



3-Year Diploma Engineering Curriculum and Syllabus for Electrical Engineering (EE)

Sixth Semester

Course Structure

Course Code	Course Title	Contact Hrs. / Week			Credit
		L	T	P	
Theory					
TIU-DEE-T300	Career Advancement & Skill Development	2	1	0	3
TIU-DEE-T302	Electrical Installation, Maintenance & Testing	2	1	0	3
TIU-DEE-E302 TIU-DEE-E304	Control of Electrical Machine (Elective) Heating , Ventilation & Air conditioning (Elective)	2	1	0	3
TIU-DEE-T304	Microprocessors& Microcontrollers	2	1	0	3
TIU-DMG-T302	Industrial Management	2	1	0	3
Practical					
TIU-DEE-L304	Microprocessors& Microcontrollers Lab	0	0	3	2
TIU-DEE-L302	Electrical Installation, Maintenance & Testing Lab	0	0	3	2
Sessional					
TIU-DES-S398	Entrepreneurship Skill Development	0	0	2	2
TIU-DEE-G398	General Viva Voce	0	0	2	2
TIU-DEE-P398	Project Work-II	0	0	2	2
Total Credits					25

Detailed Syllabus

Career Advancement & Skill Development



TIU-DEE-T300

LTP: 2-1-0

Credits: 3

According to the syllabus of JELET.

Electrical Installation, Maintenance & Testing

TIU-DEE-T302

LTP: 2-1-0

Credits: 3

Module – I : Safety & Prevention of Accidents:

- 1.1 Definition of terminology used in safety
- 1.2 I.E. Rules & statutory regulations for safety of persons & equipments working with electrical installation
- 1.3 Dos & don'ts for substation operators as listed in IS.
- 1.4 Meaning & causes of electrical accidents factors on which severity of shock depends,
- 1.5 Procedure for rescuing the person who has received an electric shock, methods of providing artificial respiration,
- 1.6 Precautions to be taken to avoid fire due to electrical reasons, operation of fire extinguisher

Module – II General Introduction:

- 2.1 Objectives of testing significance of I.S.S. concept of tolerance, routine tests, type tests, special tests.
- 2.2 Methods of testing a) Direct, b) Indirect, c) Regenerative.
- 2.3 Classification and need of maintenance
- 2.4 Advantages of preventive maintenance, procedure for developing preventive maintenance schedule,
- 2.5 Factors affecting preventive maintenance schedule.
- 2.6 Introduction to total productive maintenance

Module – III Testing & maintenance of rotating machines:

- 3.1 Type tests, routine tests & special tests of 1 & 3 phase Induction motors,
- 3.2 Routine, Preventive, & breakdown maintenance of 1 & 3 phase Induction motors as per IS 9001:1992
- 3.3 Parallel operation of alternators, Maintenance schedule of alternators & synchronous machines as per IS 4884-1968
- 3.4 Brake test on DC Series motor

Module – IV Testing & maintenance of Transformers:

- 4.1 Listing type test, routine test & special test as per I.S. 2026-1981 , specially Vector Group Test
- 4.2 Procedure for conducting following tests: Impedance voltage, load losses, Insulation resistance, Induced over voltage withstand test, Impulse voltage withstand test, Temperature rise



test of oil & winding, Different methods of determining temp rise- back to back test, open delta (delta – delta)test.

4.3 Preventive maintenance & routine maintenance of distribution transformer as per I.S. 10028(part III): 1981

Module – V Testing & maintenance of Insulation:

5.1 Classification of insulating materials as per I.S. 8504 (part III) 1994.

5.2 Factors affecting life of insulating materials.

5.3 Methods of measuring temperature of internal parts of windings/ machines & applying the correction factor when the machine is hot.

5.4 Properties of good transformer oil. List the agents which contaminates the insulating oil.

5.5 Understand the procedure of following tests on oil as per I.S. 1692-1978

(a) acidity test, (b) sludge test, (c) crackle test , (d) flash point test.

5.6 Filtration of insulating oil

5.7 Protection of electrical insulation during the period of inactivity.

5.8 Methods of cleaning the insulation covered with loose, dry dust, sticky dirt, & oily viscous films, procedure for cleaning washing & drying of insulation & revarnishing.

5.9 Methods of internal heating & vacuum impregnation.

Module – VI : Trouble shooting of Electrical Machines & Switch gear:

6.1 Significance of trouble shooting of various electrical machines and describes the procedure for the same.

6.2 Various types of faults (mechanical, electrical & magnetic) in electrical machines and reason for their occurrence

6.3 Use of following tools: Bearing puller, Filler gauge, dial indicator, spirit level, growler.

6.4 Trouble shooting charts for Single & 3-phase induction motor, Single & 3- phase transformer.

6.5 List the common troubles in HV and LV switchgear, contactors & batteries.

Module – V Installation:

7.1 Inspection procedure of Machine Installation.

7.2 Factors involved in designing the machine foundation,

7.3 Requirement of different dimension of foundation for static & rotating machines procedure for levelling & alignment of two shafts of directly & indirectly coupled drives, effects of misalignment.

7.4 Installation of rotating machines as per I.S. 900-1992.

7.5 Use of various devices & tools in loading & unloading, lifting, carrying heavy equipment.

7.6 Method of drying out of Machines.

7.7 Classification of transmission tower

7.8 Installation of Transmission Tower (From foundation to complete erection).

Module – VI Earthing:



- 6.1 Introduction & importance.
- 6.2 Step potential & Touch potential.
- 6.3 Factors affecting Earth Resistance.
- 6.4 Methods of earthing
- 6.5 Substation and Transmission Tower earthing
- 6.6 Transformer Neutral Earthing

Heating , Ventilation & Air conditioning (Elective)

TIU-DEE-E304

LTP: 2-1-0

Credits: 3

Module – I: Introduction

- 1.1 Laws of thermodynamics
- 1.2 Comparison between heat engine, heat pump and refrigeration
- 1.3 Definitions of refrigeration, ton of refrigeration, COP, enthalpy, entropy

Module – II : Types of refrigeration systems

- 2.1 Vapour compression system – components used in vapour compression system, operation of vapour compression system, its representation on P – H and T – S diagrams, effect of superheating and under cooling of refrigerant.
- 2.2 Vapour absorption system – components used in vapour absorption system, its operation, its merits and demerits compared to vapour compression system
- 2.3 Air refrigeration system – components used in air refrigeration system, its operation and applications

Module – III : Refrigerants and Lubrication

- 3.1 Classification of refrigerants
- 3.2 Types of refrigerants presently in use
- 3.3 Desirable properties of refrigerants (Physical, chemical, thermodynamic)
- 3.4 Applications of important refrigerants
- 3.5 Eco-friendly refrigerants
- 3.6 Properties of lubricants
- 3.7 Lubricants and refrigerant compatibility
- 3.8 Foaming of oil and crankcase electric heater
- 3.9 Effect of lubricant flood back to compressor
- 3.10 Additives used in lubricants
- 3.11 Necessity of oil separator

Module – IV : Components of vapour compression system

- 4.1 Various types of compressors – reciprocating (hermetic, semi sealed, open), rotary (centrifugal, lobe type, screw type, blade type), applications of each type
- 4.2 Various types of condensers (air cooled, water cooled, evaporative), applications



- 4.3 Types of cooling towers – natural draft, forced draft
- 4.4 Types of evaporators – direct expansion type, flooded type, shell and coil type, double tube type, plate surface type
- 4.5 Throttling devices – hand expansion valve, constant pressure expansion valve, thermostatic expansion valve, high side float valve, capillary tube, electronic expansion valve
- 4.6 Accessories – receiver, oil separator, drier, strainer, solenoid valve
- Note –schematic diagram and brief description only of the above components
- 4.7 Applications of refrigeration – Ice plant, water cooler, refrigerator, milk dairy, cold storage, breweries, superconductors, transport refrigeration and air conditioning

Module – V: Airconditioning

- 5.1 Psychrometry – Definition, psychrometric properties of air, use of psychrometric chart
- 5.2 Representation of simple air conditioning process on psychrometric chart.
- 5.3 Sling psychrometer
- 5.4 Airconditioning systems (Schematic layout, working and application of each of the following) Central airconditioning system – direct expansion type, chilled water type
Package type airconditioning system Unitary air conditioning system, split type system
Evaporative cooling
- 5.5 Applications of airconditioning – comfort airconditioning, industrial airconditioning, transport air conditioning

Module – VI : Components in air supply and distribution system

- 6.1 Fans and blowers (centrifugal, axial flow) – schematic diagram and applications
- 6.2 Filters – (Dry, viscous, wet, electronic type) – schematic diagram and applications
- 6.3 Different types of humidifiers and dehumidifiers
- 6.4 Grills and registers
- 6.5 Duct system – heat gain or loss in ducts
- 6.6 Causes of pressure loss through air ducts
- 6.7 Different methods of duct designing

Module – VII Thermal insulation

- 7.1 Desirable properties of insulating materials for airconditioning purpose
- 7.2 Different types of insulating materials used for airconditioning
- 7.3 Selection of insulating materials for walls, ceiling, floor, air ducts, chilled water pipes

Module – VIII Controls used in airconditioning

- 8.1 High pressure and low pressure cutouts, overload protector, thermostat, oil safety switch, fusible plug, pressure equalizer
- 8.2 Microprocessor based controls and variable frequency drive
- 8.3 Fluid flow control devices (simple sketch and wiring diagram is expected)

Module – IX Heat load

- 9.1 Definitions – SHF, RSHF, EFSHF
- 9.2 Factors responsible for heat load



- 9.3 Conditions of airconditioning and representation of comfort zone on psychrometric chart
- 9.4 Determination of capacity of airconditioning unit by referring tables only (no calculations)

Module – X Heating and ventilation

- 10.1 Plain heating, electric heating, steam heating, hot water heating, solar heating
- 10.2 Heating with humidification and heating with dehumidification
- 10.3 Natural ventilation
- 10.4 Mechanical ventilation – (1) Air extraction system ,(2) Air supply system, combined supply and extraction system
- 10.5 Air distribution system – perimeter system, extended plenum system, upward flow system, downward flow system, ejector system
- 10.6 Return duct system (only schematic diagrams and brief description of the above system)

Control of Electrical Machines (Elective)

TIU-DEE-E302

LTP: 2-1-0

Credits: 3

Module – I Control Systems :

- 1.1 Concept of Automatic control system.
- 1.2 Illustration of Open loop and closed loop control system.
- 1.3 Need for feedback system.
- 1.4 Basic elements of a servo mechanism.
- 1.5 Examples of Automatic control system.
- 1.6 Introduction to solid state control.
- 1.7 Advantages of solid state control of machines.

Module – II Magnetic Control Systems:

- 2.1 Operation & Applications of Contactor control circuit components – (i) Switches – Push button type, Selector type, Limit switch, Pressure, Float type, Proximity, Thermostat (Temperature)
- (ii) Fuses – Kit-kat type, Cartridge type, HRC type
- (iii) MCCB, MCB.
- (iv) Electromagnetic Contactor.
- (v) Overload relays – Voltage operated, Current operated, Thermal overload relay, Magnetic overload relay,
- (vi) Time delay relays (OFF delay, ON delay).
- (vii) Timer – Pneumatic type, Electronic type
- (viii) Relays –Frequency response relay, Latching relay, Phase failure relay (single phase preventer), Solid state relay.
- (ix) Solenoid valve.
- 2.2 Principles of design of motor control circuits and power circuits.



Module – III Magnetic Control of DC Motor

- 3.1 Operation of Control circuit & Power circuits of -
 - (i) Jogging operation of DC motor in one and two directions.
 - (ii) Starters of DC motor - Current limit acceleration starter, Series relay & Counter emf starter, Definite time acceleration starter.
 - (iii) Braking of DC motor - Dynamic braking , Reversing & plugging.
 - (iv) Protection of DC motor - Field failure protection circuit, Field acceleration protection circuit, Field deceleration circuit.
- 3.2 Solid State Control of DC Motor :
 - (i) Speed control of DC motor using chopper circuit
 - (ii) Speed control of DC shunt motor using thyristor- Half-wave drives & Full-wave drives.

Module – IV Magnetic Control of AC Motor

- 4.1 Operation of Control circuit & Power circuits of -
 - (i) Reversing the direction of rotation of induction motor with Interlocking systems
 - (ii) Simple ON-OFF motor control circuit,
 - (iii) Automatic Sequential control of motor.
 - (iv) DOL starter,
 - (v) Automatic Auto-transformer starter,
 - (vi) Automatic Star-Delta starter.
 - (vii) Starter for multispeed operation of motor.
 - (viii) Plugging & Dynamic braking of AC motor.
 - (ix) Protection of AC motor – Overload, Short circuit and Over temperature protection of high rating motors.
- 4.2 Solid State Control of AC Motor:
 - (i) Speed control of three phase induction motor using variable voltage frequency control,
 - (ii) Speed control of slip-ring induction motor using variable rotor circuit resistance.
 - (iii) Speed control of single phase induction motor using thyristor.
 - (iv) Speed control of synchronous motor.
 - (v) Speed control of universal motor.

Module – V Use of Programmable Logic Control (PLC):

- 5.1 Introduction & Advantages of PLC.
- 5.2 Function of each part of PLC.
- 5.3 Hardware of PLC.
- 5.4 Concept of Ladder diagram in PLC programming.
- 5.5 Ladder logic diagram for –
 - (i) DOL starter of Induction motor,
 - (ii) Automatic Star-Delta starter of Induction motor,
 - (iii) Sequential operation of three motors with a time gap,
 - (iv) Fluid filling operation.
- 5.6 Use of PLC in closed loop control, Proportional control,



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Microprocessors & Microcontrollers

TIU-DEE-T304

LTP: 2-1-0

Credits: 3

Microprocessor Architecture : Address / Data and Control lines, Timing diagrams, Internal registers, Interrupt mechanism (Hardware/Software), DMA mechanism - [NB. Study mainly based on Intel 8085 and other popular microprocessors]. Detailed description of a typical 8-bit Microprocessor (preferably 8085). Interfacing with support chips : Programmable Peripheral Interface (8255), Programmable time/counter (8253), Programmable UART (8251), Programmable Interrupt Controller (8259), DMA Controller (8257), Programmable Keyboard and Display Controller (8279) - signals and timing details along with hardware/software interfacing techniques.

Microprocessor vs. Microcontroller, Architecture of MCS51 microcontroller, PIC microcontroller family, features, Architecture, Memory organization: program memory (ROM, PROM, E2PROM) and data memory (RAM, FLASH), Register organization, Various modules like Timer, ADC, capture, compare, PWM, serial, External interface: inter-chip communication standard (I2C, SPI), device interface (switch, keyboard, LED, seven-segment display, alpha-numeric and graphic LCD, external E2PROM, external serial and parallel interface), PIC Development System, Assembler and Cross-compiler, Programming methodology, Advanced microcontroller: 16-bit and 32-bit, VHDL model of microcontrollers, IP cores.

Industrial Management

TIU-DMG-T302

LTP: 2-1-0

Credits: 3

The detailed syllabus to be provided by the department of Management.