



**DR. A P J ABDUL KALAM UNIVERSITY,
INDORE**

SYLLABUS
For
DIPLOMA in ELECTRICAL ENGINEERING
(PART TIME)
(4th YEAR, 8th SEM)

College of Polytechnic Engineering

Dr. A P J Abdul Kalam University, Indore

DR. A P J ABDUL KALAM UNIVERSITY, INDORE

Syllabus for Diploma in Electrical Engineering (Part Time)

List of Subject (4th Year, 8th Sem)

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UNIT-1 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-2 Waste heat recovery-Sources of waste heat, advantages of waste heat recovery, commercial waste heat recovery devices-Recuperators, Heat regenerators, heat pumps etc. Agricultural use of waste heat. Role of maintenance in energy conservation-Types of maintenance breakdown, predictive & preventive, maintenance and energy conservation.

UNIT-3 Heating ventilation and air conditioning-Definition of Heating, ventilation and air conditioning, Energy saving opportunities in Heating ventilation and air conditioning, Conducting Audit in Heating ventilation and air conditioning.

UNIT-4 Demand side management –Benefits, Demand side management Techniques, implementation of Demand side management programme, Tariff options of Demand side management.

UNIT-5 Energy efficient motor and drives-Motor efficiency, energy efficient motors, 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.

UNIT-6 Energy conservation in various sectors-For residential and commercial sector, in transportation, in energy intensive industries. Co-Generation benefits, types of co-generation. Economic Analysis of energy conservation-Economic analysis of investment, Economic analysis techniques, Risk analysis.

References

- [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
- [4]Four books published by BEE (Bureau of Energy Efficiency) Govt. of India

UNIT-1 General Description of Electric Traction system in India- Electric Traction, advantage and disadvantages. Choice of traction system in India.

UNIT-2 System of Track Electrification- Description of various systems - D.C., 1-Phase low frequency A.C., 1-Phase high frequency, 3-Phase A.C. and Composite system. 25 K.V. A.C., 50 Hz System-Advantages and disadvantages. Problems associated with A.C traction system, current and voltage unbalance, production of harmonics and induction effects, comparison between A.C. and D.C. system

UNIT-3 Power Supply Arrangements-High Voltage Supply. Constituents of supply system substation, feeding post, feeding and sectioning arrangements, sectioning post, elementary section. Miscellaneous equipment at control posts and switching station. Major equipment at substation, transformer, circuit breaker, interrupters. Protection system for A.C. Traction.

UNIT-4 A.C. Electric Locomotive- Block diagram of A.C. electric locomotive. Overhead equipment (O.H.E.). Pentagonal O.H.E.- catenary construction. OHE Supporting structure Current collection system, current collection gear for OHE, pole collection bow collection, pantograph collector. Air blast C.B.Tap Changer (on load). Transformer. Rectifier connection. Traction motor connection. Smoothing reactor. Desirable characteristics of traction motors. Traction motors-suitability of motors for traction, D.C. Series motors, A.C. Series single phase, repulsion motor, 3-phase I.M. linear I.M. Control of D.C. traction motor, series parallel control, energy saving with series parallel starting, metadyne control, multiple unit control. Requirements of breaking systems, types of electric breaking Conditions necessary to achieve regenerative breaking, suitability of motor.

UNIT-5 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. Requirements. Track circuits. Uses of Different signaling system.

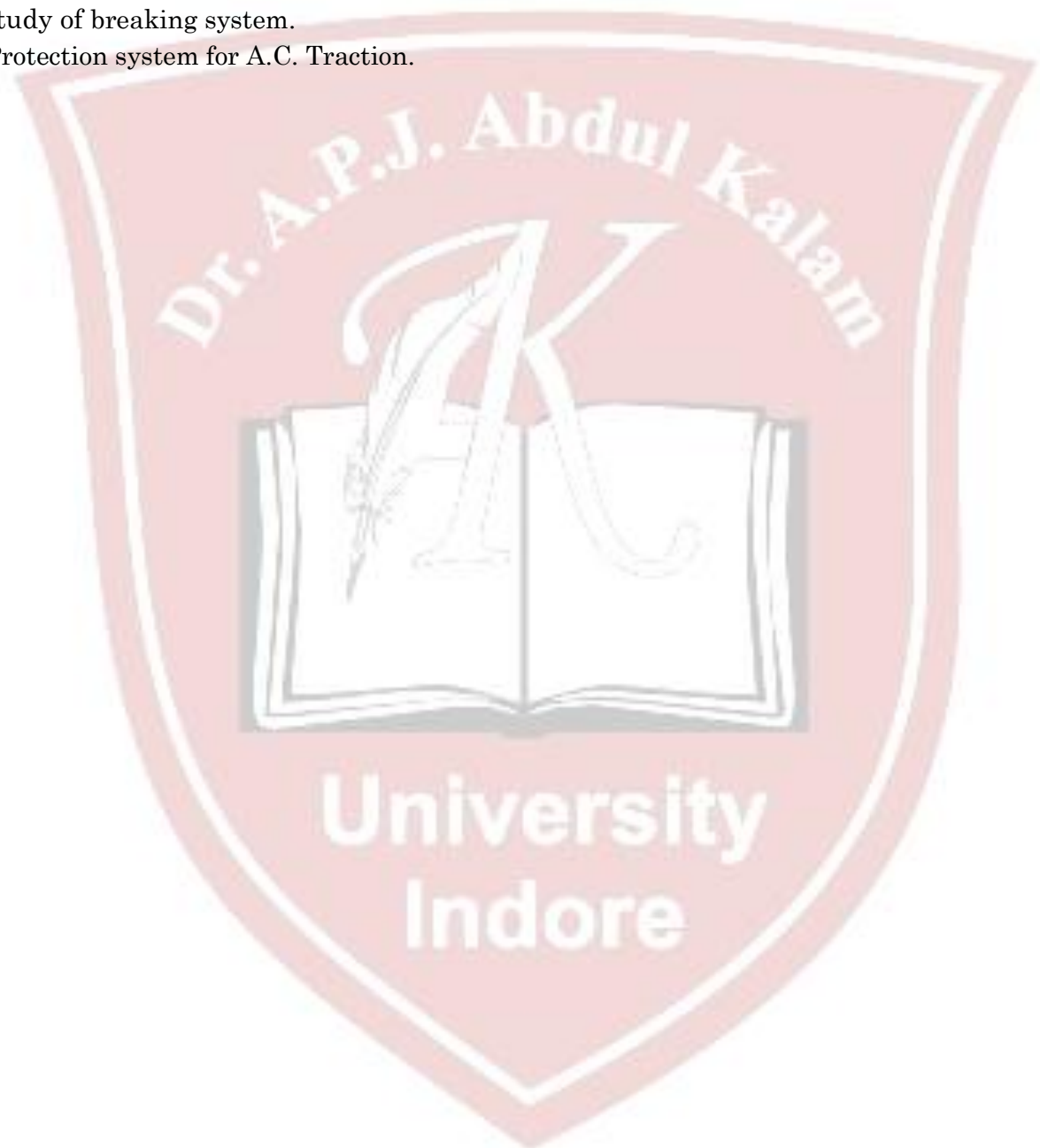
UNIT-6 Traction Mechanics-Types of services. Speed time curve. Simplified speed time curve. Average speed and schedule speed. Tractive effort. Power of traction motor. Specific energy consumption, factors affecting specific energy consumption. Mechanics of train movement. Coefficient of adhesion, factors affecting the coefficient of adhesion.

References

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.

List of Experiments

- [1] Draw Speed Current Characteristic of D.C. Series Motor.
- [2] Draw Speed Torque Characteristic of D.C. Series Motor.
- [3] Study of Various Methods for Speed Control of D.C. Motor.
- [4] Study of Pole and Bow Current Collector.
- [5] Study of Pentagraph Current Collector.
- [6] Study of Metadyne Control System.
- [7] Study of breaking system.
- [8] Protection system for A.C. Traction.



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UNIT-1 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.

UNIT-2 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-3 Advance Instruction & Programming Techniques-

Introduction. Comparison Instruction. Discussions on Comparison Instruction – EQUAL, NOTEQUAL, LESS THEN, LESS THEN OR EQUAL, GRATER THEN, MASKED COMPARISION FOR EQUAL, LIMIT TEST. Mathematical Instruction. Logical Instruction ,Data handling Instruction.

UNIT-4 PLC Input-Output (I/O) Modules Power Supply-

Introduction, Classification of Input Output Modules. 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 Redundancy. Filter.

UNIT-5 Industrial Automation & Selection of Programmable Logic Controllers-

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

UNIT-6 PLC Applications-

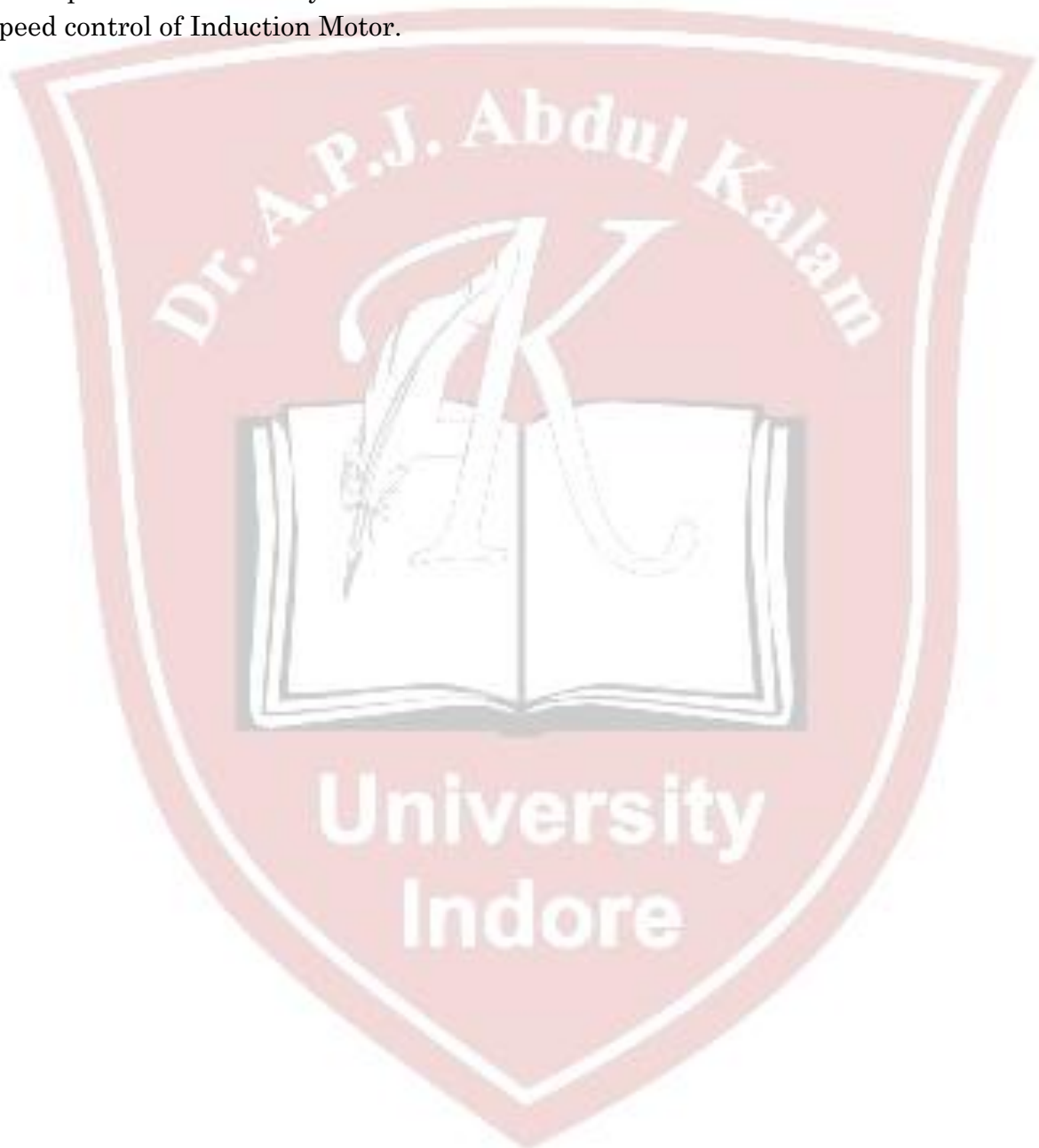
Distributed control system, (DCS). Industrial control systems, (ICS). Programmable automation controller, (PAC). Industrial safety systems. SCADA.

References

1. PLC Programming Method and Application :- John R Hackworth, Fredric D Hackworth (publication:- Pearson Education)
2. Process Dunamic and control, D.E.seborg, T.F.Edgar, D.A.Melichamp (publication:- Wiley publication)
3. Programmable Controllers operation and Application (publication :-PHI publication)
4. Programmable Logic Controllers and Industrial Automation an Introduction By:- Madhuchanda Mitra and Samarjit Sen Gupta (publication:-Penram International Publishing (India) Pvt.Ltd.
5. Programmable Logic Controllers By:-W. Bolten Programmable Logic Controllers and Industrial Automation By:- Kelvin Collins (publication:-Exposure Publishing)
6. Programmable Logic Controllers By:-Collin Simpson
7. Programmable Logic Controllers By:-Morriss Brian publication :-PHI

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.



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Project work is the area in which a student can show his creativity resources fullness, knowledge and various skills attained through the labs and work-shop during the course duration.

Project work leads the student to develop his original thinking, group discussion, leadership; interpersonal relations inter disciplinary relation and polishes his behavior in the society.

He is also exposed to market survey for procurement of components, suiting to the circuit, their equivalents, the process of try outs of circuits, modification of circuit values and finally getting the desired result.

An electronics diploma student has very vast scope of preparing project, as electronics has entered in every walk of life of the society and every hour of one's daily life. The support of the institution, faculty members, and supporting staff is of paramount Importance and their quality is also reflected in the quality of the final shape of the project.

A good project work earns credit for all concerned and increase scope of employment / self employment when presented to potential employer. With this view curriculum cannot be bound in any limits and boundary on papers. Reasonable freedom has to be given for selecting the project work as far as the project is feasible and economically viable and socially useful.

The objective of the course 'Project' is

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

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.

Project objectives.

- Requirement gathering.
- Modeling of project should be done in any well- known modeling tools.

- Analysis of Project.
- Design of Project.
- Implementation of project.
- Testing on project.
- Quality consideration of project.
- Designing a small user manual.
- Estimating the cost of the project.
- Future scope and suggestions.

Action Plan for Project Work

Orientation of students by HOD/Project supervisor, Literature survey and resource collection, Selection and finalization of topic before a committee*, Detailing and preparation of project, (Modeling, Analysis and Design of Project work), Development Stage, Testing, improvements, quality control of project, Acceptance testing, Report writing, Presentation before a committee (including user manual), Seminar-I, Seminar-II. Committee comprises of HOD, all project supervisors including external guide from industry (if any).

References / Sources for Guidance to Student for Selection of Project Work:

1. Electronics Magazines & Journals.
2. District Industries Center.
3. Industry-Institution Interaction (III)
4. Small Scale industry
5. Industrial problems discussed during industry visit/training.
6. Entrepreneurship development Board Magazine.
7. “Prime Minister Rojgar Yojana” projects from district Collectorate.

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Professional Activities is not a descriptive course, as per conventional norms; therefore specific content for this course cannot be prescribed. It is a group of open-ended activities; where in variety of tasks are to be performed, to achieve objectives. However general guidelines for achieving the target and procedure for its assessment are given under the course content.

As the student has to practice this course in all the six semesters, the guidelines given therein are common and applicable to each semester.

OBJECTIVES:

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

I. Record of written quiz.

II. Report/write up of seminar presented

III. Abstract of the guest lectures arranged in the Institution.

IV. Topic and outcome of the group discussion held.

V. Report on the problems solved through case studies.

VI. Report on social awareness camps(organized for social and environmental prevention).

VII. Report on student chapter activities of professional bodies like ISTE, IE (India), CSI etc.

J. PA is not a descriptive course to be taught in the classroom by a particular teacher. Various activities involved in the achievement of objectives of this course should be distributed to a number of teachers so that the talent and creativity of group of teacher's benefit the treatment of the course content.

These activities should preferably be conducted in English language to maintain continuity and provide reinforcement to skill development.

Small groups shall be formed like in tutorials, group discussion, case studies, seminar, project methods, roll play and simulation to make the development of personality affective.

Treatment of PA demands special efforts, attention, close co-operation and creative instinct on the part of teachers of department concerned. Since this course is totally learner centered, many of the activities planned under this course shall come out from the useful interaction of student, among themselves and with the teachers. The guide teacher/s shall best act as a facilitator of these creative hunts/ exercises, which unfold many of the hidden talents of the students or bring out greater amount of confidence in them, to execute certain activity.