



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

SYLLABUS
For
DIPLOMA in ELECTRICAL ENGINEERING
(PART TIME)
(2nd YEAR, 4th 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 (2nd YEAR, 4th SEM)

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UNIT 1 - Energy Conversion Principle

Law of conservation of energy, electromechanical energy conversion, classification of machines.

UNIT 2- D. C. Generator

Principle, construction, armature winding, types of winding, EMF equation, armature reaction and commutation, interpoles and compensating winding. Types of generators, characteristics and applications, losses and efficiency. Simple numericals.

UNIT 3- D. C. Motors

Principle, production of back EMF, torque equation. Classification, characteristics of D. C. motors, starters, speed control, losses and efficiency, applications of motors. Brake test, Swinburn test. Simple numericals.

UNIT 4- Single phase transformers

Principle, construction, classification. EMF equation, turns ratio, name plate rating, phasor diagram, no load and on load equivalent circuit. Voltage regulation, polarity ratio, open and short circuit tests, losses and efficiency, condition of maximum efficiency. All day efficiency and its numerical. Auto transformer. Parallel operation of single phase transformer.

UNIT 5- Three phase transformer

Connections, groups, Scott and open delta connection. Comparison of three phase transformer with bank of three single phase transformers. Parallel operation.

References

1. Electrical Technology Vol. II by B. L. Thareja Khanna Publisher
2. Electrical Machines by Bhattacharya, T.T.T.I.
3. Electrical Machines by Nagrath & Kothari, PHI Publication
4. Electrical Machines Vol. I & II by P.S. Bhimbra, Khanna publishers
5. विद्युत मशीनें एम.के.डियोडिया हिन्दी ग्रंथ अकादमी
6. वैद्युत मशीनें एच.एस.राय दीपक प्रकाशन

List of Experiments

- [1] Study of D. C. Machines (Parts)
- [2] Speed control of D. C. Motor (armature and field control method)
- [3] To perform Swinburn test of DC Motor.
- [4] Study of transformer (Parts) (single and three phase)
- [5] To perform polarity test of single phase transformer.
- [6] To perform ratio test of single phase transformer.
- [7] To perform open circuit test of single phase transformer.
- [8] To perform short circuit test of single phase transformer.
- [9] Parallel operation of single phase transformer.

UNIT 1 - Electrical measuring instruments

Classification of measuring instruments, Indicating, recording and integrating types of meters. Errors and types of errors, accuracy, precision and sensitivity. Electrical measuring instruments

Construction, operation. Deflecting, controlling and damping forces, supporting systems, moving coil, electro-dynamometer, moving iron and induction type instruments, simple numerical. Hot wire type instruments, vibration galvanometer, shunt and multipliers, CT & PT.

UNIT 2 - Wattmeter and Energy meters

Dynamometer and induction type wattmeter, Induction type energy meters. measurement of 1-phase and 3-phase power in balanced and unbalanced load condition, 3 phase wattmeter.

UNIT – 3

Measurement of resistance- Classification of resistance, measurement of low, medium, and high resistance. Kelvin's double bridge, wheat-stone bridge, Ammeter, voltmeter method and ohmmeter, multimeter, megger. Importance of earth resistance, Earth tester.

Magnetic measurement- Balastic galvanometer, measurement of flux by B.G. Gressort flux meter, determination of hysteresis loop for ring and bar specimen.

Dielectric measurement- Meaning of dielectric loss, its importance, methods of measurement of dielectric loss by Wattmeter, Schering Bridge.

UNIT -4 A. C. Bridges and Cathode Ray Oscilloscope

Measurement of inductance and capacitance by A.C. bridges. Maxwell, Anderson, Hays, Desauty and Wien's bridge. (no phasor diagram).

Cathode Ray Oscilloscope CRT, Electrostatic and magnetic deflection, time base X and Y amplifiers, controls on the C.R.O. Dual beam oscilloscope. Digital storage and multi-channel CRO .

UNIT- 5 Electronic Instruments and Digital instruments

Electronic Instruments: Transistor volt meter, FETVM, balanced bridge, specification of electronic voltmeter. Single and three phase electronic energy meters, mili-voltmeter and micro-volt meters.

Digital instruments: Digital voltmeters- types, specifications. Digital multimeters. Counter / timers. Universal indicators for voltage, current, frequency, power, power factor, temperature, humidity etc. Digital tachometers (Contact & non Contact type). Digital controllers.

Reference

[1]A.K. Sawhney; 'A course in Electrical & Electronic Measurements & Instrumentation'; Dhanpat Rai & co(p) Ltd ,New Delhi.

[2]G. K. Banerjee,' Electrical and Electronic Measurements'. PHI Learning Pvt.Ltd.

[3] R. B. Northrop,' Introduction to Instrumentation and Measurement'; CRC press Taylor & Francis

[4] Vijay Singh,' Fundamentals of Electrical & Electronic Measurements', New Age International Publishers. <http://www.rgpvonline.com> D

List of Experiments

- [1] Measurement of low resistance by Kelvinn Double bridge.
- [2] Measurement of medium resistance by wheat stone bridge.
- [3] Measurement of insulation resistance by Megger.
- [4] Measurement of inductance by Maxwell's bridge.
- [5] Calibration of Voltmeter, Ammeter, Wattmeter, Energy meter.
- [6] Measurement of P.F. by ammeter, voltmeter and wattmeter method.
- [7] Plot B.H. curve by method of reversal using B.G.
- [8] Use of CRO for measurement of voltage, current, phase and frequency etc.
- [9] Measurement of 3-phase power by two wattmeter method.
- [10] Study and use of digital instruments, e.g. digital multi meter, frequency meter, electronic timers and counters.
- [11] Study and use of various electrical instruments e.g. phase sequence meter, wave meter. M.D. meter, tong tester.
- [12] Study and use of C.T. & P.T. for extension of instrument range.
- [13] Use of multi meter in a circuit for measurement of voltage, current and resistance.



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UNIT-1 Semiconductor Devices

Concept of electronic emission – Different methods of electronic emission and their applications. Diodes - Formation of PN junction, forward biasing and reverse biasing of PN junction, construction, characteristics and application of different types of diodes, Zener diode .

Transistor - PNP/ NPN Junction Transistors, different configurations: CB, CE, CC. Transistors Characteristics, and applications. Special Semiconductor devices – Construction, symbol and application of Tunnel diode, photo diode, varactor, FET, MOSFET, UJT.

UNIT-2 Regulated Power Supply and Rectifiers

Regulated Power Supply - Difference between linear and switch mode power supply, regulated power supply and its limitations, series and shunt power supply using transistors, SMPS (Block diagram only), IC regulated power supply (78XX and 79XX series).

Rectifiers- Single phase, half wave, full wave and bridge types of rectifiers. calculation of output voltage, average and RMS values, ripple factor and rectification efficiency. Filter, and types of filters.

UNIT-3. Amplifiers - Principal of amplification, types of transistor amplifiers, biasing techniques, RC coupled, transformer coupled, and direct coupled amplifiers, push pull Amplifier, advantages and disadvantages, detailed study of circuit diagram, working principle and applications of above amplifiers, use of operational amplifier as comparator, multiplier, summer, integrator and differentiator.

UNIT-4 Oscillators

Principal of oscillation, Types of oscillators such as Hartley, Colpitts, tuned oscillator, Wein bridge oscillator: circuit diagram, principle, working & applications. Non-sinusoidal Generator - Astable, monostable and bistable

UNIT-5 Digital Techniques and Integrated circuits

Number system, binary, decimal number system. Addition, subtraction, multiplication & division of binary numbers. Logic gates- their symbols, truth table and applications.

Concepts of IC's classification, types and their advantages, applications of common IC's such as 741, 555, 810 and digital IC's.

Reference

1. Basic Electronics & Linear Circuits - : By Bhargawa , T.T.T.I. Chandigarh .
2. Basic Electronics - : By V.K. Mehta
3. Electronics Principle - : By Mahta.
4. Digital Electronics - : By Mahino & Leach .
5. Electronics Devices & Circuits - : By G.K. Mithal

List of Experiments

- [1] Study of C.R.O. & multimeter.
- [2] Study of electrical and electronic components.
- [3] Colour coding of Resistors.
- [4] Testing of Diode and Transistor.
- [5] Study of half wave rectifier, full wave rectifier, bridge rectifier with and without filter.
- [6] Study of Zener regulated power supply.
- [7] Study of IC Regulated power supply (78XX and 79XX)
- [8] Study of transistor characteristics.
- [9] To plot the characteristics of diode.
- [10] To plot the characteristics of Zener diode.
- [11] Study of transistor amplifier.
- [12] Study of oscillator.
- [13] Study of astable and monostable multivibrators using transistors and IC 555
- [14] Study of inverting and non-inverting amplifiers using IC 741 and calculation of its gain.

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UNIT-1 Engineering Materials

Introduction of Materials, Need and classification of engineering materials. Metals and alloys-**Ferrous Metals**- Cast Iron, Wrought Iron, Steel, Alloy Steel. **Non Ferrous Metals**- Aluminum, Copper, Lead, Tin, Copper tin-antimony alloy, Bearing Metals, Copper tin alloy, Zinc, Copper Zinc alloy.

UNIT-2 Mechanical Properties and Tests

Properties of Materials- Stiffness, Strength, Ductility, Malleability, Elasticity, Plasticity, Toughness, Brittleness, Hardness and Harden ability, Fatigue

Material Test- Tensile Test, Impact Test (Izod and Charpy), Hardness Test (Brinell, Rockwell and Vickers)

Heat Treatment- Definition and objectives of Heat treatment, Effect of different factors in heat treatments, Heat treatment Process -Annealing, Normalizing, Hardening by Quenching, Tempering, Case hardening, Carburizing

UNIT-3 Thermodynamics

Introduction, Work, Heat & Power, Various thermodynamics properties, Thermodynamic system Thermodynamic State of the System, Process on the system, Statement of 1st and 2nd law of thermodynamics, Law of Ideal gases-Boyle's Law, Charles Law, Gas equation Properties of steam- Enthalpy of Dry and wet steam, Specific volume of dry and wet steam, Internal Energy of Dry and Wet Steam. Boilers- Classification of boilers.

UNIT-4 I.C. Engine

Define Heat Engine, Differentiate I.C. Engine and E.C. Engine, Classification of I.C. Engines. Explain the working of two strokes and four stroke petrol engine with line diagram. Explain the working of two stroke and four stroke diesel engine with line diagram. Indicated Horse Power (IHP), Brake Horse Power (BHP), Mechanical Efficiency.

UNIT-5 Air Compressor and Fluid Mechanics

Introduction of Air Compressor and their classification, Working principle of reciprocating Air-compressor. Industrial uses of Air-compressor. Multistage reciprocating compressor & their merit & Demerit. Rotary compressor. Definition of various fluid properties. Fluid pressure and its measurement. Pascal's Law. Static Pressure- Intensity of pressure at a point in fluid at rest, Pressure head, Absolute and gauge pressure. Simple and differential U type manometers. Total and center of pressure on the plate surface immersed in water Horizontally and vertically.

UNIT-5 Hydrodynamics

Energies in fluid- Pressure energy, Kinetic energy, Potential energy, Total energy. Bernoulli's theorem, its assumption and application. Pitot tube. Venturimeter. Orifice meter. Working principle of Hydraulic Pumps- Reciprocating pump, Centrifugal pump. Working Principles of water turbine, Impulse turbine, Reaction turbine.

UNIT-6 Power Transmission :

Methods of Power transmission. Belt drive -Open and cross belt drive. Application and advantages of belt drive. Velocity ratio of pulleys. Compound belt drive. Effect of slip in the belt drive. Gear drive- simple gear drive. Compound gear drive. Worm and wheel. Bevel gear. Velocity ratio in gear drive. Merit and demerits of gear drive. Simple problems of gear drive.

References

1. General Mechanical Engineering by S.B. Mathur
2. Elements of Mechanical Engineering by Mathur, Mehta & Tiwari
3. Elements of Mechanical Engineering by Raw & Choudhary
4. Fluid Mechanics by R.S. Khurmi.

List of Experiments

- [1] Perform Tensile Test of standard mild steel and C.I. specimen
- [2] Perform Hardness Test Brinell and Rockwell
- [3] Impact Test Izod and Charpy on mild steel specimen
- [4] Study of Boilers- Fire tube ,Water tube ,Bab cock & Wilcox Boiler .Boiler mountings ,Boiler accessories
- [5] Study of steam engine
- [6] Study of I.C. Engine -Two stroke and four stroke Petrol & Diesel Engine.
- [7] Study of Air Compressor, Single stage and multistage compressor their construction and their uses.
- [8] Pressure measurement by manometer
- [9] Determination of coefficients of discharge of the following devices -
 - Venturi meter
 - Rota meter
 - Orifice Meter
 - Pitot tube
- [10] Study of Centrifugal & reciprocating pumps.
- [11] Study of simple gear & compound train in power transmission system

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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 openended 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.

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