage.

(a) Term work

| In Industry | Marks allotted |
|---|---|
| 1. Attendance and General Discipline | 05 |
| 2. Daily diary Maintenance | 05 |
| 3. Initiative and participative attitude during training | 05 |
| 4. Assessment of training by Industrial Supervisor/s | 05 |
| **TOTAL** | **20** |

(b) Practical/Oral Examination (Viva-Voce)

| In Institution | Marks allotted |
|---|---|
| 1. Training Report | 10 |
| 2. Seminar and cross questioning (defense) | 20 |
| **TOTAL** | **30** |

Marks of various components in industry should be awarded to the students, in consultations with the Training and Placement Officer/Faculty of Institute, Who must establish contact with the supervisor/Authorities of the organisation where, students have taking training to award the marks for term work and I/c of training from Industry. During training students will prepare a first draft of training report in consultation with section in-charge. After training they will prepare final draft with the help of T.P.O./Faculty of the institute. Then they will present a seminar on their training and they will face viva-voce on training in the institute.

## 1.1 OBJECTIVE OF INDUSTRIAL TRAINING

The objective of undertaking industrial training is to provide work experience so that student's engineering knowledge is enhanced and employment prospects are improved. The student should take this course as a window to the real World of Work and should try to learn as much as possible from real life experiences by involving and interacting with industry staff. Industrial training also provides an opportunity to students to select an engineering problem and possibly an industry guide for their Major Project in final semester.Industrial training of the students is essential to bridge the wide gap between the classroom and industrial environment.

This will enrich their practical learning and they will be better equipped to integrate the practical experiences with the classroom learning process.

**1.2 LEARNING THROUGH INDUSTRIAL TRAINING**

During industrial training students must observe following to enrich their learning:

- Industrial environment and work culture.
- Organisational structure and inter personal communication.
- Machines/ equipment/ instruments - their working and specifications.
- Product development procedures and phases.
- Project planning, monitoring and control.
- Quality control and assurance.
- Maintenance system.
- Costing system.
- Stores and purchase systems.
- Layout of Computer/ EDP/MIS centres.
- Roles and responsibilities of different categories of personnel.
- Customer services.
- Problems related to various areas of Work etc.

Faculty and TPO are supposed to plan industrial training in such a manner that students get exposure on most of the above arena in the field (world of work).
Students are supposed to acquire the knowledge on above by -

1. Observation,
2. Interaction with officials at the workplace
3. Study of Literature at the workplace (e.g. User Manual, standards, maintenance schedules, etc.)
4. "Hand's on" experience
5. Undertaking / assisting project work.
6. Solving problems at the work place.
7. Presenting a seminar.
8. Participating in-group meeting/ discussion.
9. Gathering primary and secondary data/ information through various sources, Storage, retrieval and analysis of the gathered data.
10. Assisting officials and managers in their working.
11. Undertaking a short action research work.
12. Consulting current technical journals and periodicals in the library.
13. Discussions with peers.

1.3 GUIDANCE TO THE FACULTY/TPO FOR PLANNING AND IMPLEMENTING THE INDUSTRIAL TRAINING

The industrial training programme, which is spread to 2 weeks' duration, has to be designed inconsultation with the authorities of the work place, keeping in view the need of the contents.
Following are some of the salient points:

- Spelling out the objectives of the industrial training in behavioral terms and same is informed in advance to the 1) students, 2) authorities of the work place and 3) supervising faculty members.

- Discussing and preparing students for the training for which meetings with the students has to be planned.
- Meeting with industrial personnel and orienting them regarding the objective of the training and the expectations of the programme.
- Correspondence with the authorities of the worplace.
- Orientation classes for students on how to make the training most beneficial - monitoring daily diary, writing weekly reports, how to interact with various categories of industrial personnel, how to behave and undertake responsibilities, how to gather information from the workplace,ethics etc.
- Guiding students to make individual plans (week wise/ day wise) to undertake industrial training

- Developing a system of maintaining training records, by teachers for every batch of students for convenient retrieval.
- Inviting industrial personnel to deliver lectures on some aspects of training.

**1.4 ACTION PLAN FOR PLANNING STAGES AT THE INSTITUTION LEVEL**

| S.No. | Activity | Commencing | Week Finishing week | Remarks |
|---|---|---|---|---|
| 1. | Meeting with Directot. | | | |
| 2. | Meeting with Colleagues | | | |
| 3. | Correspondence with work place (Industries concerned) | | | |
| 4. | Meeting with authorities of work place | | | |
| 5. | Orientation of students for industrial training | | | |
| 6. | Scrutinizing individual training plan of students | | | |
| 7. | Commencement of industrial training | | | |
| 8. | First monitoring of industrial training | | | |
| 9. | Second monitoring of industrial training | | | |
| 10. | Finalization of Training report | | | |
| 11. | Evaluation of performance at Industry level | | | |
| 12. | Evaluation of industrial programme in the institution. | | | |

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**1.5 INDUSTRIAL TRAINING**
**DAILY DIARY**

Name of the
Trainee:……College:……
Industry/Work place:……..Week
No.:……Department/Section:……Date:……..

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| Dates | Brief of observations made, work done, problem/project undertaken, discussion held,literature-consulted etc. |
|---|---|

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# SARDAR PATEL UNIVERSITY, BALAGHAT

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**Three Year Diploma in Electrical Engineering (EE)**

**DEE606P**

**PROFESSIONAL ACTIVITIES**

**OBJECTIVES:**

- Ø To allow for professional development of students as per the demand of engineering profession.
- Ø To provide time for organization of student chapter activities of professional bodies) i.e. Institute of engineers, ISTE or Computer Society of India etc.)
- Ø TO allow for development of abilities in students for leadership and public speaking through organization of student's seminar etc.
- Ø To provide time for organization of guest lectures by expert engineers/eminent professionals of industry.
- Ø To provide time for organization of technical quiz or group discussion or any other group activity.
- Ø To provide time for visiting library or using Internet.
- Ø To provide time for group discussion or solving case studies.
- Ø To provide time for personality development of students.
- Ø To provide time for working for social cause like awareness for environmental and ecology etc.

**DETAILED INSTRUCTIONS TO CONDUCT PROFESSIONAL ACTIVITIES:**

A. Study hours, if possible should be given greater time slot with a minimum of two hrs/week to a maximum of four hrs/week.

B. This course should be evaluated on the basis of grades and marksheet of students, should have a separate mention of the grade awarded. There will be no pass/fail in professional activities(PA).

C. Following grade scale of evaluation of performance in PA has been established.

| Grades | Level of performance |
|---|---|
| **A** | **Excellent** |
| **B** | **Good** |
| **C** | **Fair** |
| **D** | **Average** |
| **E** | **Below Expectations** |

D. Grades once obtained in a particular examination shall become final and no chance of improvement in grades will be given to the students.

E. Assessment of performance in PA is to be done internally by the Institution, twice in a Semester/Term through a simultaneous evaluation of the candidate by a group of three teachers, of the deptt. Concerned. Group of teachers will jointly award the grade to candidate in the assessment. Best of the grades obtained by the student in these two assessments shall be finally taken on the mark sheet of the respective Semester/Term.

   Candidate abstaining from the prescribed course work and/or assessment planned at the Institute shall be marked ABSENT in the mark sheet, instead of any grade.

F. While awarding the grades for performance in PA, examining teacher should reach the final consensus based on the attendance, punctuality, interest, presentation skills in seminar on the topic assigned (collection of relevant data, observations, analysis, findings/conclusion) and its written report, awareness of latest developments in the chosen programme of study.

G. Institution shall maintain the record of grades awarded to all the students in PA for a period of 1 year.

H. It shall be mandatory for students to submit a compendium for his PA in the form of a Journal.

I. Compendium shall contain following:
   1. Record of written quiz.
   2. Report/write up of seminar presented
   3. Abstract of the guest lectures arranged in the Institution.
   4. Topic and outcome of the group discussion held.
   5. Report on the problems solved through case studies.
   6. Report on social awareness camps( organized for social and environmental prevention).
   7. Report on student chapter activities of professional bodies like ISTE, IE (India), CSI etc.in them, to execute certain activity.