TEACHING AND EXAMINATION SCHEME
FOR DIPLOMA **II Year ELECTRICAL ENGINEERING**
SESSION – 2001-2002 & ONWARDS
Third Semester

Code No.	Subjects	Distribution of Time				Distribution of Max. Marks/ Duration							Total Marks
		Hours per week				University's Exam.				Sessionals			
		L	T	P	Tot	TH	Hrs.	PR	Hrs.	CT	TU	PR(S)	
EE 31	Applied Electronics	3	--	2	5	70	3	--	--	30	--	50	150
EE 32	Mechanical Engineering	2	2/2	2	5	70	3	--	--	30	25	25	150
EE 33	Electrical Technology	3	2/2	2	6	70	3	50	3	30	25	25	100
EE 34	Electrical Engineering Materials	3	2/2	--	4	70	3	--	--	30	50	--	150
EE 35	Non-Conventional Energy Sources	3	2/2	--	4	70	3	--		30	50	--	150
EE 36	Electrical Instruments and Measurement	2	--	2	4	70	3	50	3	30	--	50	200
EE 37	Electrical Workshop-I	2	--	6	8	70	3	50	3	30	--	50	200
	Total	18	4	14	36	490		150		210	150	200	1200
												Grand Total:	**1200**

1. L:Lecture
2.T:Tutorial
3.P:Practical
4.TH:Marks for University Examination for Theory
5.PR: Marks for University's Examination for Practicals
6.CT:Marks for Class Tests
7TU:Marks for Tutorials
8.PR(S):Marks for Practical and Viva

TEACHING AND EXAMINATION SCHEME

TEACHING AND EXAMINATION SCHEME
FOR DIPLOMA **II Year ELECTRICAL ENGINEERING**
SESSION – 2009-2010 & ONWARDS
Fourth Semester

Code No.	Subjects	Distribution of Time				Distribution of Max. Marks/ Duration							Total Marks
		Hours per week				University's Exam.				Sessionals			
		L	T	P	Tot	TH	Hrs.	PR	Hrs.	CT	TU	PR(S)	
EE 41	Electrical Machines-I	2	2/2	2	5	70	3	50	3	30	25	25	200
EE 42	Electrical Circuit Theory	2	2/2	--	3	70	3	--	--	30	50	--	150
EE 43	Generation of Electrical Energy	2	2/2	--	3	70	3	--	--	30	50	--	150
EE 44	Electrical Estimating and Costing	2	--	2	4	70	3	50	3	30	--	50	200
EE 45	Instrumentation	2	2/2	2	5	70	3	--	--	30	25	25	150
EE 46	Electrical Design and Drawing	2	-	6	8	70	3	50	3	30	-	50	200
EE 47	Electrical Workshop-II	2	-	6	8	70	3	50	3	30	--	50	200
	Total	14	4	18	36	490		200		210	150	200	1250
												Grand Total:	**1250**

1. L:Lecture
2.T:Tutorial
3.P:Practical
4.TH:Marks for University Examination for Theory
5.PR: Marks for University's Examination for Practicals
6.CT:Marks for Class Tests
7TU:Marks for Tutorials
8.PR(S):Marks for Practical and Viva

TEACHING AND EXAMINATION SCHEME
FOR DIPLOMA **III Year ELECTRICAL ENGINEERING**
SESSION – 2009-2010 & ONWARDS
Fifth Semester

Code No.	Subjects	Distribution of Time				Distribution of Max. Marks/ Duration							Total Marks
		Hours per week				University's Exam.				Sessionals			
		L	T	P	Tot	TH	Hrs.	PR	Hrs.	CT	TU	PR(S)	
EE 51	Electrical Machines-II	3	2/2	2	6	70	3	50	3	30	25	25	200
EE 52	Power Electronics	2	--	3	5	70	3	--	--	30	--	50	150
EE 53	Transmission and Distribution	3	2/2	--	4	70	3	--	--	30	50	--	150
EE 54	Utilization of Electrical Power	3	2	--	5	70	3	--	--	30	50	--	150
EE 55	Electrical Maintenance and Repair	2	--	6	8	70	3	50	3	30	--	50	200
EE 56	**Elective – I**												
	EE 561 Electromagnetic Field Theory	2	2	--	4	70	3	--	--	30	50	--	
	EE 562 Electric Traction System	2	2	--	4	70	3	--	--	30	50	--	150
EE 57	**Elective – II**												
	*EE 571 'C' Programming	2	--	2	4	70	3	--	--	30	--	50	
	*EE 572 Computer in Business Systems	2	--	2	4	70	3	--	--	30	--	50	150
	Practical Training (24 Working Days)							100					100
												Grand Total:	**1250**

*EE 571 Common for All Branches of Engineering except CS
*EE 572 Common for All Branches of Engineering

TEACHING AND EXAMINATION SCHEME
FOR DIPLOMA **III Year ELECTRICAL ENGINEERING**
SESSION – 2009-2010 & ONWARDS
Sixth Semester

Code No.	Subjects	Distribution of Time				Distribution of Max. Marks/ Duration							Total Marks
		Hours per week				University's Exam.				Sessionals			
		L	T	P	Tot	TH	Hrs.	PR	Hrs.	CT	TU	PR(S)	
EE 61	Electrical Machines-III	3	2	--	5	70	3	--	--	30	50	--	150
EE 62	Microprocessor and Its Application	3	--	2	5	70	3	50	3	30	--	50	200
EE 63	Switchgear and Protection	3	2	--	5	70	3	--	--	30	50	--	150
EE 64	Electrical Installation and Design	2	--	6	8	70	3	50	3	30	--	50	200
EE 65	Control System Engineering	3	2	--	5	70	3	--	--	30	50	--	150
EE 66	**Elective – III**												
	EE 661 Basic Digital Electronics	2	--	2	4	70	3	--	--	30	--	50	
	EE 662 Electrical Machine Design	2	2	--	4	70	3	--	--	30	50	--	
	EE 663 Power System Analysis	2	2	--	4	70	3	--	--	30	50	--	150
EE 67	**Elective – IV**												
	*EE 671 Management	2	2	--	4	70	3	--	--	30	50	--	
	*EE 672 Entrepreneurship Development	2	2	--	4	70	3	--	--	30	50	--	
	*EE 673 Production System Management	2	2	--	4	70	3	--	--	30	50	--	150
	Project (24 Working Days)							100					100
											Grand Total:		**1250**

*EE 671/EE 672/ EE 673 Common for All Branches of Engineering

APPLIED ELECTRONICS

CODE EE 31

L	T	P
3	--	2

RATIONALE

Applied electronics has the close relation with electrical engg. and at present the knowledge of applied 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 provide sufficient knowledge of semiconductor devices as well as P-N junction, rectifiers, bipolar junction transistor, RC coupled amplifier, special devices, feedback amplifier and oscillator.

CONTENTS

1. Semiconductors :

1.1 Basic idea of semiconductors. N and P type semi-conductors
1.2 Potential barrier and temperature effect on barrier potential
1.3 Concept of energy band diagram for intrinsic and extrinsic semiconductors

2. Semi Conductor Diode :

2.1 P-N junction diode
2.2 P-N junction diode in forward and reverse bias
2.3 V-I characteristics of forward and reverse bias diodes
2.4 V-I characteristics of zener diode and its applications
2.5 Semiconductor diode as half wave rectifier, its efficiency and ripple factor
2.6 Semiconductor diode as full wave rectifier, its efficiency and ripple factor
2.7 Bridge rectifier, Overall comparison between half wave and other full wave rectifiers
2.8 Peak inverse voltage (PIV)
2.9 Use of filter circuit in rectifiers

2.9.1 L filter
2.9.2 C filter
2.9.3 LC section filter
2.9.4 π section filter

3. Bi-Polar Junction Transistor :

3.1 Concept of transistor
3.2 Types of transistor and their working in forward and reverse bias
3.3 Constants of transistor (α,β,γ)
3.4 Analysis of transistor amplifier, load line
3.5 Operating point and biasing
3.6 Input - output characteristics in CB, CC and CE configuration
3.7 Low frequency small signal hybrid equivalent circuit of transistor
3.8 Derivation of voltage, current and power gain, input and output impedance of CE configuration

4. R-C Coupled and Power Amplifier :

4.1 Gain at low, mid and high frequency range, cut off frequencies
4.2 Concept of power amplifiers
4.4 Types of power amplifier
4.5 Class A power amplifier, output power analysis
4.6 Push-pull amplifier.
4.7 Class - B power amplifier

5. Special Devices :

5.1 Construction, operation, equivalent circuit and characteristics of

5.1.1 JFET, MOSFET, CMOS
5.1.2 Semiconductor photo devices such as LED, LDR, photo transistor

5.1.3 Varactor diode

6. Feed Back and Oscillators :

6.1 Basic concept of feedback and types of feedback
6.2 Advantages and disadvantages of negative feedback for gain, stability, frequency and nonlinear distortion
6.3 Voltage series, shunt and current series and shunt feed back circuit
6.4 Use of positive feedback for oscillators
6.5 Barkhausen criteria
6.6 Principles of RC phase shift, Wein bridge oscillator
6.7 Principle of Hartely, Colpits oscillator
6.9 Crystal oscillator and its frequency stability criteria

PRACTICALS

1. To plot V-I characteristics of P-N semiconductor diode in forward and reverse bias
2. To 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. To plot input output characteristics of P-N-P transistor in CB configuration.
8. To plot input output characteristics of P-N-P transistor in CE configuration.
9. To plot V-I characteristics of N-P-N transistor in CB configuration
10. To plot V-I characteristics of N-P-N transistor in CE configuration
11. To calculate the operating point of N-P-N transistor for CE configuration
12. To study and perform RC phase shift oscillators
13. To study and perform Wein bridge oscillator.
14. To study and perform Hartely oscillators
15. To study the push-pull amplifier circuit
16. Observe the response of amplifier with feed back and without feed back.

REFERENCE BOOKS :

1. Integrated Electronics — Millman & Halkias (TMH)
2. Electronics Principle — V.K.Mehta (Student Pub.)
3. Electronics Devices & Circuits — A. Mottershead (PHI)
4. Electronics Principle — Malvino (TMH)
5. Electronics Devices & Circuits — Sanjeev Gupta

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MECHANICAL ENGINEERING

CODE EE 32

L	T	P
2	2/2	2

RATIONALE

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.

CONTENTS

1. Mechanical Properties of Metals :

1.1 Definitions -

- 1.1.1 Elasticity
- 1.1.2 Plasticity
- 1.1.3 Ductility
- 1.1.4 Brittleness
- 1.1.5 Toughness
- 1.1.6 Hardness
- 1.1.7 Malleability
- 1.1.8 Fatigue

1.2 Examples of applications of above terms related to electrical engineering.

2. Basic Concept of Thermal Engineering :

2.1 Energy
2.2 Internal energy
2.3 Potential energy
2.4 Kinetic energy
2.5 Heat
2.6 Work and enthalpy
2.7 Specific heat
2.8 Specific heat ratio
2.9 Characteristics gas equation
2.10 Universal gas constant
2.11 First law of thermodynamics
2.12 Second law of thermodynamics

3. Hydraulics :

3.1 Physical properties of a fluid

- 3.1.1 Density
- 3.1.2 Specific volume
- 3.1.3 Specific weight
- 3.1.4 Specific gravity
- 3.1.5 Viscosity

3.2 Pascal's law

4. Pressure Measuring Devices :

4.1 Manometers

- 4.1.1 Simple manometers
- 4.1.2 Differential manometers
- 4.1.3 Inverted 'U' tube

4.2 Pressure gauges
4.3 Continuity equation

5. Bernaulli's Theorem :

5.1 Energy of a fluid

5.1.1 Pressure energy
5.1.2 Velocity energy
5.1.3 Datum energy

5.2 Venturimeter & its uses

6. Pumps :

6.1 Types of lumps
6.2 Centrifugal pump
6.3 Reciprocation pump
6.4 Their relative advantages and performance

7. Turbine :

7.1 Working principles and types of water turbines
7.2 Selection of turbines
7.3 Brief idea of turbine

7.3.1 Pelton wheel turbine
7.3.2 Francis turbine

8. Properties of Steam :

8.1 Generation of steam at constant pressure
8.2 Enthalpy of water wet steam
8.3 Enthalpy of dry saturated stem
8.4 Dryness fraction
8.5 Superheated steam
8.6 Latent enthalpy
8.7 Enthalpy of steam
8.8 Specific volume
8.7 External work during evaporation
8.8 Internal content enthalpy
8.9 Internal energy of steam
8.10 Use of steam table
8.11 Simple numerical problems

9. Boilers :

9.1 Classification of boilers
9.2 Working of common boilers

9.2.1 Babcox and Wilcox
9.2.2 Chichram boiler

9.3 Boiler mounting and their accessories
9.4 Introduction to modern high pressure boiler for thermal power station (Lamont boiler, weffler boiler, Benson boiler and Velox boiler).

10. Steam Turbines :

10.1 Introduction
10.2 Types of steam turbine
10.3 Working principle of steam turbine
10.4 Uses and advantages of steam turbine

11. I.C. Engines :

11.1 I.C. engine cycle (otto, diesel)
11.2 Working principle of

11.2.1 Two stroke petrol and diesel
11.2.2 Four stroke petrol and diesel

12. Transmission :

12.1 Belt drive
12.2 Rope drive
12.3 velocity ratio
12.4 Tension ratio
12.5 Effect of centrifugal tension
12.6 Application of these drives

13. Lubrication :

13.1 Object of lubrication
13.2 Different methods of lubrication
13.3 Properties of lubricants

PRACTICALS

1. Verification of Bernualli'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.
8. Study of constructional features & working of cooling towers, ponds.
9. Study of two-stroke petrol engine.
10. Study of four-stroke petrol engine.
11. Study of four-stroke diesel engine.

REFERENCE BOOKS :

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

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ELECTRICAL TECHNOLOGY

CODE EE 33

L	T	P
3	2/2	2

RATIONALE

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.

CONTENTS

1. D.C. Circuits :

1.1 Resistance, specific resistance, Ohm's law, Resistance in series, parallel and series parallel circuits.
1.2 Kirchhoff's laws
1.3 Application of Kirchhoff's laws

2. Capacitance :

2.1 Capacitor
2.2 Capacitance of an isolated sphere
2.3 Parallel plate capacitor
2.4 Special cases of parallel plate capacitor
2.5 Cylindrical capacitor
2.6 Capacitor in series and parallel
2.7 Capacitor with compound dielectric
2.8 Energy stored in capacitor
2.9 Charging and discharging of a capacitor, time constant
2.10 Different types of capacitor used in various electrical applications.

3. Magnetic Circuits :

3.1 Introduction
3.2 Comparison between magnetic circuit and electric circuits
3.3 Behavior of magnetic circuits
3.4 Composite magnetic circuits
3.5 Parallel magnetic circuits
3.6 B-H curve
3.7 Rise of current in inductive circuit
3.8 Decay of current in inductive circuit
3.9 Eddy current and Eddy current loss

4. Phasor Algebra :

4.1 Mathematical representation of a vector
4.2 Symbolic notation
4.3 Significance of operator-j
4.4 Conjugate complex number
4.5 Trigonometrical form of vector representation
4.6 Exponential form of vector representation
4.7 Polar form of vector representation
4.8 Addition and subtraction of vector
4.9 Multiplication and division of vector quantity
4.10 120^{o} operator

5. A.C. Circuits :

5.1 Alternating quantity and its equation
5.2 Maximum, Average and RMS values.
5.3 Form factor
5.4 Behaviour of R, L and C in A.C. circuits with phasor diagrams
5.5 A.C. through R-L circuit, power factor, active and reactive component of current, power

5.6 Q-factor of a coil
5.7 A.C. through R-C circuit, dielectric loss and power factor of a capacitors
5.8 Solving series R-L-C circuits
5.9 Solving A.C. parallel circuit by phasor diagram and phasor algebra
5.10 Solving A.C. series and parallel circuits.

6. Polyphase System :

6.1 Need and advantage of 3-phase system
6.2 Generation of 3-phase voltage
6.3 Phase sequence
6.4 Star-Delta connections
6.5 Phase and Line relations of voltage and current in star -delta connections (for balanced load)
6.6 Expression of power in 3-phase circuits (for balanced load)

7. Battery :

7.1 Types of storage batteries
7.2 Construction and working of Lead acid batteries and Ni-Fe batteries
7.3 Discharging and recharging of Lead acid batteries
7.4 Care of Lead acid batteries
7.5 Ampere and watt-hour efficiencies

PRACTICALS

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)
11. Study of lead acid battery
12. Charging and discharging of lead acid battery.

REFERENCE BOOKS :

1.	Electrical Engineering(Hindi & English)	K.D.Sharma
2.	Electrical Technology	B.L.Theraja
3.	Electrical Engineering (Part-I)	D.R.Nagpal
4.	Electrical Technology	J.B.Gupta
5.	Basic Electrical Engg.	V.N. Mittal
6.	Basic Electrical Engg.	Nagrath & Kothari

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ELECTRICAL ENGINEERING MATERIALS

CODE EE 34

L	T	P
3	2/2	--

RATIONALE

A diploma holder in electrical engineering will be involved in efficient & effective maintenance, repair & production of electrical equipment & systems. 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.

CONTENTS

1. Classification :

1.1 General requirement of electrical engineering materials,
1.2 Classification of materials into conducting, semi-conducting and insulating materials through a brief reference to atomic structure

2. Conducting Materials :

2.1 Resistivity
2.2 Factors affecting resistivity such as

- 2.2.1 Temperature
- 2.2.2 Alloying
- 2.2.3 Aging effect

2.3 Classification of conducting materials into -

- 2.3.1 Low resistivity materials
- 2.3.2 High resistivity materials

3. Low Resistivity Materials :

3.1 General properties of copper, aluminium and steel as conductors

- 3.1.1 Resistivity
- 3.1.2 Temperature coefficient
- 3.1.3 Contact resistance
- 3.1.4 Melting point
- 3.1.5 Density

3.2 Mechanical properties of hard and annealed copper, aluminium and low and high tensile steel

- 3.2.1 Mechanical strength
- 3.2.2 Resistance to corrosion
- 3.2.3 Ductility
- 3.2.4 Solderability etc.

3.3 Use of copper, aluminium with steel as a conductors and their comparison

4. High Resistivity Materials :

4.1 General properties, composition and use of high resistivity materials as

- 4.1.1 Nichrome
- 4.1.2 Eureka

4.1.3 Manganin
4.1.4 German silver
4.1.5 Tungsten
4.1.6 Platinum

4.2 Materials for lamp filaments and their properties

5. Contact Materials :

5.1 General properties and uses of contact materials such as

5.1.1 Silver
5.1.2 Tungsten
5.1.3 Copper

6. Brush Materials :

6.1 General properties and uses of brush materials such as

6.1 Carbon
6.2 Electro graphite
6.3 Metal graphite

7. Insulating Materials :

7.1 Electrical properties

7.1.1 Volume resistivity
7.1.2 Surface resistance
7.1.3 Dielectric strength
7.1.4 Dielectric constant

7.2 Physical properties

7.2.1 Specific gravity
7.2.2 Viscosity
7.2.3 Hygroscopicity

7.3 Thermal properties

7.3.1 Heat resistance
7.3.2 Thermal conductivity
7.3.3 Ignitibility
7.3.4 Thermal expansion and contraction
7.3.5 Thermal stability of composition

7.4 Chemical properties

7.4.1 Solubility
7.4.2 Chemical resistance
7.4.3 Weatherability

7.5 Classification of insulating materials on the basis of temperature limit

7.6 Composition, properties and applications of

7.6.1 Fibrous materials
7.6.2 Ceramics
7.6.3 Mica and mica products
7.6.4 Asbestos and asbestos products
7.6.5 Glass and glass products
7.6.6 Natural and synthetic rubber
7.6.7 PVC
7.6.7 Bakelite

7.7 Properties of liquid insulating materials such as

7.7.1 Transformer oils
7.7.2 Mineral insulating oils

7.8 Properties of gaseous insulating materials such as

7.8.1 Hydrogen
7.8.2 Air
7.8.3 SF_6

8. Magnetic Materials :

8.1 Terminology and classification

8.1.1 Diamagnetic material
8.1.2 Paramagnetic material
8.1.3 Ferromagnetic material

8.2 Effect of Curie temperature
8.3 Hysteresis loop
8.4 Soft and hard magnetic materials
8.5 Different magnetic materials such as

8.5.1 Soft ferrites
8.5.2 Silicon steel
8.5.3 Nickel Iron alloys
8.5.4 Cobalt steel
8.5.5 Tungsten steel
8.5.6 ALNICO
8.5.7 ALNI

9. Semiconducting Materials and their Properties :

10. Special Purpose Materials :

10.1 Metals/ alloys for fuses with their properties composition & uses
10.2 Composition and properties of soldering materials
10.3 Materials for thermocouple
10.4 Materials for bimetal
10.5 Super conductivity and super conducting materials application and recent trend in this field.

REFERENCE BOOKS :

1. Electrical Engineering Materials — T.T.T.I. Madras
2. Electrical Engineering Materials — Raina, Bhattacharya
3. Electrical Engg. Materials — B.R. Sharma
4. fo|qr bathfu;fjax inkFkZ — ds-Mh- 'kekZ
5. fo|qr bathfu;fjax inkFkZ — Mh-vkj ukxiky

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NON-CONVENTIONAL ENERGY SOURCES

CODE EE 35

L	T	P
3	2/2	--

RATIONALE

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.

CONTENTS

1. Sources of Energy :

- 1.1 Different sources
- 1.2 Application of sources with reference to Rajasthan

2. Solar Energy :

- 2.1 Application
- 2.2 Unit of solar power and solar energy
- 2.3 Historical review and future prospects
- 2.4 Schematic diagram of a solar thermal power plant
- 2.5 Solar central receiver thermal power plant
- 2.6 Solar pond thermal plant
- 2.7 Solar thermal power supply system for space station
- 2.8 Introduction to photo voltaic system
- 2.9 Merits and limitation of solar PV system
- 2.10 Principle of photo voltaic cell
- 2.11 V-I characteristics of solar cell
- 2.12 Efficiency of a solar cell
- 2.13 Transparent, insulating and absorbing materials
- 2.14 Building heating by active and passive system
- 2.15 Solar still, solar dryer and solar cooker
- 2.16 Solar seasoning of timber

3. Wind Energy :

- 3.1 Introduction to wind energy
- 3.2 Merits and demerits of wind energy
- 3.3 Wind power and energy pattern factor
- 3.4 Wind machine
  - 3.4.1 Horizontal axis wind machine
  - 3.4.2 Vertical axis wind machine
- 3.5 Site selection of a wind machine
- 3.6 Maintenance of a wind machine
- 3.7 Efficiency of a wind machine
- 3.8 Application of a wind machine

4. Bio-Gas Energy :

- 4.1 Introduction to bio-gas energy
- 4.2 Properties of bio-gas
- 4.3 Principle of bio-gas production
- 4.4 Chemical and microbiological processors
- 4.5 Factors which affects bio-gas production
- 4.6 Different feed stocks for bio-gas production
- 4.7 Classification of bio-gas plant

4.7.1 Fixed dome type
4.7.2 Floating type

4.8 Comparison between fixed dome and floating type bio-gas plant
4.9 Site selection of bio-gas plant
4.10 Selection of size and specification of bio-gas plant
4.11 Water removing devices
4.12 Maintenance of bio-gas plants
4.13 Bio gas lamp and chulha
4.14 Bio gas storage and transportation
4.15 Purification of bio-gas
4.16 Environmental effect of bio-gas plant
4.17 Visit to a bio-gas plant
4.18 Preparation of a project report on a bio-gas plant

5. Ocean Energy :

5.1 Introduction to ocean energy
5.2 Types of ocean energy

5.2.1 Open cycle
5.2.2 Closed cycle

6. Appropriate Technology :

6.1 Introduction to appropriate technology
6.2 Concepts of appropriate technology
6.3 Need of appropriate technology
6.4 Merits and demerits
6.5 Comparison between appropriate and modern technology
6.6 Application

REFERENCE BOOKS :

1. Energy technology — S.Rao & B.B. Parulekar
2. Non-conventional Energy Sources — A.N. Mathur & N.S.Rathore
3. Non-conventional Sources of energy and appropriate technology — D.M. Agrawal & S.K. Bhatnagar
4. Non-conventional Energy Sources — G.D.Rai
5. Solar Energy — Garg & Prakash

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ELECTRICAL INSTRUMENTS AND MEASUREMENT

CODE EE 36

L	T	P
2	--	2

RATIONALE

A diploma holder in electrical engineering where ever placed on job, has to select a suitable measuring instruments 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.

CONTENTS

1. Classification of Measuring Instruments :

1.1 Indicating, recording and integrating instruments
1.2 Accuracy and sensitivity
1.3 Types of errors
1.4 Deflecting, controlling and damping torque
1.5 Construction, working principle and operation of PMMC, moving iron (MI), dynamometer type ammeter and voltmeter.
1.6 Rectifier type instruments
1.7 Electrostatic voltmeter
1.8 Range extension using shunts and multipliers

2. Wattmeters and Energy Meters :

2.1 Construction, operation and working principles

2.1.1 Dynamometer type wattmeter
2.1.2 Induction type wattmeter

2.2 Blondels theorem and measurement of power by two wattmeter method in 3-phase circuits
2.3 Single phase and three phase induction type energy meter
2.4 Testing of single phase induction type energy meter by direct and phantom loading.
2.5 Adjustments of single phase induction type energy meter
2.6 Brief study of static energy meter (single and 3 phase)

3. Measurement of Resistance :

3.1 Classification of resistance
3.2 Measurement of low resistance by Kelvin's double bridge
3.3 Measurement of medium resistance by Ammeter and Voltmeter, Whetstone's bridge, Substitution methods
3.4 Measurement of high resistance and insulation resistance
3.5 Megger, Earth tester and Ohmmeter

4. Potentiometers :

4.1 Types of A.C. and D.C. potentiometers
4.2 Construction
4.3 Standardisation
4.4 Applications

5. A.C. Bridges :

5.1 General equation for bridge balance
5.2 Maxwell's inductance bridge
5.3 Maxwell's inductance - capacitance bridge
5.4 Anderson's bridge
5.5 Schering bridge
5.6 Wein's bridge for frequency measurements

6. Brief study of:

6.1 CRO
6.2 Electronic voltmeter

PRACTICALS

1. Study of constructional features and calibration of moving iron and moving coil type ammeter and voltmeter.
2. Study of constructional features and calibration of dynamometer type wattmeter and induction type energy meter.
3. Measurement of power in 3-phase circuits by two wattmeter method
4. Testing of single-phase induction type energy meter by direct and phantom loading.
5. Measurement of resistance by Kelvin's double bridge
6. Measurement of resistance by Whetstone bridge
7. Study of the constructional details and working of Megger and measurement of insulation resistance.
8. Measurement of Earth's resistance by Earth tester
9. Study and use of multimeter
10. Calibration of ammeter and voltmeter by D.C. potentiometer
11. Measurement of resistance by D.C. potentiometer
12. Measurement of inductance and capacitance with the help of a suitable A.C. Bridge
13. Measurement of frequency using CRO

REFERENCE BOOKS :

1. Electrical Measurement & Instrumentation A.K.Sawhney
2. Electrical Measurement & Instruments J.B.Gupta
3. Electrical Measurement E.W.Golding
4. Electrical Measurement D.R.Nagpal

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ELECTRICAL WORKSHOP - I

CODE EE 37

L	T	P
2	--	6

RATIONALE

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.

CONTENTS

1. Wiring :

1.1 System of wiring
1.2 Types of wiring and their application

2. Wire Joints :

2.1 Different types of joints
2.2 Their uses

3. Wiring Diagram of Different Lamp Control Circuits and Their Working :

3.1 Bell indicator
3.2 Fluorescent tube (single and double)
3.3 Mercury vapour lamp
3.4 Sodium vapour lamp
3.5 Neon sign lamp
3.6 Flasher

4. Study the Following Circuit :

4.1 Emergency light
4.2 Voltage stabilizer
4.3 Domestic refrigerator

5. Fault Investigation and Testing :

5.1 Specification, wiring, dismantling, fault investigation, repairing, assembling and testing the following electrical appliances -

5.1.1 Electric heater
5.1.2 Electric immersions heater
5.1.3 Room heater
5.1.4 Electric kettle
5.1.5 Electric soldering iron

6. Automobile Electrical System :

6.1 Dynamo
6.2 Self starter
6.3 Voltage regulator
6.4 Ignition coil
6.5 Lighting circuit

6.5.1 Four wheeler
6.5.2 Two wheeler

PRACTICALS

1. To test polarity of supply

    1.1 By tester
    1.2 By test lamp

2. Study of conduit and PVC casing capping wiring fitting and preparations of following circuits in above wiring -

    2.1 Control of one lamp from one point by a single pole switch
    2.2 Control of two lamp from two points by two single pole switches.
    2.3 Control of one lamp from two places by two way switches (staircase wiring)

3. Preparations of straight joints on multistrand insulated wire

    3.1 Twisted joint
    3.2 Married joint

4. Preparation of cross joints on insulated wires

    4.1 Plain cross joint
    4.2 Duplex cross joint

5. Preparation of wiring diagram and wiring of the following -

    5.1 Sodium vapour lamp
    5.2 Mercury vapour lamp
    5.3 Corridor wiring
    5.4 Row of lamps (decorative light)
    5.5 Double Fluorescent tube of 40 watts

6. 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.

7. Assembling, dismantling and fault investigation in the following domestic appliances

    7.1 Electric heater
    7.2 Electric immersion heater
    7.3 Room heater
    7.4 Electric kettle
    7.5 Electric soldering iron

REFERENCE BOOKS :

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 — Secondary Education Board Rajasthan, Ajmer
5. Basic shop practicals in electrical Engg. — Vinod kumar, & K. Vajay

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ELECTRICAL MACHINES - I

CODE EE 41

L	T	P
2	2/2	2

RATIONALE

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.

CONTENTS

1. D.C. Generator :

1.1 Construction of D.C. machine
1.2 Lap and wave winding (Brief idea)
1.3 Principle of D.C. generator
1.4 Excitation methods and different types of D.C. Generator
1.5 E.M.F. equation
1.6 D.C. generator characteristics
1.7 Losses
1.8 Efficiency and condition for maximum efficiency
1.9 Concept of armature reaction
1.10 Effect of armature reaction on commutation and generated voltage.

2. D.C. Motor :

2.1 Different types of D.C. motor
2.2 Principle of D.C. motor
2.3 Concept of back emf
2.4 Torque, speed and power relations
2.5 Starters for D.C. shunt and compound motors
2.6 Characteristics of D.C. motor
2.7 Speed control of D.C. motor

2.7.1 Field control
2.7.2 Armature control
2.7.3 Series parallel control

2.8 Testing of D.C. machine by

2.8.1 Direct loading
2.8.2 Swineburn's test
2.8.3 Hopkinson's test and
2.8.4 Calculation of efficiency as a generator and motor from above test

3. Transformer :

3.1 Construction of single phase and three phase transformer
3.2 Principle of operation
3.3 Emf equation and Turn ratio
3.4 Idea of leakage reactance
3.5 Transformer phasor diagram

3.5.1 At no load
3.5.2 At load (Lagging, Leading and UPF)

3.6 Equivalent circuit of single phase transformer
3.7 Losses, efficiency and regulation
3.8 Condition for maximum efficiency

3.9 All day efficiency
3.10 Transformer testing

3.10.1 By direct loading
3.10.2 By open circuit and short circuit test

3.10.2.1 Determination of equivalent circuit parameters

3.10.3 Back to back test

3.11 Parallel operation of single-phase transformer with equal and unequal voltage ratio.
3.12 Off load and on load tap changers
3.13 Auto transformer
3.14 Poly phase connection (Descriptive study)

3.14.1 Scott connection
3.14.2 Open-Delta connection
3.14.3 Star-Star connection
3.14.4 Delta - Delta connection

3.15 Parallel operation of 3-phase transformer

PRACTICALS

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.

REFERENCE BOOKS :

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

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ELECTRICAL CIRCUIT THEORY

CODE EE 42

L	T	P
2	2/2	--

RATIONALE

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.

CONTENTS

1. Network Parameters :

1.1 Active and passive
1.2 Linear and non-linear
1.3 Unilateral and bilateral
1.4 Lumped and distributed
1.5 Time varying and time invariant parameters
1.6 Voltage and current sources (ideal and practical)
1.7 Dependent and Independent sources
1.8 Source conversion techniques

2. Network Theorems :

2.1 Kirchhoff's law, node and mesh analysis, Solution by Kramer's rule up to three variables
2.2 Superposition theorem
2.3 Thevenin's theorem
2.4 Norton's theorem
2.5 Maximum power transfer theorem
2.6 Tellegen's theorem
2.7 Star-delta transformation
2.8 Millman's theorem

3. Resonance :

3.1 Series resonance
3.2 Parallel resonance
3.3 Q-factor, bandwidth, selectivity, half power frequencies, graphical representations
3.4 Importance of resonance

4. Circuit Transients :

4.1 Introduction to Laplace transform and inverse Laplace transformations
4.2 Laplace transformation of following functions

- 4.2.1 Unit impulse function
- 4.2.2 Unit step function
- 4.2.3 Exponential function
- 4.2.4 Ramp function
- 4.2.5 Sinusoidal function
- 4.2.6 Derivative function
- 4.2.7 Integral function

4.3 Laplace transformation theorem

- 4.3.1 Shifting Theorem
- 4.3.2 Shift in 's' domain theorem
- 4.3.3 Complex differentiation theorem
- 4.3.4 Final value theorem

4.3.5 Initial value theorem
4.3.6 Complex integration theorem

4.4 Solution of series RL, RC and RLC circuits by Laplace transformation

5. Two Port Network :

5.1 z-parameters
5.2 y-parameters
5.3 h-parameters
5.4 ABCD- parameters
5.5 Inter relation among z,y,h and ABCD parameters.
5.6 Special types of network such as T, π, Bridge - T, Parallel-T and Lattice.

6. Complex Frequency and Pole-Zero Diagram :

6.1 Concept of complex frequency
6.2 Poles and zeros of simple function
6.3 Ploting of poles and zero diagram of a simple function (up to second order)
6.4 Necessary conditions of pole and zero locations of driving point functions.

REFERENCE BOOKS :

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

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GENERATION OF ELECTRICAL ENERGY

CODE EE 43

L	T	P
2	2/2	--

RATIONALE

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.

CONTENTS

1. Introduction :

1.1 Electrical energy demand and electrical energy growth in India
1.2 Electrical energy growth in India
1.3 Electrical energy sources
1.4 Fossil fuels and nuclear fuels
1.5 Preesent status of electrical demand in Rajasthan

2. Load and Load Curves :

2.1 Types of load
2.2 Variation in demand, chronological load curve
2.3 Load duration curve, energy load curve
2.4 Load factor, capacity factor, diversity factor, connected load, maximum demand, utilisation factor etc.
2.5 Base load and peak load plants

3. Tariffs and Power Factor Improvement :

3.1 Objectives of tariff
3.2 General tariff form and types of tariff

3.2.1 Flat rate
3.2.2 Straight meter rate
3.2.3 Block meter rate
3.2.4 Hopkinson demand tariff
3.2.5 Doherty demand rate
3.2.6 Wright demand rate

3.3 Present tariff pattern in Rajasthan

4. Power Factor Improvement :

4.1 Meaning of power factor
4.2 Causes of low power factor
4.3 Effects of low power factor
4.4 Advantages of power factor improvement
4.5 Methods of power factor improvement
4.6 Location of shunt capacitors

5. Thermal Power Station :

5.1 Selection of plant location
5.2 Block diagram of plant and its working
5.3 Coal handling plant
5.4 Pulverising plant
5.5 Draft system
5.6 Boilers
5.7 Ash handling plant
5.8 Turbine
5.9 Different types of condensers
5.10 Cooling towers and ponds
5.11 Feed water heater
5.12 Economiser
5.13 Super heater and reheater
5.14 Air preheater

6. Hydro Electric Power Plants :

6.1 Selection of site
6.2 Advantages and disadvantages of hydro power plant
6.3 Hydrology
6.4 Classification based on

6.1.1 Water flow regulations
6.1.2 Load
6.1.3 Head

6.5 Element of hydro power plant and their functions

6.5.1 Dam
6.5.2 Storage reservoir
6.5.3 Fore bay
6.5.4 Surge tank
6.5.6 Pen stocks
6.5.7 Spill way
6.5.8 Head race and tailrace
6.5.9 Types of turbines
6.5.10. Specific speed

6.6 Brief idea about small and mini hydro plants
6.7 Pumped storage plant

7. Nuclear Power Station :

7.1 Introduction and selection of site
7.2 Block diagram of plant and its working

7.3 Main components and their function
7.4 Energy mass relationship
7.5 Energy due to fission and fusion
7.6 Nuclear chain reaction
7.7 Multiplication factor and critical size
7.8 Moderators materials
7.9 Fissile and fertile materials
7.10 Classification of Nuclear reactor, main parts and their functions
7.11 Safety measures required in nuclear plant
7.12 Disposal of nuclear waste

8. Diesel Power Plants :

8.1 Main components and working of diesel power plant with the help of block diagram
8.2 Advantage and disadvantage of diesel power plant
8.3 Application of diesel power plant
8.4 Principle and operation of gas turbine plants
8.5 Comparison of different power stations
8.6 Inter connection of power stations

REFERENCE BOOKS :

1. Generation of Electrical Energy B.R. Gupta
2. Power Plant Engg. Domkundwar
3. A course in Electrical Power Soni, Gupta, Bhatnagar

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ELECTRICAL ESTIMATING AND COSTING

CODE EE 44

L	T	P
2	--	2

RATIONALE

Practically a diploma engineer is required to estimate material requirements. But for the basic concepts some exposure to estimating and costing is also thought essential for the diploma engineer. This course shall make him aware about estimating and costing of total material required for various jobs.

CONTENTS

1. Wiring Materials and Accessories :

1.1 Different electrical symbols
1.2 Brief description, general specification and approximate cost of

- 1.2.1 Different types of wire and cable
- 1.2.2 Switches, socket outlets, ceiling roses, lamp holders, plugs
- 1.2.3 Conduits and it accessories
- 1.2.4 Distribution boards and boxes
- 1.2.5 Fuses, MCB, isolators, E.L.C.B. and energy meters
- 1.2.6 Incandescent, Fluorescent and discharge lamps
- 1.2.7 D.C. and A.C. motors and starters
- 1.2.8 Diesel generating set

2. General Principle of Estimating and Costing :

2.1 Purpose and essential of estimating and costing
2.2 Preparation of list of materials
2.3 Market survey, price list and net prices
2.4 Calculation of material and labour cost, contingencies, supervision, overhead charges, profit and total cost.
2.5 Purchase process: quotations, comparative statement, purchase order, tender order, security money

3. Earthing :

3.1 Need of earthing
3.2 Pipe and plate earthing
3.3 Schedule of material and accessories, costing and estimates.

4. Service Connection :

4.1 General rules and regulation
4.2 Overhead and underground service connection
4.3 Schedule of material and accessories for single phase and three-phase service connection
4.4 Costing of material and work

5. Plan Estimation of 1-ϕ and 3-ϕ Electrical load :

5.1 Installation plan
5.2 Single line-wiring diagram
5.3 Calculation of conductor size
5.4 Design for main switch boards and distribution board
5.5 Calculation of number of circuits
5.6 List of material required for following and preparation of estimate, calculation of material cost using PWD B.S.R.

- 5.6.1 Single story building
- 5.6.2 Multistory building
- 5.6.3 Small workshop
- 5.6.4 Agricultural pump
- 5.6.5 Floor mill
- 5.6.6 Institution or office building

PRACTICALS

1. Design and estimate the material of electrical installation for the following (by conventional method).

1.1 Residential building upto 40 points
1.2 Office building upto 30 points
1.3 Community hall upto 40 points
1.4 Small workshop upto 10 light points and 5 power points
1.5 Motor pump set

2. Preparation of schedule of material and estimate for the following using PWD B.S.R.

2.1 Residential building upto 40 points
2.2 Office building upto 30 points
2.3 Community hall upto 40 points
2.4 Small workshop upto 10 light points and 5 power points
2.5 Motor pump set

3. Design and preparation of schedule of material of estimate for service connection

2.1 1-ϕ Overhead
2.2 3-ϕ overhead
2.3 1-ϕ underground
2.4 3-ϕ underground

REFERENCE BOOKS :

1. Electrical Estimating and Costing — TTTI Madras
2. Electrical Estimating and Costing — M.F. Buereslui
3. Electrical Estimating and Costing — Y.P. Jaggi
4. Electrical Estimating and Costing — Raina, Bhattacharya.
5. Electrical Drawing and Estimating — Surjit Singh

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INSTRUMENTATION

CODE EE 45

L	T	P
2	2/2	2

RATIONALE

This course aims at imparting the basic concept of instrumentation. All production processes in variably comprises of the above mentioned branches of engg. These branches of study should prove useful both for field jobs and continuing studies.

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.

CONTENTS

1. Instrumentation System :

1.1 Introduction to measurement system
1.2 Generalised block diagram representation of instrumentation system
1.3 Brief description of components of instrumentation system

2. Transducer :

2.1 Classification of transducer

2.1.1 Primary transducer
2.1.2 Secondary transducers
2.1.3 Active transducer
2.1.4 Passive transducer
2.1.5 Analog transducer
2.1.6 Digital transducer

2.2 Construction, principle of operation and application of the following transducers :

2.2.1 Potentiometer
2.2.2 L V D T and R V D T
2.2.3. Resistance strain gauge

2.2.3.1 Gauge factor
2.2.3.2 Gauge materials
2.3.3.3 Temperature compensation

2.2.4 Thermocouple
2.2.5 Thermister
2.2.6 R T D
2.2.7 Photo cell
2.2.8 Piezo Electric
2.2.9 Capactive
2.2.10 pH electrode

3. Measurement of Following Physical Parameter Using Suitable Transducers :

3.1 Linear displacement
3.2 Angular displacement
3.3 Strain, Stress and force
3.4 Velocity and Speed
3.5 Temperature
3.6 Pressure
3.7 pH value
3.8 Flow measurement

4. Signal Conditioning :

4.1 Introduction
4.2 D.C. signal conditioning

4.3 A.C. signal conditioning
4.4 Brief idea of data acquisition system

5. Instrument Transformer :

5.1 Definition of terms related to instrument transformer
5.2 Current Transformer (CT)
5.3 Potential Transformer (PT)
5.4 Difference between CT and PT
5.5 Application of CT and PT

PRACTICALS

1. Measurement of displacement using following transducers :

   1.1 Potentiometer
   1.2 L.V.D.T.
   1.3 Capacitive

2. Measurement of temperature with the help of

   2.1 Thermocouple
   2.2 Thermister
   2.3 R.T.D.

3. Measurement of pH value by pH electrode.
4. Application of strain gauge for measurement of displacement
5. Measurement of strain with the help of strain gauge.
6. Velocity and speed measurement by suitable transducer
7. Pressure measurement by bourdon tube
8. Study of instrument transformers & measurement of turn ratio of current transform and potential transformer.

REFERENCE BOOKS :

1. Electrical and Electronics Measurement and Instrumentation — A.K.Sawhney.
2. Instrumentation and System — Rangan & Sharma
3. Electrical and Electronics Measurement — J.B. Gupta

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ELECTRICAL DESIGN AND DRAWING

CODE EE 46

L	T	P
2	--	6

RATIONALE

Design aspect for diploma engineers is not much as compared to drawing and estimating. Practically an Engineer is required to estimate material requirements. But for the basic concepts some exposure to design aspects is also thought essential for engineers. This course shall make engineers aware about design, drawing and total material requirement for various jobs.

The contents shall make an Engineer to learn design concepts, draw various circuits of power systems and estimate requirements of materials for electrical works.

CONTENTS

1. Transformer Design :

1.1 Single phase and three-phase core type distribution transformer
1.2 Single phase shell type transformer
1.3 Output equation
1.4 Main dimension of frame
1.5 Core design and winding design

2. Design of Winding :

2.1 Definition of -

2.1.1 Single and double layer winding
2.1.2 Full pitch and short pitch winding
2.1.3 Integral and fractional winding

2.2 Developed winding diagrams of single phase and three-phase induction motors
2.3 Developed winding diagrams of alternators

3. Simple Alarm and Signal Circuits :

Using contactors, designing and drawing schematic and wiring diagrams of alarm and signal circuits. Circuits should involve use of switches, push buttons, bells, indicating light which are used in offices, hospitals, hotels and buses etc.

4. Contactor Control Circuits :

4.1 The circuit should incorporate remote control, interlocking, time delay, sequential operation, overload short circuit and no-load protection applicable to -

4.1.1 D.O.L starter
4.1.2 Star-Delta starter
4.1.3 Rotor resistance and reversing starters.

4.2 Contactor control schematic and wring diagram for speed reversing of motors.
4.3 Contactor control schematic and wring diagram for fast and slow speeds of motors.
4.4 Contactor control schematic and wiring diagram of sequential operation of motors.
4.5 Control of pump motor with water level indicators.

5. Panel Wiring Diagram : Panel wiring diagram for the following with usual protective devices and showing the various equipment with suitable ranges -

5.1 Synchronization and parallel operation of 3-phase alternators
5.2 A.C. 3-phase squirrel cage induction motor.
5.3 A.C. 3-phase slip ring induction motor.
5.4 Parallel operation of three phase transformers
5.5 D.C. compound generator

5.6 Parallel operation of D.C. compound generators

PRACTICALS

Drawing sheets to be prepared.

1. Electrical symbols as per I.S. 1 Sheet
2. Preparation of sectional plan, elevation and view of transformer
   - 2.1 Single-phase core and shell type 1 Sheet
   - 2.2 Three-phase core and shell type 1 Sheet
3. Alarm circuits. 3 Sheets
4. Contactor circuits. 3 Sheets
5. Developed winding diagrams. 4 Sheets
6. Panel wiring diagram. 3 Sheets

REFERENCE BOOKS :

1. Electrical Design, Estimating and Costing — K.B. Raina, S.K. Bhattacharya
2. Electrical M/C Design — A.K. Shawney
3. Electrical Drawing and Design — Jaggi
4. Electrical M/C Design — V.N. Mittal
5. Electrical Engg. Drawing — Surjit singh
6. Electrical Engg. Drawing — J.B.Gupta
7. Handbook of Electrical Engg. — S.L. Bhatia

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ELECTRICAL WORKSHOP - II

CODE EE 47

L	T	P
2	--	6

RATIONALE

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.

CONTENTS

1. Domestic Appliances :

- 1.1 Introduction
- 1.2 Appliances making use of thermal effects
- 1.3 Design of heating elements wire
- 1.4 Table fan
  - 1.4.1 Construction and its working
  - 1.4.2 Wiring diagram
  - 1.4.3 Assembling
  - 1.4.4 Dismantling
  - 1.4.5 Defects and remedies
- 1.5 Ceiling fan
  - 1.5.1 Construction and its working
  - 1.5.2 Wiring diagram
  - 1.5.3 Assembling
  - 1.5.4 Dismantling
  - 1.5.5 Defects and remedies
- 1.6 Voltage regulating devices
  - 1.6.1 Resonant types
  - 1.6.2 UPS(off line)
  - 1.6.3 UPS (On line)
  - 1.6.4 Servos
  - 1.6.5 SMPS
- 1.7 Electric washing machine
  - 1.7.1 Working principle
  - 1.7.2 Construction and its working
  - 1.7.3 Internal wiring diagram
  - 1.7.4 Characteristics
  - 1.7.5 Assembling and disassembling
  - 1.7.6 Fault, causes and remedies
- 1.8 Simple telephone
  - 1.8.1 Telephone circuit
  - 1.8.2 Construction
- 1.9 Water cooler
  - 1.9.1 Wiring diagram
  - 1.9.2 Construction and its working
  - 1.9.3 Assembling and disassembling
  - 1.9.4 Possible fault and their remedies

2. Earth Leakage Circuit Breaker :

2.1 Introduction
2.2 Working principle
2.3 Types of ELCB
2.4 Standard on ELCB

3. Miniature Circuit Breaker :

3.1 Introduction
3.2 Construction of MCB
3.3 Overload protection with MCB
3.4 Safety
3.5 Selectivity
3.6 MCB v/s fuse
3.7 Economic consideration

PRACTICALS

1. Dismantling, identifying of various parts, finding fault, removing the fault, assembling and testing of

1.1 Table fan
1.2 Ceiling fan
1.3 Electric washing machine
1.4 Room cooler
1.5 Voltage regulating device
1.6 Electric toaster and sandwich maker
1.7 Electric mixy
1.8 Water cooler

2. Study the construction of telephone and its circuit
3. To make connection of supply and consumer board
4. Study of contactors and time delay relays

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