Faculty of Engineering & Technology

Study and Evaluation Scheme

Of

Diploma (Engineering)
Diploma – Electrical Engineering

(Applicable w.e.f Academic Session 2016-18 till revised)

AKS UNIVERSITY, SATNA

Study and Evaluation Scheme

** The University Authorities reserve all the rights to make any additions/deletions or changes/modifications to this syllabus as deemed necessary.
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Paper Code</th>
<th>Subjects</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credit</th>
<th>Total Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>08EE301</td>
<td>Electrical And Electronics Measurement And Measuring Instrument</td>
<td>4</td>
<td>1</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>08EE302</td>
<td>Electrical Materials And Circuits</td>
<td>4</td>
<td></td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>08ME306</td>
<td>General Mechanical Engineering</td>
<td>4</td>
<td>1</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>08EE304</td>
<td>Non Conventional Sources of Energy</td>
<td>3</td>
<td>1</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>08EE307</td>
<td>Electrical Engineering Drawing</td>
<td>3</td>
<td>1</td>
<td></td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Paper Code</th>
<th>Subjects</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credit</th>
<th>Total Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>08EE351</td>
<td>Electrical Materials And Circuits (Lab)</td>
<td>2</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>08EE355</td>
<td>General Mechanical Engineering (Lab)</td>
<td>2</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>08EE354</td>
<td>Electrical And Electronics Measurement And Measuring Instrument Lab</td>
<td>2</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Diploma (Electrical engineering)**

**IV semester**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Paper Code</th>
<th>Subjects</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credit</th>
<th>Total Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>08EE401</td>
<td>Generation Transmission And Distribution</td>
<td>4</td>
<td>1</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>08EE406</td>
<td>Instrumentation And Control</td>
<td>4</td>
<td></td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>08EE407</td>
<td>Electrical Machine</td>
<td>4</td>
<td>1</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>08MT404</td>
<td>Industrial Management</td>
<td>3</td>
<td>1</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>08EE408</td>
<td>Fundamental Of Electronics</td>
<td>3</td>
<td>1</td>
<td></td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Paper Code</th>
<th>Subjects</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credit</th>
<th>Total Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>08EE451</td>
<td>Generation Transmission And Distribution (Lab)</td>
<td></td>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>08EE455</td>
<td>Electrical Machine (Lab)</td>
<td></td>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>08EE456</td>
<td>Instrumentation And Control (Lab)</td>
<td></td>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>08EE457</td>
<td>Fundamental Of Electronics (Lab)</td>
<td></td>
<td>2</td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
## Diploma (Electrical engineering) 
### V semester

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Paper Code</th>
<th>Subjects</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credit</th>
<th>Total Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>08EE501</td>
<td>Electrical Estimating and Costing</td>
<td>4</td>
<td>1</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>08EE506</td>
<td>Electric Traction</td>
<td>4</td>
<td></td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>08EE503</td>
<td>Power Electronics</td>
<td>4</td>
<td>1</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>08EE504</td>
<td>Switchgear Operation And Protection</td>
<td>3</td>
<td>1</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>08EE505</td>
<td>Utilization Of Electrical Power</td>
<td>3</td>
<td>1</td>
<td></td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Paper Code</th>
<th>Subjects</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credit</th>
<th>Total Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>08EE555</td>
<td>Electric Traction (Lab)</td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>08EE552</td>
<td>Power Electronics (Lab)</td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>08EE553</td>
<td>Switchgear Operation And Protection (Lab)</td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>08EE554</td>
<td>Utilization Of Electrical Power (Lab)</td>
<td>2</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

## Diploma (Electrical engineering) 
### VI semester

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Paper Code</th>
<th>Subjects</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credit</th>
<th>Total Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>08EE602</td>
<td>Energy Conservation And Management</td>
<td>3</td>
<td>1</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>08EE603</td>
<td>Testing And Maintenance of Electrical Machines</td>
<td>4</td>
<td>1</td>
<td></td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>08EE652</td>
<td>Elective</td>
<td>3</td>
<td>1</td>
<td></td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Paper Code</th>
<th>Subjects</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>Credit</th>
<th>Total Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>08EE652</td>
<td>Testing And Maintenance Of Electrical Machines (Lab)</td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>08EE653</td>
<td>Industrial Project</td>
<td>20</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### List of Elective Subject (Student can Choose any one Subject)

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Subject Code</th>
<th>Subject Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>08EE604</td>
<td>EXTRA HIGH VOLTAGE AC/DC</td>
</tr>
<tr>
<td>2</td>
<td>08EE605</td>
<td>MICROPROCESSOR AND CONTROL SYSTEM COMPONENT</td>
</tr>
</tbody>
</table>
UNIT I: FUNDAMENTALS OF MEASUREMENTS

UNIT II: MEASUREMENT OF CURRENT AND VOLTAGE

UNIT III: MEASUREMENT OF RESISTANCE
Classification of resistance, Measurement of low resistance by Kelvin's double bridge, Measurement of medium resistance by Ammeter and Voltmeter, Whetstone's bridge, Substitution methods, Measurement of high resistance and insulation resistance, Megger, Earth tester and Ohmmeter.

UNIT IV: MEASUREMENT OF CURRENT AND VOLTAGE

UNIT V: A.C. BRIDGES
General equation for bridge balance, Maxwell's inductance bridge, Maxwell's inductance - capacitance bridge, Anderson's bridge, Schering Bridge, Wien's bridge for frequency measurements.

LIST OF EXPERIMENTS:-
1. Study of different electrical & electronics measuring instruments
3. Measurement of medium resistance by wheat stone bridge\ meter bridge
5. Calibration of single phase energy meter.
7. Study of C.R.O
8. Use of CRO for measurement of voltage,
9. Use of CRO for measurement current, phase and frequency
TEXT BOOKS:-
2. Electrical Measurement E.W.Golding
3. Electrical and Electronics Measurement and Instrumentation (HINDI) Mahendra Diodia
   Nav Bharat Pubilcation Merath (U.P)

REFERENCE BOOKS:
1. Electrical Measurement & Instruments J.B.Gupta
2. Electrical Measurement D.R.Nagpal
3. Instrumentation and System Rangan & Shar
Diploma (Engg.)
Electrical Engineering
Semester-III
ELECTRICAL MATERIALS AND CIRCUIT

UNIT I: Principles of Circuit Analysis


UNIT II: Network Theorem

Thevenin’s theorem, Norton’s Theorem, Superposition theorem, Maximum Power transfer theorem, Millman’s Theorem, Reciprocity theorem.(Numerical based on above theorems).

UNIT III: Single phase AC Circuits


UNIT IV: Poly phase AC Circuits

Generation of three phase e. m. f, Phase sequence, polarity marking, Types of three-phase connections, Concept of unbalanced load and balanced load Line, phase quantities and power in three phase system with balanced star and Delta connected load & their interrelationship Advantages of polyphase circuits over single phase circuits.

UNIT V: Electrical materials

Text Books:
1 M.E. Van Valkenburg, “Network Analysis”, Prentice Hall of India
3 C.L Wadhwa, “Network Analysis and Synthesis” New Age International Publishers,
4 D.Roy Choudhary, “Networks and Systems” Wiley Eastern Ltd.

Reference Books:

LIST of EXPERIMENTS

1. To observe Response of R,L and C to A.C supply. Observe the current and voltage wave forms on C. R. O. and determine magnitude and phase angle of voltage and current.
2. To verify the superposition theorem applicable to D.C. circuit.
3. To verify Thevenin’s theorem applicable to D.C circuit
4. To verify Norton’s theorem applicable to D.C circuit
UNIT-I
Properties and Testing of Materials: Introduction, Mechanical properties- Stress, strain, strength, Elasticity, plasticity, Ductility, Toughness, brittleness, hardness, malleability, formability, weldability, tensile, strength, fatigue, Hardenasibility, stiffness, tenacity, Modulus of elasticity, Modulus of rigidity, endurance, persso’s ratio, proportional limit, yield point, ultimate strength.


UNIT-II
Shearing and Bending Moment: Introduction, definition, bending, pure bending, transverse welding, shear force and bending moment, S.F. & B.M. diagrams for cantilever, simply supported and overhanging with paint and U.P.L.

UNIT-III
Stress in Frames: Introduction, classification, perfect, imperfect and redundant frame, stress calculation-graphical method only.

Power & Transmission: Introduction, belt drive gears-types, velocity ratio, Max. power fen belt drive.

UNIT-IV
Hydrostatics: Introduction- fluids and their properties liquid pressure, intensity of pressure, pascal’s law, pressure head of liquid, total pressure, centre of pressure, Determination of centre of pressure in case of inclined plane. Concept of atmospheric and gauge pressure, Absolute pressure.

Fluid Mechanics & Machinery: Introduction, type of flow, Bernoulli’s theorem- statement, and its Application. U-tube differential manometer, venturimeter, pilot tube, orifice meter, Cc, Cv & Cd, Batches- rectangular, triangular and trapezoidal notch- determination of discharge, wire-types, determination of discharge, loss of heads due to sudden contraction, sudden expansion, loss of heads due to friction, hydraulics gradient, total energy, reciprocation pump, centrifugal pump, comparison, water turbines-purpose, type- construction and working of pelton wheel, Franliz and Keplan turbines Hydel power plant.

UNIT-V


Steam Turbine: Introduction, working principle, Types functions and applications

REFERENCE BOOK
1- THERMODYNAMICS BY R. YADAV(CENTRAL BOOK DEPOT.)
LIST OF EXPERIMENTS :-
1- STUDY OF UNIVERSAL testing machine
2- Study of hardness tester and impact testing M/c
3- To perform hardness test on Brinelle hardness testing m/c and Charpy/ izod test on impact testing m/c
4- To prepare joint by welding, soldering and brazing
5- Study of reciprocation pump
6- Study of centrifugal pump
7- Determination of discharge through venturimeter
8- Study of fire tube boiler
9- Study of fiber tube boiler
10- Study of water tube boiler
11- Study of 2/4 stroke petrol engine
12- Study of stroke diesel engine..
Diploma (Engg.)
Electrical Engineering
Semester-III
Non Conventional Sources of Energy

UNIT-I
Introduction: Limitations of conventional energy sources, need and growth of alternate energy sources, basic schemes and applications of direct energy conversion. MHD Generators: Basic principles and Hall Effect, different types of MHD generators, applications and economic aspects.

UNIT-II

UNIT-III
Thermo-electric Generators: Seeback effect, peltier effect, Thomson effect, thermoelectric convertors, brief description of the construction of thermoelectric generators, applications and economic aspects.

UNIT-IV
Fuel Cells: Principle of action, gibbs free energy, general description of fuel cells, types, construction, operational characteristics and applications.

UNIT-V
Miscellaneous Sources: Geothermal system, characteristics of geothermal resources, choice of generators, electric equipment and precautions. Low head hydro plants, definition of lowhead hydro power, choice of site and turbines. Tidal energy, idea of tidal energy, tidal electric generator, limitations.

Reference Books:
1. G.D. Rai, „Non-conventional energy sources”, Khanna Publishers
2. B.H.Khan, „Non Conventional Energy Resources” TMH.

Text Books:
Diploma (Engg.)
Electrical Engineering
Semester-III

ELECTRICAL ENGINEERING DRAWING

UNIT-I
SYMBOLS AND NOTATIONS: Symbols of practical units, multiple and submultiples, types of supplies, single phase, three phase three wire, three phase four wire, D.C. supply etc. Accessories like main switches, distribution board, fan, light fixture, bell, buzzer, lighting arrestor. All types of motor starter, instruments, electronic component etc. Rating plate of machines.

UNIT-II
DOMESTIC WIRING: All types of lighting circuits. Fluorescent tube circuits, intermediate switch circuits, fan circuits, wiring of a residential building. Sodium vapor lamp, mercury vapor lamp.
POWER WIRING: Internal wiring diagrams of single phase motor. Wiring diagrams of D.C. and A.C. motors starters like three phase points shunt motor starter, four point compound motor starter, direct on line (D.O.L.) starter, star-delta starter, contactor type and auto transformer starter. Internal Connections of D.C. series, shunt, and compound motors. Three phase motors: squirrel cage, slip ring, synchronous, etc. Plate earthing and pipe earthing as per I.S.S.

UNIT-III
WINDING DIAGRAM: Simplex type lap and wave diagram for D.C. machines. Single phase and three phase motors winding diagrams.
ELECTRICAL MACHINE DRAWING: Parts of D.C. machine like, magnetic poles, commutator, armature, etc. A.C. machine rotor, slip rings, etc. Various cable sections. Bushing of the transformer. Assembly diagrams of the D.C. machine, A.C. machines and transformer.

UNIT-IV
INSTRUMENT CIRCUITS: Connections of meters in circuits. Ammeter, Bolt meter, Watt meter, energy meter, power factor meter, frequency meter, synchroscope, etc. Current Transformer, Potential Transformer, etc.
ALTERNATOR PANEL DIAGRAM: Panel diagram with circuit breaker, isolator, measuring instruments, synchroscope. Over current and earth fault protection, differential protection, voltage regulator, etc.

UNIT-V
TRANSMISSION AND DISTRIBUTION: All types of transmission towers and distribution poles. Arrangement of various type of cross arms, with insulators, jumpers. Electrical layout of 33Kv/11Kv substation, with all protective devices, etc.

TEXT BOOK: -
1. ELECTRICAL DRAWING BY K.L. NARANG
2. VAIDYUT ABHIYANTRIKI DRAWING (HINDI) BY M.F. QURAISHI, DEEPAK PRAKASAN

REFERENCE BOOK: -
1. ELECTRICAL ENGINEERING DRAWING BY SURJEET SINGH
2. ELECTRICAL ENGINEERING DRAWING WORKBOOK BY T.T.T.I. BHOPAL
Diploma (Engg.)
Electrical Engineering
Semester-IV
GENERATION TRANSMISSION & DISTRIBUTION

UNIT-I
Generation: Conventional & Non Conventional energy sources, Thermal, Hydro and Nuclear power generation (its working principle & layout diagram, site selection, component, equipments), Brief description of MHD, Tidal, Wind, Geothermal, Biogas, photo voltaic. Hydro power station - Types of water turbines, hydro projects. Nuclear power station - Types of reactor, fuel used.

UNIT-II
Transmission: Concept of transmission, single line diagram of complete power system, standard voltage of A. C. transmission. Concept of HVDC transmission system. Overhead lines (i) ) Electrical design: R, L, C of single & three phase line, transposition, corona discharge, and power loss. Type of insulator, string efficiency & voltage distribution, grading ring & arcing horns.
(ii) Transmission line calculation: Lumped and distributed constant “π” & “T” line concept, voltage regulation, transmission efficiency, Ferranti effect.
(iii) Mechanical design: Concept sag – calculation, calculation of sag on equal level support. Effect of wind and temperature on sag. Types of line supports, joints, clamps, earth wires & guards, vibration dampers.

UNIT-III
Distribution: Classification of distribution line, ring main, radial. Permissible voltage drops, calculation, extension of existing lines. IS codes of clearance of conductor, conductor clearance from telephone lines, railway lines, building etc. earthing of lines, stay wire, stay rod etc. Service Mains: Service line to small building, big institution and factories.

UNIT-IV
Tariffs: Types, Flat, Block, Two – part, Maximum demand, power factor tariffs, their merits & demerits, selection of tariffs

UNIT-V

Text Books :-

Reference books :-
LIST OF EXPERIMENTS:
1. To find out the performance of short and medium transmission line by forming simulative network.
2. To study different types of line insulators.
3. To find out voltage distribution and string efficiency by using a simulating network.
4. To study various types of cables and A.C.S.R.
5. To study of current transformer and potential transformer.
6. To find out fusing factor of different types of fuses.
7. Visit to any substation and write a report on it.
8. Visit to any generating station and write a report on it.
Diploma (Engg.)
Electrical Engineering
Semester-IV
INSTRUMENTATION & CONTROL

Unit-I
Measuring System Elements of a measuring system, Block diagram of system configuration, performance, standards, time lag, error, distortion and distortion meters, noise and noise factor.

Unit-II
Transducers definition and classification, mechanical devices as primary detectors, Characteristic & choice of Transducers, Electrical transducers, Advantages of electric transducers, Active and passive transducers, Classification, Resistive, inductive and capacitive transducers, Potentiometric, Metallic and semiconductor strain gauges, Gauge factor, types, material used and applications. Thermistor, RTD, Inductive, LVDT, RVDT and Capacitive transducers and their application. Thermocouples, Piezo-Electric transducers, principle, materials used, mode of operation and application. Frequency generating transducers. Hall effect transducers, Opto-electronic transducers such as photo voltaic, Photo conductive, and photo conductive cells, constructional details, characteristics and applications. Photo diodes and transistors, characteristics and applications. Digital transducers.

Unit-III
Signal Conditioners: Purpose of signal conditioning, Classification, Input modifier, Operational amplifiers circuits used in instrumentation, D.C. amplifier, chopper amplifier. Instrumentation amplifier, characteristics, three amplifier configuration. A/D and D/A converters.

Unit-IV
Measurement of speed: Measurement of speed by stroboscope, photoelectric and reluctance pick-up devices for speed measurement.
Measurement of Flow: Turbine and electromagnetic flow meters, Ultrasonic flow meter.
Measurement of Humidity: Humidity, absolute and relative humidity, Resistive and Capacitive hygrometers.
Measurement of Force and Torque: Electronic weighing system

Unit V
Process Control: Importance and definition of variables, open loop & closed loop control system, Block diagram, servomechanism ON-OFF center
List of Practicals: (Any Ten)
1. Measurement of Distortion using wave distortion meter.
3. Measurement of linear displacement by LVDT and draw its characteristics.
4. Measurement of temperature by-
   (a) Thermocouple  (b) Resistance Thermometer
6. Study and use of data conversion using ADC and DAC.
9. Study and use of synchros in position telemetry system.
11. Study and flow measurement using electromagnetic flow meter.
12. Study of time division and frequency division multiplexing.
14. Study and measurement of temperature using optical and radiation pyrometer.
15. Study of strip chart recorder and magnetic tape recorder.

References:
1. Instrumentation By Cooper
2. Instrumentation Devices and Systems by C S Rangan, G R Sharma and V S V Mani

Textbook:
Diploma (Engg.)
Electrical Engineering
Semester-IV
Electrical Machine

Unit I: ENERGY CONVERSION PRINCIPLES
Law of conservation of energy, electromechanical energy conversion classification of machines, role of electrical energy and uses, electro-mechanical energy conversion principles conditions of production of E.M.F., rotor action, singly excited and doubly excited field system.

UNIT II: D.C. Machine
DC GENERATOR: D.C. Generator Construction of D.C. machine Lap and wave winding (Brief idea) Principle of D.C. generator, Excitation methods and different types of D.C. Generator E.M.F. equation D.C. generator characteristics Losses, Efficiency and condition for maximum efficiency, Concept of armature reaction Effect of armature reaction on commutation and generated voltage. Parallel operation of DC generators and load sharing. DC MOTOR: Different types of D.C. motor, Principle of D.C. motor, Concept of back emf, Torque, speed and power relations, Starters for D.C. shunt and compound motors, Characteristics of D.C. motor, Speed control of D.C. motor, Field control, Armature control, Series parallel control, Testing of D.C. machine by Direct loading Swinburne’s test Hopkinson's test and Calculation of efficiency as a generator and motor

UNIT III: TRANSFORMER
Principle of working, Construction and types, material used in different parts of transformer, Emf equation and transformer ratio, no load and on load vector diagram, voltage drop in transformer, equivalent circuit, O.C & S.C Test, regulation of transformer, losses & efficiency, Sumpner test, parallel operation, auto transformer, basic procedure and steps for design of single phase transformer.
Construction and types of connection of 3-phase transformer, comparison of a bank of 3 no. single phase transformer and three phase transformer, parallel operation of 3-phase transformer, accessories of transformer, cooling of transformer.

UNIT-IV: INDUCTION MOTOR
3-PHASE INDUCTION MOTOR: Production of rotating magnetic field, principle, and types of induction motors. Equivalent circuit, torque equation, torque-slip characteristics. Types of starters, DOL, star delta, Autotransformer type, rotor resistance type, contactor type starter, speed control. No load and blocked rotor test, losses and efficiency, crawling and cogging. Braking and its applications. Double cage IM & its advantages.
1-PHASE INDUCTION MOTOR: Principle, double revolving field theory. Types of motors with their construction, characteristics and applications. Comparison of three phase with single phase induction motors.

UNIT-V: SYNCHRONOUS MACHINE
SYNCHRONOUS MOTOR: Principle, construction, phasor diagram, effect of change in Excitation, V-curves & Inverted V-curves, synchronous condenser, starting of motors, hunting
And its prevention, coding of synchronous machines.

TEXT BOOKS:
1. Electrical Technology By B.L. Theraja. Vol-II.
2. Electrical Machines by Ashfaq Hussain. (Dhanpat Rai & Co.)

REFERENCE BOOKS:
2. Electrical Machine by Dr. P.S. Bimbhara (Khanna Publication)
3. Electrical Machines by Nagrath and Kothari (TMH).
4. A.C. Machines by Langs Dorf (Tata McGraw-Hill)

LIST OF EXPERIMENTS :-
Experiment can cover any of the above topics , following is a suggestive list :
1. Parallel operation of two transformers.
2. To perform Sumpner ‘s (Back to Back ) test on two identical transformers.
3. To perform open circuit test and short circuit test on single phase transformer.
4. To study the speed control of d.c. motor below the normal range by armature resistance control and to plot speed Vs armature voltage , characteristic.
5. To study speed control of d.c. motor above normal range by field control and to plot speed Vs field current , characteristic.
6. To perform load test on 3-phase induction motor.
7. Perform no load and block rotor test on 3 phase induction motor.
8. To perform no load and block rotor test on single phase induction motor.
9. To synchronise a 3-phase alternator with the bus-bar.

List of practical:
1. Study of D C Machine (Parts)
2. Open characteristics (ED/ If) of a D C generator (a) series (b) shunt (c) compound
3. External characteristics of D C Generator (V \ IL)
4. Control the speed of D C series motor.
5. Perform swinburn’s test of D C machine
7. Perform load test on single phase transformer
8. Operate two single phase transformer in parallel having
9. Perform Sumpner’s test on single phase transformer
10. Perform heat run test of single phase transformer
11. Prepare a report on transformer accessories and cooling methods of a Substation
Rationale: Diploma pass-outs are generally engaged in middle level management. It is found necessary to impart the diploma pass-outs at final year level certain concepts, principles, procedures and understanding of management techniques so that he is brought out to a fairly high level of competency in "supervisor-ship." The course has two aspects - behavioral science and mathematical approach towards management. Behavioral science includes communication skills, grievance handling, motivation, morale and leadership. Mathematical approach includes PPC, CPM, PERT and Inventory management. It has been felt necessary to provide the students knowledge about newer trends in management like TQM, JIT, ISO and role of Computers. It is hoped that the course will help the students to be successful in middle management role.

Unit-I


System thinking: System definition and parameters. Different production and nonproduction systems, system design, different types of models under system thinking.

Materials management: Introduction, function, purchase systems, stock turnover, ordered quantity. Inventory, need of inventory control, EOQ and simple numerical problems on EOQ. Safety stock, different techniques of inventory control, ABC analysis (simple treatment only). Stores management - storing procedure and store records.

Unit-II

Production planning and control: Production systems, characteristics of each type, production and consumption rate. PPC functions, Gantt chart, advantages and preparation of Gantt chart (simple cases only), Critical ratio scheduling.

Value analysis: Concept of cost and value, types of value, objectives and procedure of value analysis, VA test, DARSIRI method of VA.

Project planning by network: Network definition, objectives. CPM and PERT, activity, event, network formation, Fulkerson's rule, dependency of activities, dummy activity, duration, EST, EFT, LST, LFT, EPO, LPO, Total float and Free float. Network analysis in tabular form.

Unit-III


Supervision and leadership: Meaning and role of Supervisor in an industry. Older workers and their supervision. Concept of Leadership, qualities of good leader, leadership styles.
UNIT-IV
ORGANISATIONAL DYNAMICS : Characteristics and principles of Organisation, Modern organisational approach, types of organisation, meaning and significance of various types of organisation, resistance to change, factors for reducing the resistance to change.

OPERATIONS RESEARCH : Definition and concept of OR, methods of OR, simple Linear Programming problem formulation and solution by Graphical method.

UNIT-V
NEW TRENDS IN MANAGEMENT : Role of computers in management, Introduction to Management Information System (MIS).
Total Quality Management (TQM) - Introduction, stages of development - Inspection, Quality Control, Quality Assurance, Total Quality Control, TQM. Introduction to ISO-9000. Deming's PDCA Cycle (Plan, Do, Check and Action). Japanese Quality Management, culture, Kaizen Strategy (continuous improvement), Quality Circle, Just In Time (JIT) - concept and application.

REFERENCE BOOKS
1. Learning Package on Industrial Management Publisher : TTTI, Bhopal.
2. CPM and PERT - Principles and Applications By L.S.Shrinath
3. Industrial Organisation and Management By K.K.Ahuja

TEXT BOOKS
1. Production Operation Management By Goel B.S. Pragati Prakashan.
2. Indutrial Engg. and Management By O.P.Khanna. Khanna Publisher.
Diploma (Electrical Engineering)  
Semester-IV  
FUNDAMENTAL OF ELECTRONICS

Unit I: HISTORY OF ELECTRONICS  
a) Generation of electronics: First generation; concept of emission of electrons, Second generation: semiconductor Third generation: SSI fourth generation: concept of LSI VLSI  
b) Semiconductor Device: P-type and N-type semiconductor with energy level diagram PN junction Barrier voltage, Types of PN junction: Grown junction, alloy junction, Diffused junction, epitaxial junction Forward biased & reversed biased junction Diode symbol, circuit diagram for characteristics (forward & reversed) Characteristics, diode equation.

UNIT II: SEMICONDUCTOR DIODE  
a) Types of Diode: Zener diode, Tunnel diode, photo diode, varactor diode  
b) Application of Diode: 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 III: TRANSISTOR  
Types of Transistor, Formation of a transistor P-N-P & N-P-N transistor working, symbol, Leakage current in a transistor, Relationship between alpha & beta, Common Base configuration, Common Emitter configuration, Transistor characteristics UJT, FET and MOSFET: symbol, construction and working.

UNIT IV: AMPLIFIER  
a) Transistor Biasing: D.C & A.C load line, procedure for drawing load line, operating point Biasing of a transistor - need for biasing (give reason) - method of biasing, fixed battery method, emitter resistances method, potential divider method Biasing techniques  
b) Types of amplifier: Principal of amplification, types of transistor amplifiers, feedback amplifier, RC coupled, tuned amplifier, and direct coupled amplifiers, operational amplifier power amplifier and their types (Class A, class B, class AB and class C)

UNIT V : OSCILLATOR  
Oscillator-block diagram treatment, definition, applications, classification, explain damped oscillation, positive feedback amplifier as an oscillator, baekhausen criterion for sustained oscillation, L-C Oscillators - Circuit diagram & working of Hartelley & colpitt’s oscillator, R-C oscillators, R-C Phase shift oscillator, circuit, working, Wien bridge Oscillator-Block diagram Treatment Crystal oscillator - explain piezoelectric Non sinusoidal oscillators - circuit diagram, working.

List of practical:  
1. Color coding and testing of electronic components  
2. To plot Forward & Reverse biased characteristics of diode.  
3. To plot Forward & Reverse biased characteristics of Zener diode.  
5. To Study the filter circuits. a] Capacitor Filter b] Inductor filter & draw wave forms  
6. To Plot Input & output characteristics of transistor in CE mode.  
7. To Plot Input & output characteristics of transistor in CB mode.  
8. To study the Zener Diode as Regulator & calculate load regulation.  
9. To study Single stage common emitter amplifier & plot its frequency response.
10. To study Two stage RC coupled amplifier & plot its Frequency response.

**Text Books:**
2. V.K Mehta, ELECTRONIC PRINCIPLES, S Chand
3. SANJEEV GUPTA, ELECTRONICS DEVICES & CIRCUITS
Unit-I
Principles of estimating, purchase procedure, cost of materials, various charges like labour, stores, overhead tools, contingency etc.

Unit-II

Unit-III
Service connections For a single storey and multistoried building, single phase and three phase service connections, various methods of service connections. Distribution of circuits for light and power load. (Guidance may be taken by the M.P. Electricity Boards estimates).

Unit-IV
Preparation of estimate and costing of 11KV or 33KV line. Selection of routes. Estimates for distribution lines- Location of poles for a given situation or locality. Providing street lights, necessary hardware, stay arrangements, underground cables, providing services lines using underground cables.


Unit-V
Diploma (Electrical Engg.)
Semester-V
ELECTRIC TRACTION

UNIT-I
Requirements of an Ideal traction system. Traction Systems: Non-electric traction systems. Electric traction systems: Straight electric traction, its advantages and disadvantages. Diesel electric traction, its advantages and disadvantages. Systems of track electrification: DC System, composite system—single phase to three phase system and single phase AC to DC system (Kando system). Advantages and disadvantages of single phase 25 Kv AC system over DC system.

UNIT-II
Traction Mechanics: - Units used in traction mechanics. Types of services, speed time curve. Average speed and schedule speed. Factors affecting the schedule speed. Tractive effort, specific energy consumption, factors affecting specific energy consumption. Coefficient of adhesion. (Simple numerical on simplified speed time curves and specific energy consumption).

UNIT-III
Traction Motors: desirable characteristics of traction motors, special features of traction motor. Suitability of DC series motor for traction. Suitability of three phase Induction motor for traction. Traction motor Control: Traction control of DC locomotives and EMUs, series parallel control combined with rheostatic control, transition from series to parallel combination (open circuit transition, shunt transition and bridge transition), energy efficiency and limitations of series parallel cum rheostatic control, chopper control of motors in DC traction systems. Traction control system of AC locomotives: Tap changer, step less voltage control through use of thyristors.

UNIT-IV

UNIT-V
Application of computers in management of electric traction: introduction. Computer capability relevant to electric traction. Advantages of use of computers for management of electric traction.

Reference books:

Text books:

List of Experiment:
1. Study of electric AC locomotives.
2. Study of relays, contactors
3. Study overload protection, earth fault protection of power.
4. Study Differential current protection of traction circuits
5. Study of computer aided locomotive designs.
6. Study of monitoring execution of trip inspection
7. Study the use of computers for management of electric traction system.
Diploma (Engg.)
Electrical Engineering
Semester-V
POWER ELECTRONICS

Unit-I
SCR - Structure, Two transistor model, characteristics, turn-on methods, factor responsible for temperature rise, circuit for over voltage, over current, voltage surge & high dv/dt, Gate production. Modes of heat transfer.

Triggering circuits - Resistance phase shift, UJT, Schmitt trigger. Turn-off types of commutation, methods of commutation. SCR rating, series and parallel connection. Thyristor family and other devices, DIAC, TRIAC, SCS, SUS, LASC, MOSFET, IGRT, GTO, MCT.

Unit-II

Unit-III
Inverter- Series and parallel inverter, current and voltage source inverter, emergency tube light, comparison of inverters using different types of (transistor, MOSFET, IGRT) devices, block diagram of UPS (on load / off load). Applications of Inverter

Unit-IV
Converter- Block diagram of DC to DC converter. Converter duty cycle, variable and constant frequency control method, 1-quadrant 2-quadrant 4-quadrant operation of choppers, applications of choppers. Working of single phase cyclo-converter, basic concept of three phase cyclo converter, application of cyclo-converters.

Unit-V
Speed control of Motors- Advantages of electronic speed control, 4-quadrant operation of DC motors, constant torque and constant horse power operation, speed control of separately excited DC motor, single and 3 phase controlled rectifiers, field failure protection and armature current limiter, speed control using chopper, dual converter. Speed control of induction motor using rectifier, inverter and cyclo-convector (block diagram only). Speed control of slip ring induction motor using SCRS in rotor circuit.

List of Practical:
2. Study of single phase controlled rectifiers.
3. Study of emergency tube light
4. Study of SCR triggering circuits
5. Study of commutation circuits
6. Electronic speed control of d.c.motor
7. Electronic speed control of induction motor
8. Study of UPS
9. Study of chopper

Reference:
1. Power electrics : Circuits, devices & applications, M. H. Rashid, PHI
2. Power Electronics, P.C. Jain, TMH

Textbooks:
1. P.C. Sen, Power Electonics, TMH
2. Dr. P.S. Bhimbhra, Power Electonics, Khanna Pub.
Unit-I

Introduction to power system - Growth of power system in India, future schemes, various elements of power system. Interconnection, its necessity and advantages, planning, operation and improvement of power system. Load study, type of faults.

Representation of power system - Single line diagram, use of standard symbol.

Per unit quantity - definition and advantages, base impedance conversion of per unit values from one base values to other base values. Generalized ABCD constants, their values in terms of circuit parameters. To prove AD-BC=1 characteristics of ABCD constants.

Unit-II


Unit-III

Introduction to protection - Purpose of protective system, requirement and selection. Abnormalities in a power system and their effects. Reasons for failure. Self and non self clearing faults. Use of CT/PT in protective scheme. Definition of terms regarding CT/PT. Advantages of CT/PT. Neutral earthing, their methods and advantages.

Unit-IV

Protective relay - Type of relays- induction, electromagnetic, thermal. Primary and back up relaying. Types of back up relays, causes of failure of primary relaying. Explanation of terms used in relaying. Principle and working of different types of relays- electromagnetic and induction type. Induction type over current relay, reverse power relay, time and current settings. Differential relays., distance relays, thermal relays, inverse current characteristics.

Circuit interruption devices - Function of fuse. fusing factor, fusing characteristic. Application of isolator and circuit breakers. Circuit breaker capacities. Arc formation in C.B. and methods of arc extinction. Definition of various terms with reference to circuit interruption wave form. working principle and operation of Bulk Oil/Minimum oil/air blast/SF CB. Merits and Demerits of different types of C.B.

Unit-V

Protection against over voltages - Causes and effects of over voltage. Traveling wave. Overvoltage protection, earth wire, lighting arresters- Multiple gap type, horn gap type, line type, station type and distribution type. Surge absorber.

Protective schemes- Protection of alternator- various abnormalities, Merz price differential protection, over current and earth fault protection. Protection of transformer- various abnormalities, differential protection, Buchholz relay. Feeder and transmission line protection - time graded and over current protection, current graded system, differential protection. Protection of Induction motors, use of thermal relays and under voltage protection.
List of Practicals:
1. Study of a HVDC system.
2. Study and use of CT/PT employed for protection and determine their ratio error.
3. Study of an Induction type O/C relay and plot the inverse characteristic
4. To study the differential protection of transformer/alternator.
5. Visit to power station
6. Study of different protective elements/schemes- ground wire Lightening arrestors, fuse, circuit breaker.
7. Study of Min. Oil Circuit breaker.

References:
2. Badriram & Vishwakarma, Power System Protection

Textbooks:
Utilisation of Electrical Power

Unit-I Electric Drives
Merits and demerits of electric drives, factors governing selection of motors, drive requirements. Group and individual drive, starting and running characteristics of various motors. Selection of starters, hand operated and contractor type starters, liquid resistor type starter. Speed control of motors, load equalization, use of fly wheel. Motor enclosures, selection of motors for particular service, size and rating of motors.

Unit-II


Unit-III Illumination
Electromagnetic wave spectrum, solid and plane angle, definition of electrical term in use like MSEP, MHSCP etc. sensitivity of human eye. Luminous efficiency, horizontal and vertical laws of illumination, Inverse square law & lambert’s cosine law. Definition of terms used in lighting, lighting scheme, various types of lamps their uses and fittings. Numericals problems on laws of illumination.

UNIT-IV Power factor Improvement
Causes of low power factor, Disadvantages of Low power factor, power factor improvement by using static capacitors, Location of capacitors for power factor improvement, most economical power factor.

Unit-V Electro-chemical processes and storage batteries
Electro deposition and faraday’s laws of electrolysis (numerical). various electro-chemical processes like electroplating, electro-extraction, regions Storage batteries, classification, construction. Battery maintenance. Battery charning, circuit diagram. Application of storage batteries

List of Practicals:
1. Speed control of slip ring induction motor by variation of rotor resistance.
2. To verify the change in power factor by changing load parameters and its improvement using capacitance.
3. To draw ‘V’ curves of synchronous motor.
4. Study and operation of resistance oven and to control its temperature.
5. Study of dielectric / induction heating.
7. Study and operation of various types of lamps.
8. Study of arc welding
Diploma (Electrical Engg.)

Semester-VI

ENERGY CONSERVATION AND MANAGEMENT

UNIT-I

UNIT-II
Tariff and Energy Conservation in Industries: Energy cost and recent MSEB tariffs, application of tariff system to reduce energy bill, energy conservation by improving load factor and power factor.

UNIT-III
Energy conservation in transmission and distribution systems: reactive power compensation, demand side management, system voltage optimization and phase current balancing, losses in transmission and distribution system and its minimization.

UNIT-IV

UNIT-V
Energy Audit: Procedure of energy audit, energy flow diagram and its importance, measurements in energy audit and various measuring instruments, questionnaires for the energy audit, equipment used for energy conservation. IE rules and regulations for energy audit, Electricity act 2003.

Reference books:

Text books:
1. M.J. Steinburg and T.H. Smith Economy Loading of Power plant and Electric system John Willey and sons
UNIT-I
Electrical Accidents and Safety Measures - Electrical accidents, Safety regulations, treatment of
shock, fire extinguishers.

UNIT-II

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

UNIT-IV
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-V
Trouble Shooting -Normal performance of equipment, trouble shooting internal and external faults, instruments and accessories for trouble shooting, trouble shooting charts.

Reference books:
2. C.J. Hubert Preventive Maintenance Hand Books & Journals.

Text book:

List of Experiments:
1. Draw circuit diagram select appropriate meters, connect it to perform routine test on 1 Ø.I.M.
2. To perform routine test on three phase Induction motor, & calculate the different parameters.
3. Select two single phase transformers and to perform polarity test.
4. To perform back to back test.
5. To perform parallel operation of transformer as per I.S.
6. To perform parallel operation of alternator as per I.S.
7. To perform open circuit test on induction motor, plot circle diagram & calculate parameters.
8. To perform short circuit test on induction motor, plot circle diagram & calculate parameters.
9. To perform brake test on DC series motor & plot characteristic of output against torque, speed, load current as per I. S.
Diploma (Electrical Engg.)
Semester-VI
Elective-1
EXTRA HIGH VOLTAGE AC/DC

UNIT-I
Introduction : Need of EHV transmission, comparison of EHV AC & HVDC transmission, mechanical considerations of transmission line.

UNIT-II
EHV AC Transmission Parameters of EHV lines, Voltage gradient in bundle conductors lines, conductor sizing, over-voltages due to switching, ferro resonance. Insulation coordination line insulators and clearances, Corona & its effects, power loss, audible noise and radio-interference, long distance transmission with series and shunt compensations, principle of half wave transmission, flexible ac transmission

UNIT-III
HVDC Transmission :Types of dc links, terminal equipments & their operations, HVDC control system, reactive power control, harmonics and filters, multiterminal dc (MTDC) system, ac/dc system analysis, protection of terminal equipments. HVDC transmission based on voltage source-converters.

UNIT-IV

UNIT-V
FACTS devices, basic types of controller, series controller, static synchronous series compensator(SSSC), thyristor-controlled series capacitor(TCSC), thyristor controlled series reactor(TCSR), shunt controller (STATCOM), static VAR compensator(SVC), series-series controller, combined series-shunt controller, unified power flow controller(UPFC), thyristor controlled phase shifting transformer(TCPST).

References :
UNIT-I
CONTROL SYSTEMS IN INSTRUMENTATION: Introduction. role of control system in instrumentation. Open loop and close loop control system, block diagram of open loop control system, types of open loop control system, block diagram of close loop control system, types of close loop control system, comparison between open loop and close loop control system, servomechanism and regulators with suitable examples.

UNIT-II
BASIC CONTROL ACTION AND CONTROLLER CHARACTERISTICS: On-off type control, proportional control, derivative control, Integral control, Proportional-derivative control, Proportional integral control (PID control).

UNIT-III
CONTROL SYSTEM COMPONENTS: Importance of control components. Construction, working principle, torque-speed characteristic, merits and demerits and applications of AC/ DC Servo motor, construction, working principle of synchro, synchro as transmitter receiver and control transformer, application in position control system, construction, working principle AC/DC Techo generator, Application of position control and speed control with feedback through Techo-generator, classification of stepper motor, construction, working, principle of stepper motor, solenoid valve, control valve, servo voltage stabilizer.

UNIT-IV
MICROPROCESSOR INTRODUCTION ARCHITECTURE: Introduction to microprocessor. Advantages and disadvantages of micro processor control over traditional control. Structure of microprocessor, generalized architecture of microprocessor, functions of each block. Lumped and distributed digital control and their block diagram. Different types of memories (ROM, RAM, PROM, EPROM, EEPROM), Functional block diagram of 8085 micro processor with pin diagram, logical block diagram of 8085 microprocessor- Registers, ALU, Decoder, Serial control action, Interrupt section, timing and control section.

UNIT-V
APPLICATIONS OF MICROPROCESSOR IN INSTRUMENTATION SYSTEM: Schematic diagram of memory chips decoder, memory interphasing. Traffic light control. SCR firing angle control. Data acquisition system

Text books:
1. Automatic Control System by S.Hasan Saeed-Katson
2. Microprocessor & its application by B.Ram

Reference books:
1. Microprocessor Architecture, Programming and Applications with the 8085- Ramesh aonkar
2. Control System Components B. Chattergee
**List of Experiment:**
1. Control of angular displacement using Synchro.
2. Study of AC and DC servo motor.
3. Use techogenerator for automatic speed control of D.C. motor
4. Study of basic control action and controller.
5. Various servo stabiliser for automatic voltage control and study/trace its control circuit.
7. Use microprocessor for temperature control.
8. Use microprocessor for S.C.R. firing control.
10. Study of data acquisition system.