



POLYTECHNIC ELECTRICAL ENGINEERING

SECOND YEAR SYLLABUS

SESSION 2013-14

DETAILED SYLLABUS

SEMESTER III

BASIC ELECTRONICS **CODE DEE 301**

Introduction:

Basic electronics has the close relation with electrical engg. and at present the knowledge of basic electronics engg. is extensively used in all branches of engg. so for a diploma holder in electrical engg., it has become essential to have adequate knowledge of electronic devices. The course covered in this subject provides sufficient knowledge of semiconductor devices as well as P-N junction, rectifiers, bipolar junction transistor, RC coupled amplifier, special devices, feedback amplifier and oscillator. Basic digital electronic is the requirement of modern computer, microprocessor and digital communication system. On the account of reliability and accuracy digital electronic system are replacing conventional analog systems. A diploma holder having knowledge of digital system will be useful to the industries.

Theory

Unit I

Semi Conductor Diode: Basic Introduction of P-N junction diode, Semiconductor diode as half wave rectifier, Semiconductor diode as full wave rectifier, Bridge rectifier, Overall comparison between half wave and other full wave rectifiers, Peak inverse voltage (PIV), Use of filter circuit in rectifiers, L filter, C filter, LC section filter, π Section filter, , Construction, operation, equivalent circuit and characteristics of JFET, MOSFET, CMOS, Semiconductor photo devices such as LED, LDR, photo transistor, Varactor diode, Analog & Digital signals and its representation, Advantages of digital techniques

Unit II



Bi-Polar Junction Transistor: Concept of transistor, Types of transistor and their working in forward and reverse bias, Constants of transistor (α, β, γ), Analysis of transistor amplifier, load line, Operating point and biasing, Input - output characteristics in CB, CC and CE configuration, Low frequency small signal hybrid equivalent circuit of transistor, Derivation of voltage, current and power gain, input and output impedance of CE configuration.

Unit III

R-C Coupled and Power Amplifier: Gain at low, mid and high frequency range, cut off frequencies, Concept of power amplifiers, Types of power amplifier, Class A power amplifier, output power analysis, Push-pull amplifier, Class - B power amplifier.

Unit IV

Feed Back and Oscillators : Basic concept of feedback and types of feedback, Advantages and disadvantages of negative feedback for gain, stability, frequency and nonlinear distortion, Voltage series, shunt and current series and shunt feed back circuit, Use of positive feedback for oscillators, Barkhausen criteria, Principles of RC phase shift, Wein bridge oscillator.

Unit V

Boolean Algebra And Logic Gate: Basic laws of Boolean algebra, Proof by perfect induction, De'Morgen's theorem and its applications, Simplification of expression by Boolean algebra, K-Map, Realization of simplified expression by logic gates, Introduction, Symbol and truth table of NOT, AND, OR, NAND, NOR, EX-OR, EX-NOR gates, Universal gates and realization of other gates, Positive, negative logic.

Unit VI

Combinational And Sequential Circuits: Binary half and full adder, Binary half and full subtractor, Binary serial, parallel and BCD adder, Parity bit generator and checker, Binary comparator, Basic idea of multiplexer, demultiplexer, encoder and decoder, Introduction to R-S,D,J-K,T, M/s J-K and their truth table, Concept of edge and level triggering, Asynchronous and synchronous counters – up, down and up-down, Mode counter – Mod - 3, Mod - 5, decade counter, Ring counter, Johnson counter, Left, right and bi-direction shift register, Series and parallel shift register, Use of shift register for binary multiplication and division.

Reference Books:

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|---|---------------------|
| 1. Electrical Engineering (Hindi & English) | K.D.Sharma |
| 2. Electrical Technology(Vol. -I) | B.L.Theraja |
| 3. Electrical Engineering Part-I | D.R.Nagpal |
| 4. Electrical Technology | J.B.Gupta |
| 5. Basic Electrical Engg. | Nagrath & Kothari |
| 6. Electrical Engineering Materials | Raina, Bhattacharya |



7. Electrical Engg. Materials
8. Electrical Engg. Materials

B.R. Sharma
P.L. Kapoor

BASIC ELECTRICAL ENGINEERING

CODE DEE 302

Introduction:

A Diploma holder in electrical engineering is expected to be well conversant with the basics of D.C. circuits, A.C. circuits, capacitive and inductive circuits. This subject covers the basic principles, which are required for a thorough understanding of electrical Technology. In addition, he may be required to procure, inspect & test Electrical Engineering materials. Knowledge of properties of various types of materials is required in order to execute the above mentioned functions. He may also have to decide for an alternative when a particular material is either not readily available in the market or its cost becomes prohibitive.

Theory

Unit I

Circuit Theory: Resistance, specific resistance, Ohm's law, Resistance in series, parallel and series parallel circuits, Kirchhoff's laws, Application of Kirchhoff's laws, Alternating quantity and its equation, Maximum, Average and RMS values., Form factor, Behaviour of R, L and C in A.C. circuits with phasor diagrams, A.C. through R-L circuit, power factor, active and reactive component of current, power, Q-factor of a coil, A.C. through R-C circuit, dielectric loss and power factor of a capacitors, Solving series R-L-C circuits, Solving A.C. parallel circuit by phasor diagram and phasor algebra, Solving A.C. series and parallel circuits, Magnetic Circuits Introduction, Comparison between magnetic circuit and electric circuits, Behavior of magnetic circuits, Composite magnetic circuits, Parallel magnetic circuits, B-H curve, Rise of current in inductive circuit, Decay of current in inductive circuit

Unit II

Capacitance: Capacitor, Capacitance of an isolated sphere, Parallel plate capacitor, Special cases of parallel plate capacitor, Cylindrical capacitor, Capacitor in series and parallel, Capacitor with compound dielectric, Energy stored in capacitor, Charging and discharging of a capacitor, time constant, Different types of capacitor used in various electrical applications.

Polyphase System: Need and advantage of 3-phase system, Generation of 3-phase voltage, Phase sequence, Star-Delta connections, Phase and Line relations of voltage and current in star - delta connections (for balanced load), Expression of power in 3-phase circuits (for balanced load)



Unit III

Battery : Types of storage batteries, Construction and working of Lead acid batteries, Ni-Fe batteries and Lithium ion batteries, Discharging and recharging of Lead acid batteries, Ampere and watt-hour efficiencies.

Unit IV

Classification of Electrical Engineering Materials: General requirement of electrical engineering materials, Classification of materials into conducting, semi-conducting and insulating materials through a brief reference to atomic structure, Resistivity, Factors affecting resistivity such as Temperature, Alloying, Aging effect, General Properties of following materials, Low Resistivity Materials, High resistivity materials, Bruch materials, Contact materials, **Insulating Materials:** Electrical properties, Volume resistivity, Surface resistance, Dielectric strength, Dielectric constant, Physical, Thermal, Chemical properties, Classification of insulating materials on the basis of temperature limit, Composition, properties and applications of - Fibrous materials, Ceramics, Mica and mica products, Asbestos and asbestos products, Glass and glass products, Natural and synthetic rubber, PVC, Bakelite, Properties of liquid insulating materials such as - Transformer oils, Mineral insulating oils, Properties of gaseous insulating materials such as- Hydrogen, Air, SF₆

Unit V

Magnetic Materials and Special Purpose Material: Terminology and classification, Diamagnetic material, Paramagnetic material, Ferromagnetic material, Effect of Curie temperature, Soft and hard magnetic materials, Different magnetic materials such as- Soft ferrites, Silicon steel, Nickel Iron alloys, Cobalt steel, Tungsten, steel, ALNICO, ALNI, Metals/ alloys for fuses with their properties composition & uses, Composition and properties of soldering materials, Materials for thermocouple, Materials for bimetal, Super conductivity and super conducting materials application and recent trend in this field.

Reference Books:

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|-------------------------------------|-------------------------|
| 1. Electronic Principles | V.K.Mehta |
| 2. Electronics Devices & Circuits | Sanjeev Gupta |
| 3. Integrated Electronics | Millman & Halkias (TMH) |
| 4. Digital Principles & Application | Malvino Leach |
| 5. Digital Electronics | T.C. Bartee |
| 6. Modern Digital Electronics | R.P.Jain |



BASIC MECHANICAL ENGINEERING CODE DEE 303

Introduction:

A Diploma holder in electrical engineering absorbed in State electricity boards & industries has to deal with the different types of water turbines, pumps, steam engine & boilers, therefore the basic construction/working of types of steam & water prime movers becomes essential. This subject fulfills the above need.

Theory

Unit I

Basic Concept of Thermal Engineering: Energy, Internal energy, Potential energy, Kinetic energy, Heat, Work and enthalpy, Specific heat, Specific heat ratio Characteristics gas equation, Universal gas constant Electrical Engineering, First law of thermodynamics and Second law of thermodynamics.

Unit II

Hydraulics: Physical properties of a fluid, Density, Specific volume, Specific weight, Specific gravity, Viscosity, Pascal's law, Pressure Measuring Devices, Manometers, Simple manometers, Differential manometer, Inverted 'U' tube, Pressure gauges, Continuity equation, Bernoulli's Theorem-Energy of a fluid, Pressure energy, Velocity energy, Datum energy, Venturimeter & its uses.

Unit III

Pumps and Turbine: Types of pumps, Centrifugal pump, Reciprocating pump, Their relative advantages and performance, Working principles and types of water turbines, Selection of turbines, Brief idea of turbine, Pelton wheel turbine, Francis turbine.

Unit IV

Properties of Steam: Generation of steam at constant pressure, Enthalpy of water wet steam, Enthalpy of dry saturated stem, Dryness fraction, Superheated steam, Latent enthalpy, Enthalpy of steam, Specific volume, External work during evaporation, Internal content enthalpy, Internal energy of steam, Use of steam table, Simple numerical problems, Boilers-Classification of boiler, Working of common boilers, Babcock and Wilcox, Chichram boiler, Boiler mounting and their accessories, Introduction to modern high pressure boiler for thermal power station (Lamont boiler, weffler boiler, Benson boiler and Velox boiler), Steam Turbines Introduction, Types of steam turbine, working principle of steam turbine, Uses and advantages of steam turbine.

Unit V



I.C. Engines: I.C. engine cycle (Otto , diesel), Working principle of -Two stroke petrol and diesel , Four stroke petrol and diesel.

Unit VI

Transmission and Lubrication: Belt drive, Rope drive, velocity ratio, Tension ratio, Effect of centrifugal tension, Application of these drives, Object of lubrication, Different methods of lubrication, Properties of lubricants.

Reference Books:

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|--------------------------------------|----------------|
| 1. Thermodynamics & Heat Power Engg. | Mathur & Mehta |
| 2. Thermal Engg. | P.L. Ballaney |
| 3. Hydraulics & Hyd. Machines | Khurmi |
| 4. Strength of Materials | G.C.Singh |
| 5. Heat Engines | Pande & Shah |

ELECTRICAL MEASUREMENT AND INSTRUMENTATION CODE DEE 304

Introduction:

A diploma holder in electrical engineering where ever placed on job, has to select a suitable measuring instrument for measuring electrical quantities, so he/she should have adequate knowledge of construction, working, application, specification and errors of different measuring instruments. This subject covers most commonly used electrical instruments and measuring processes for above need. The course also aims at imparting the basic concept of instrumentation. After studying this course the students will be capable of implementation of these principles in process industries as well as engg. industries. Students shall be in a position to upkeep and maintain instruments and control systems.

Theory

Unit I

Introduction to Measuring Instruments: Classification of M.I.- Absolute & Secondary Instruments, Analog & Digital Instruments, Different Principles used in M.I., Sensitivity, Accuracy and precision, Types of errors, Deflecting, controlling and damping torque, Different Measuring Instruments, PMMC, moving iron and rectifier type ammeters and voltmeters, Electrostatic voltmeter, Dynamometer type ammeter, voltmeter and wattmeter, Induction type wattmeter & energy meter, Blondels theorem and measurement of power by two wattmeter method in 3-Phase circuits, Testing of single phase induction type energy meter by direct and



phantom loading, Adjustments of single phase induction type energy meter, Brief study of static energy meter (single and 3 phase), Range extension using shunts and series multipliers, CRO, Electronic voltmeter

Unit II

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, Potentiometers-Types of A.C. and D.C. potentiometers, Construction, Standardisation, Applications

Unit III

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

Unit IV

Instrumentation System: Introduction to measurement system, Generalised block diagram representation of instrumentation system, Brief description of components of instrumentation system, Instrument Transformers-Definition of terms related to instrument transformers, Current Transformer (CT), Potential Transformer (PT), Difference between CT and PT, Application of CT and PT

Unit V

Transducers: Classification of transducer- Primary transducers, Secondary transducer, Active transducer, Passive transducer, Analog transducer, Digital transducer, Construction, principle of operation and application of the following transducers: Potentiometer, L V D T and R V D T, Resistance strain gauge, Gauge factor, Gauge materials, Temperature compensation, Thermocouple, Thermister, R T D, Photo cell, Piezo Electric, Capacitive, Measurement of Following Physical Parameter Using Suitable Transducers-Linear displacement, Angular displacement, Strain, Stress and force, Velocity and Speed, Temperature, Pressure, pH value, Flow measurement

Reference Books:

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|---|-----------------|
| 1. Electrical Measurement & Instruments | J.B.Gupta |
| 2. Electrical Measurement | E.W.Golding |
| 3. Electrical Measurement | D.R.Nagpal |
| 4. Electrical and Electronics Measurement and Instrumentation | A.K.Sawhney. |
| 5. Instrumentation and System | Rangan & Sharma |



MICROPROCESSOR AND “C” PROGRAMMING CODE DEE 305

Introduction:

Now a day the use of computer is very wide so for a diploma holder the knowledge of computer is essentials. As the microprocessor is heart of computer, the knowledge of it is necessary. This subject provides the brief idea of microprocessor. 'C' is computer programming language and also structured programming language. In 'C' programming language we consider various syntax used in programming. By having good knowledge of 'C', students can write modular application and system programs. 'C' can be used in the engineering applications. By acquiring a sound knowledge of 'C' students will be able to understand the concept of all the application areas. This course is specially designed for engineering students of all diploma streams.

Theory

Unit I

Introduction: Evolution of microprocessor, Digital computer, Organisation of computer, Definition of- Instruction, Program, Machine language, Assembly language, High level language, Compiler and Assembler

Unit II

Microprocessors Architecture (Intel 8085): Functional block diagram, Pin-Out diagram with description, Buses- Address bus, Data bus, Control bus, Registers, Arithmetic and logic unit, Timing and control unit, Types of instructions and classification into groups, Types of addressing modes, Status flags

Unit III

Programming and Application of Microprocessor: Some examples of assembly language programme, Introduction to circuits (block diagram only) used in electrical application, ADC, DAC, Analog Multiplexer, Sample and Hold, Programmable peripheral interface (PPI), Measurement of Electrical Quantities : Frequency measurement Phase angle and power factor measurement, Voltage and current measurement, Power and energy measurement, Measurement of Physical Quantities : Temperature measurement, Deflection measurement, Water level indicator, Angular speed, Traffic Control.

Unit IV

Introduction of ‘C’ Language: Scope of ‘C’ Language, Distinction and similarities with other HLLs, Special features and Application areas, Elements of ‘C’, Character set, Key words, Data types, Constants and Variables, Operators: unary, binary, ternary, Operator precedence, Console



Input-Output- Types of I-O, Console I-O, Unformatted console I-O: getchar(), putchar(), gets(), puts(), getch(), getche(), Formatted I-O: scanf(), printf()

Unit V

Arrays, Function and Pointers: Basic concepts, Memory representation, One dimensional array, Two dimensional array, Functions-Basic concepts, Declaration and prototypes, Calling, Arguments, Scope rules, Recursion, Storage classes types, Library of functions, math, string, system, Basic concepts, &, * operator, Pointer expression: assignment, arithmetic, comparison, Dynamic memory allocation, Pointer v/s Arrays

Unit VI

Structure and Enumerated Data Types: Basic concepts, Declaration and memory map, Elements of structures, Enumerated data types: typedef, enum, Union, Control Flow- Statements and blocks, if, switch, Loops-for, while, do-while, goto and labels, break, continue, exit, Nesting control statements

Reference Books:

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| 1. Microprocessor & Micro Computer | B. Ram |
| 2. Microprocessor, Architecture Programming & Applications | Ramesh & Gaonkar |
| 3. An Introduction to Microprocessors | A.P. Mathur |
| 1. 'C' Programming | Stephen Kochan |
| 2. Programming with 'C' | Schaum's Series |
| 3. 'C' Programming | V.Balguru Swami |
| 4. 'C' Programming | Kernighan & Ritchie |
| 5. Let us 'C' | Yashwant Kanetkar |

MANAGEMENT-I CODE DIM 306

Introduction:

This subject will introduce the students about how to set up a small-scale industry. The subject includes the procedure for how to select, proceed and start the SSI, which also involves a concrete market survey report and project formulation. To achieve the target and goals in an organisation it is essential to co-ordinate the entire system. For this purpose the knowledge of principles of management, human resources development, material management and financial management is required.

Theory:

Unit I



Entrepreneurship: Role of entrepreneurship and its advantage, Classification of industries (based on scale), Classification of industries (based on type), New industrial policy, M.R.T.P. act, Product identification/ selection, Site selection, Plant layout, Institutional support needed, Pre-market survey

Unit II

Entrepreneurship Support System: Role of District Industries Centre in setting up industry, Function of NSIC, SISI, NISIET, NRDC, SSIC, SIDO, NMTC, KVIC, RSMDC, Role of state finance corporation, state electricity board, pollution control board, RAJCON, BIS, I.S.O. etc.

Unit III

Principles of Management: Management, administration and organisation, difference between them, Scientific management: Meaning, characteristics, object and advantage: Taylor's scientific management – Fayol's principles of management, functions of management, Types of
Raw Material Management: Allotment of iron and steel, coke/ coal, Allotment of other indigenous raw material from NSIC, Allotment of imported raw material and parts

Unit IV

Marketing Facilities: Supply of product to state govt, to defence, to railways, to CSPO, to CSD, Participation in international exhibition and fairs, trade centres, state emporium and departmental stores, Quality consciousness and its effect on product sales
Marketing Management: Concept of Marketing, Problems of Marketing, Pricing policy, Distribution channels and methods of marketing

Unit V

Setting up SSI: Registration of SSI, Allotment of land by RIICO, Preparation of project report, Structure of organization, Building construction, Establishment of machines
Financial Sources for SSI: Various institutions providing loans for industries, various types of loans, Subsidies

Reference Books:

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|--|---------------------------|
| 1. Hand Book of Small Scale Industry | P.M. Bhandari |
| 2. Hand Book on Entrepreneurship Development | O.P. Harkut |
| 3. Entrepreneurial Development | S.S. Khanka |
| 4. Statistical Quality Control | Mahohar Mahajan |
| 5. ISO: 9000 Quality System | S. Dalela |
| 6. Industrial Management | V.K. Sharma & O.P. Harkut |
| 7. Industrial Engg. & Management | O.P. Khanana |
| 8. Industrial Engg. & Management | T.R. Banga |



BASIC ELECTRONICS PRACTICAL CODE DEE 307

1. Measurement of armature winding and series field winding resistance of a D.C. machine by ammeter-voltmeter method.
2. Measurement of shunt field winding resistance of a D.C. machine by ammeter- voltmeter method.
3. Verification of Kirchhoff's laws in D.C. circuits.
4. Verification of Kirchhoff's laws in A.C. circuits.
5. Determination of B-H curve of a D.C. machine.
6. Measurement of power and power factor of single phase R-L-C series circuit.
7. Determination of R and L of a choke coil using 3-voltmeter and an ammeter.
8. Determination of R and C of a capacitor using 3-ammeter and a voltmeter.
9. Measurement of phase and line voltage and current in Star and Delta connection.
10. Measurement of power in 3-phase circuit (for balanced load).

BASIC ELECTRICAL ENGINEERING PRACTICAL CODE DEE 308

1. Plot V-I characteristics of P-N semiconductor diode in forward and reverse bias.
2. Plot the V-I characteristics of a Zener diode and design a voltage regulator using zener diode.
3. Observe the wave form for HWR and calculate ripple factor.
4. Observe the wave form for FWR and calculate ripple factor.
5. Observe the wave form for bridge rectifier and calculate ripple factor.
6. Observe the wave form for capacitor filter and find the effect of value of capacitor on ripple factor.
7. Plot input output characteristics of P-N-P transistor in CB configuration.
8. Plot input output characteristics of P-N-P transistor in CE configuration.
9. Plot V-I characteristics of N-P-N transistor in CB configuration.
10. Plot V-I characteristics of N-P-N transistor in CE configuration.
11. Verify the truth table of NOT, AND, OR, NAND, NOR, EX-OR, EX-NOR gates.
12. Design a NOT, AND, OR, EX-OR, EX-NOR gates using universal gates.
13. Design a binary half and full adder.
14. Design a binary half and full subtractor.
15. Verify the truth table of R-S, J-K, D, T, flip flops.



BASIC MECHANICAL ENGINEERING PRACTICAL CODE DEE 309

1. Verification of Bernoulli's theorem.
2. Determination of coefficient of venturimeter.
3. Study of reciprocating pump and centrifugal pumps.
4. Testing of centrifugal pump for discharge & heads.
5. Study of Pelton wheel & Francis turbines.
6. Study of boiler available, its mountings & accessories.
7. Study of steam turbine.

ELECTRICAL MEASUREMENT AND INSTRUMENTATION PRACTICAL CODE DEE 310

1. Calibration of ammeter and voltmeter.
2. Calibration of dynamometer type wattmeter and induction type energy meter.
3. Measurement of power in 3-phase circuits by two wattmeter method
4. Measurement of resistance by Kelvin's double bridge
5. Measurement of resistance by Whetstone bridge
6. Measurement of Earth's resistance by Earth tester
7. Calibration of ammeter and voltmeter measurement of resistance by D.C. potentiometer
8. Measurement of inductance and capacitance with the help of a suitable A.C. Bridge
9. Measurement of frequency using CRO
10. Measurement of displacement using following transducers: Potentiometer, L.V.D.T., Capacitive
11. Measurement of temperature with the help of, Thermocouple, Thermister, R.T.D.
12. Measurement of strain with the help of strain gauge.
13. Velocity and speed measurement by suitable transducer
14. Study of instrument transformers & measurement of turn ratio of current transform and potential transformer.

MICROPROCESSORS AND C-PROGRAMMING PRACTICAL CODE DEE 311

1. Study of Intel 8085 microprocessors
2. Program to add two 8-bit numbers
3. Program to subtract two 8-bit numbers
4. Program to find 1's complement of 8-bit numbers
5. Program to find 2's complement of 8-bit numbers



6. Program to shift an 8-bit number left by one bit
7. Program to mask of least significant 4 bits of 8 bit number
8. Program to mask of most significant 4 bits of 8 bit number
9. Program to find square from look up table
10. Program to find largest of two numbers
11. Program to find smallest of two numbers
12. Problems based on arithmetic expression, fixed mode arithmetic.
13. Problems based on conditional statements and control structures.
14. Problems based on arrays (1-D, 2-D), functions and pointers.
15. Problems based on engineering applications.





POLYTECHNIC ELECTRICAL ENGINEERING

SECOND YEAR SYLLABUS

SESSION 2013-14

DETAILED SYLLABUS

SEMESTER IV

ELECTRICAL CIRCUIT THEORY CODE DEE 401

Introduction:

A diploma holder in electrical engg. is expected to analyse electrical and electronic circuits and networks during his job. For this sound understanding of the concept and methods of analysis of electrical circuits and network is a must for him. This course will develop analytical abilities of students in solving problems.

Theory:

Unit I

Network Parameters: Active and passive, Linear and non-linear, Unilateral and bilateral, Lumped and distributed, Time varying and time invariant parameters, Voltage and current sources (ideal and practical), Dependent and Independent sources, Source conversion techniques

Unit II

Network Theorems: Node and mesh analysis, Solution by Kramer's rule up to three variables, Star-delta transformation, Superposition theorem, Reciprocity theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Millman's theorem, Tellegen's theorem

Unit III

Resonance: Series resonance, Parallel resonance, Q-factor, bandwidth, selectivity, half power frequencies, graphical representations, Importance of resonance

Unit IV



Circuit Transients: Introduction to Laplace transform and inverse Laplace transformations, Laplace transformation of following functions- Unit impulse function, Unit step function, Exponential function, Ramp function, Sinusoidal function, Derivative function, Integral function, Laplace transformation theorem- Shifting Theorem, Shift in 's' domain theorem, Complex differentiation theorem, Final value theorem, Initial value theorem, Complex integration theorem, Solution of series RL, RC and RLC circuits by Laplace transformation

Unit V

Two Port Network: z-parameters, y-parameters, h-parameters, ABCD- parameters, Inter relation among z, y, h and ABCD parameters., Special types of network such as T, π , Bridge - T, Parallel-T and Lattice.

Unit VI

Complex Frequency and Pole-Zero Diagram: Concept of complex frequency, Poles and zeros of simple function, Plotting of poles and zero diagram of a simple function (up to second order), Necessary conditions of pole and zero locations of driving point functions.

Reference Books:

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|--------------------------------|------------------------|
| 1. Electrical Circuit Theory | Arumugam & Premkumaran |
| 2. Electrical Networks | Soni & Gupta |
| 3. Electrical Network Analysis | Umesh Sinha |
| 4. Electrical Network Analysis | G.K.Mithal |
| 5. Text Book of Circuit Theory | G.S. Verma |
| 6. Electrical Circuit M.E. | Valvenkerberg |

ELECTRICAL MACHINES - I CODE DEE 402

Introduction:

An electrical diploma holder is usually placed in Electricity Corporation, industries, public departments etc. An electrical diploma holder has to handle different electrical machines required for various types of jobs. They are to supervise the selection, installation, operation, maintenance, testing and repair of electrical machinery used in various industrial, domestic and other applications. The most commonly used electrical machines are D.C. machines, A.C. machines, transformers, rectifiers etc. Knowledge of construction working and performance characteristics of such machines is a must for a diploma holder for doing job efficiently. D.C. machines, transformers and rectifiers have been covered in this subject.



Theory

Unit I

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

Unit II

D.C. 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, 1 Field control, Armature control, Series parallel control, Testing of D.C. machine by, Direct loading, Swineburn's test, Hopkinson's test and, Calculation of efficiency as a generator and motor from above test

Unit III

Transformer: Construction of single phase and three phase transformer, Principle of operation, Emf equation and Turn ratio, Idea of leakage reactance, Transformer phasor diagram, At no load, At load (Lagging, Leading and UPF), Equivalent circuit of single phase transformer, Losses, efficiency and regulation, Condition for maximum efficiency, All day efficiency

Unit IV

Transformer testing- By direct loading, By open circuit and short circuit test, Determination of equivalent circuit parameters, Back to back test, Parallel operation of single-phase transformer with equal and unequal voltage ratio., Off load and on load tap changers, Auto transformer,

Unit V

Poly phase connection (Descriptive study): Scott connection, Open-Delta connection, Star-Star connection, Delta - Delta connection, Parallel operation of 3-phase transformer

Reference Books:

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|---------------------------------------|-------------------|
| 1. Vidyut Engg.(S.I.Units) (Hindi) | K.D.Sharma |
| 2. Electrical Engg. part I& II(Hindi) | D.R.Nagpal |
| 3. Electrical Machines | J.B.Gupta |
| 4. Electrical Technology | S.L.Uppal |
| 5. Electrical Technology Vol.-II | B.L.Theraja |
| 6. A Basic Course in Electrical Engg. | Sharma & Gupta |
| 7. Electric Machine | P.S. Bimbra |
| 8. Electric Machine | Nagrath & Kothari |



POWER SYSTEM - I

CODE DEE 403

Introduction:

Most of the diploma holders get employment in Electricity Corporation and industries. They are required to handle responsibilities in generating stations. The work of an engineer is for operation and maintenance of equipments and supervisory control in power plants. It is expected that the different power stations taught in this course content shall make an engineer suitable for operation, maintenance and commissioning of power stations. The conventional sources of energy are depleting day by day and will not be sufficient to meet the future demand of energy. Therefore, there is a need for generation of energy by using non-conventional sources. With this in view diploma holders should be conversant with basic knowledge and practical applications of non-conventional sources of energy in rural, cottage and small industries. For rural development it is desirable to ensure the living conditions of the people in villages. For this purpose technology transfer to meet the rural needs, with the facilities available is essential, i.e. appropriate technology.

Theory

Unit I

Introduction: Electrical energy demand and electrical energy growth in India, Electrical energy growth in India, Electrical energy sources, Fossil fuels and nuclear fuels, Present status of electrical demand in Rajasthan

Unit II

Hydro Electric Power Plants: Selection of site, Advantages and disadvantages of hydro power plant, Hydrology, Classification based on- Water flow regulations, Load, Head, Element of hydro power plant and their functions- Dam, Storage reservoir, Fore bay, Surge tank, Pen stocks, Spill way, Head race and tailrace, Types of turbines, Specific speed, Brief idea about small and mini hydro plants, Pumped storage plant

Diesel Power Plants: Main components and working of diesel power plant with the help of block diagram, Advantage and disadvantage of diesel power plant, Application of diesel power plant, Principle and operation of gas turbine plants, Comparison of different power stations, Inter connection of power stations

Unit III

Nuclear Power Station: Introduction and selection of site, Block diagram of plant and its working, Main components and their function, Energy mass relationship, Energy due to fission and fusion, Nuclear chain reaction, Multiplication factor and critical size, Moderators materials, Fissile and fertile materials, Classification of Nuclear reactor, main parts and their functions, Safety measures required in nuclear plant, Disposal of nuclear waste



Thermal Power Station: Selection of plant location, Block diagram of plant and its working,, Coal handling plant, Pulverising plant, Draft system, Boilers, Ash handling plant, Turbine, Different types of condensers, Cooling towers and ponds, Feed water heater, Economiser, Super heater and reheater, Air preheater

Unit IV

Solar, Wind and Ocean Energy: Application, Unit of solar power and solar energy, Historical review and future prospects, Schematic diagram of a solar thermal power plant, Solar central receiver thermal power plant, Solar pond thermal plant, Solar thermal power supply system for space station, Introduction to photo voltaic system, Merits and limitation of solar PV system, Principle of photo voltaic cell, Transparent, insulating and absorbing materials, Building heating by active and passive system, Solar still, solar dryer and solar cooker,

Wind Energy- Introduction to wind energy, Merits and demerits of wind energy, Wind power and energy pattern factor, Wind machine, Horizontal axis wind machine, Vertical axis wind machine, Site selection of a wind machine, Application of a wind machine

Ocean Energy- Introduction to ocean energy, Types of ocean energy, Open cycle, Closed cycle

Unit V

Bio-Gas Energy: Introduction to bio-gas energy, Properties of bio-gas, Principle of bio-gas production, Chemical and microbiological processors, Factors which affects bio-gas production, Different feed stocks for bio-gas production, Classification of bio-gas plant- Fixed dome type, Floating type, Comparison between fixed dome and floating type bio-gas plant, Site selection of bio-gas plant, Bio gas lamp and chulha, Bio gas storage and transportation

Reference Books:

- | | |
|---|---------------------------|
| 1. Generation of Electrical Energy | B.R. Gupta |
| 2. Power Plant Engg. | Domkundwar |
| 3. A course in Electrical Power | Soni, Gupta, Bhatnagar |
| 4. Energy technology | S.Rao & B.B. Parulekar |
| 5. Non-conventional Energy Sources | A.N. Mathur & N.S.Rathore |
| 6. Non-conventional Sources of
Bhatnagar energy and appropriate technology | D.M. Agrawal & S.K. |
| 7. Non-conventional Energy Sources | G.D.Rai |
| 8. Solar Energy | Garg & Prakash |

ELECTRICAL WORKSHOP CODE DEE 404

Introduction:

A diploma holder in electrical engineering has to perform supervisory duty in industries and Electricity Corporation. He/ She should have adequate knowledge as well as should be able to



educate his/her subordinates for electrical wiring, wiring circuits, fault investigation and repair of domestic appliances. A diploma holder in electrical engineering has to perform supervisory duty in industries and Electricity Corporation. He / She should have adequate knowledge as well as should be able to educate his/her subordinates for electrical wiring installation and full investigation and repair of domestic appliances. This syllabus deals with above topics in details. Many of electrical technicians employed in state electricity boards or other industries are engaged in installation, maintenance and repair of a variety of electrical machines. Such areas may include generation, transmission and distribution systems and different types of electric drive used with a variety of mechanical gadgets. Normally manufacturers of heavy electrical machines provide service manuals, instructions for installation, maintenance and fault location. This syllabus has been designed to provide certain guidelines and broad principles regarding the above activities and after undergoing this course the technician shall be fit to undertake repairs and maintenance of electrical equipments.

Theory

Unit I

Safety Measures: Study of various safety devices and appliances in an electrical workshop, Safety measures for working on low, medium and high voltage main and the study the apparatus used, Use of fire fighting, electric shock treatment, first aid, and safety posters etc.

Domestic Appliances: Introduction, Appliances making use of thermal effects, Design of heating elements wire, Study of the followings – Table fan, Ceiling fan, Washing machine, Emergency light, Refrigerator, Air Conditioner, Water cooler, MCB, ELCB

Unit II

Wiring: Systems of wiring, Types of wiring and their application, Wiring Diagram of Different Lamp Control Circuits and Their Working, Bell indicator, Fluorescent tube (single and double), Mercury vapour lamp, Sodium vapour lamp, Neon sign lamp, Flasher, Wire Joints-Different types of joints, their uses

Fault Investigation and Testing: Specification, wiring, dismantling, fault investigation, repairing, assembling and testing the following electrical appliances- Electric heater Electric immersions heater, Room heater, Electric kettle, Electric soldering iron

Unit III

Introduction of Electrical Maintenance: Fundamental of electrical maintenance and repair, Classification, scope and frequency of electrical maintenance and repair work, General structure and equipment of electrical repair shop, Repair records and maintenance schedule.

Maintenance and Repair of Storage Batteries: Inspection and checking of storage batteries, Trouble and its shootings, Repair of storage batteries

Maintenance and Repair of Transformers: Introduction, Transformer inspection, Periodical overhauling of transformer, Location of transformer defects, Winding and core repairs, Bushing repairs, Repair and maintenance of conservator, Dismantling and assembling of transformer,



Transformer drying out, Maintenance of Buchholz's relay, Maintenance of transformers while in services, Electrical characteristics of transformer oil, Transformer oil purification methods

Unit IV

Maintenance and Repair of D.C. Motors and of A.C Motors: Identification of terminals of D.C. compound motors, Testing of armature and commutator, Over hauling of D.C. Machine, Repairing of field winding, Sparking at brushes and its remedies, Commutators and brush mechanism and its defect, A. C. Motors-Different tests on 1- ϕ capacitor type A.C. motor-Open capacitor, Short capacitor, Change of value, Test for open and short circuits faults, Checking of centrifugal switch, Over hauling, dismantling and assembling of ceiling fan and table fan, Identification of terminals of 3-phase squirrel cage induction motor, Electrical fault location, Mechanical fault location, Drying and testing of insulation, Abnormal heating at bearing, Greasing, degreasing and impregnating, Alignment and rotor balancing

Unit V

Maintenance and Repairs of Circuit Breakers: Maintenance and troubleshooting of, Oil circuit breakers, Air blast circuit breakers, SF6 circuit breakers, Preventive maintenance of relays

Unit VI

Automobile Electrical System: Dynamo, Self starter, Voltage regulator, Ignition coil, Lighting circuit- Four Wheeler, Two Wheeler

Reference Books:

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|--|-------------------------|
| 1. Study of electrical appliances and devices | K.B. Bhatia |
| 2. Workshop practice in electrical engineering | M.L. Gupta |
| 3. Electrical wiring | Arora, B.Dass |
| 4. Domestic Appliance S.E. Board Rajasthan, Ajmer | |
| 5. Basic shop practicals in electrical Engg. | Vinod kumar, & K. Vajay |
| 6. Study of Electric Appliances and Devices | K.B.Bhatia |
| 7. Basic of Practicals in Electrical Engg. | Vinod kumar & K. Vijay |
| 3. Electrical Gadgets | H. Partab |
| 4. Electrical Wiring | Arora, B. Das. |
| 5. Workshop Practices in Electric Engg. | M.L.Gupta |
| 1. Installation, Fault Location & Maintenance T.T.T.I,Bhopal. | |
| 2. Operation & Maintenance of Electrical Equipment (Vol. I & II) | B.V.S.Rao |
| 3. Preventive Maintenance of Electrical Equipment | Charles I Hubert. |
| 5. Electrical Maintenance & Repair | Mahendra, Bhardwaj |



MANAGEMENT-II CODE DEE 405

Introduction:

This subject will introduce the students about how to set up a small-scale industry. The subject includes the procedure for how to select, proceed and start the SSI, which also involves a concrete market survey report and project formulation. To achieve the target and goals in an organisation it is essential to co-ordinate the entire system. For this purpose the knowledge of principles of management, human resources development, material management and financial management is required.

Unit I

Contracts and Tenders: Type of contracts, Necessity of contract and tenders, Type of tenders, tendering procedure

Unit II

Project Report: Procedure of preparing a project report, Format of project report, Preparation of project report for some SSI items
ownership, sole trading, partnership, joint stock, co-operative and public enterprise, Types of organisation, different types and their charts., Importance of human relation professional ethics, Need for leadership, leadership qualities, Motivation

Unit III

Human Resources Development: Introduction, object and functions of human resource development department, Recruitment, sources and methods of selection, need for effective training, method of training, duties of supervisor / Formen, role of HRD in industries.

Unit IV

Wages and Incentives: Definition and requirements of good wage system methods of wage payment, Wage incentives - type of incentive, difference in wage incentive and bonus. incentive to supervisor.

Tax System and Insurance: Idea of income tax, sales tax, excise duty and custom duty, Industrial and fire insurance, procedure for industrial insurance.

Unit V

ISO: 9000 Series of Quality System: Definition of few important terms related to ISO quality system, Various models for quality assurance in ISO: 9000 series, Various elements of ISO: 9001 model (20 points), Benefits by becoming an ISO: 9000 company, Introduction to total quality management (TQM)



Unit VI

Labour Legislation and Pollution Control Acts: Industrial acts : factory act 1948, Workmen's compensation act 1923, Apprentices act 1961, Water pollution contract act 1974 and 1981, Air pollution contract act 1981, Environmental protection act 1986, Forest (animal conservation act 1972), Pollution control provisions in motor vehicle act.

Reference Books:

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|--|---------------------------|
| 1. Hand Book of Small Scale Industry | P.M. Bhandari |
| 2. Hand Book on Entrepreneurship Development | O.P. Harkut |
| 3. Entrepreneurial Development | S.S. Khanka |
| 4. Statistical Quality Control | Mahohar Mahajan |
| 5. ISO: 9000 Quality System | S. Dalela |
| 6. Industrial Management | V.K. Sharma & O.P. Harkut |
| 7. Industrial Engg. & Management | O.P. Khanana |
| 8. Industrial Engg. & Management | T.R. Banga |

ELECTRICAL MACHINES PRACTICAL - I

CODE DEE 406

1. Study of constructional features of D.C. machine and identify the terminals of D.C. shunt generator.
2. Determination of O.C.C of D.C. shunt generator
3. Determination of external characteristics of D.C. shunt generator.
4. Determination of external characteristics of compound generator
5. Study of constructional features of D.C. shunt and compound motor starter and connecting, starting and reversing the direction of D.C. shunt motor.
6. Performing Swineburne's test on a D.C. machine
7. Performing Hopkinson's test on a D.C. machine.
8. Speed control of D.C. shunt motor by rheostatic control (both field and armature control)
10. Study of constructional features of single phase and three phase transformers
11. Determination of transformation ratio, regulation and efficiency of a single-phase transformer by direct loading.
12. Open circuit and short circuit test of a single-phase transformer and determination of its equivalent circuit parameters, efficiency and regulation.
13. Parallel operation of single-phase transformers with same voltage ratio and sharing of loads.



ELECTRICAL WORKSHOP PRACTICAL CODE DEE 407

1. **Preparations of joints on multi strand insulated wire:** Twisted joint, Married joint, Plain cross joint, Duplex cross joint
2. **Preparation of wiring diagram and wiring of the following** -Sodium vapour lamp, Mercury vapour lamp, Corridor wiring, Row of lamps (decorative light), Double Fluorescent tube of 40 watts
3. To make the positions, fix and complete the internal wiring of the fitting of a switch board, containing at least four switches, one plug and one regulator.
4. **Assembling, dismantling and fault investigation in the following domestic appliances:** Electric heater, Electric immersion heater, Room heater, Electric kettle, Electric soldering iron
5. Dismantling, identifying of various parts, finding fault, removing the fault, assembling and testing of- Table fan, Ceiling fan, Electric washing machine, Room cooler, Electric toaster and sandwich maker, Electric mixy, Water cooler
6. Study the construction of telephone and its circuit
7. To make connection of supply and consumer board
8. Study of contactors and time delay relays
9. Soldering practice and lugs jointing.
10. Perform the following test on 1-phase transformer
 - 10.1 Insulation resistance test.
 - 10.2 Ratio test.
 - 10.3 Polarity and phasing out test.
11. Transformer oil dielectric strength test.
12. Fire point, flash point and sludge test of transformer oil
13. Study of choke winding.
14. Prepare coil winding of a small transformer.
15. Rewinding of a ceiling fan.
16. Fault location and remedies in star-delta starter.
17. Fault location and remedies in rotor-resistance starter.
18. Preparation of periodical maintenance schedule for a power transformer.
19. Study of fire fighting equipments
20. Study of electric shock treatment, preparation of treatment chart.