



**DIRECTORATE OF TECHNICAL EDUCATION
DIPLOMA IN MECHANICAL ENGINEERING**

**M SCHEME
2015 -2016 onwards**

**II YEAR
IV SEMESTER**

32044 – ELECTRICAL DRIVES AND CONTROL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : 32044
Semester : IV
Subject Title : ELECTRICAL DRIVES AND CONTROL

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours /Week	Hours/ Semester	Marks		Duration	
Electrical Drives and Control	6	90	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit	Topics	Hours
I	DC CIRCUITS AND DC MACHINES	14
II	AC CIRCUITS AND AC MACHINES	14
III	STEPPER AND SERVO MOTORS & DRIVES	14
IV	POWER SUPPLIES AND LOGIC GATES	13
V	CONTROL ELEMENTS AND PLC	13
	TEST AND REVISION	7
	Total	75

RATIONALE:

The automation is being the order of the day to improve the production with high quality consciousness. Such automation involves electrically operated switches, sensors controlled through electrically driven motors and actuators. The subject aims in introducing the basic electrical DC and AC circuits and motors and also focuses

on the various special control devices like stepper, servo drives and its controlling elements.

OBJECTIVES:

- Explore fundamental electric circuit laws.
- Explain the working principle of DC and AC Electrical machines.
- Identify the effective uses of drives of Electrical machines.
- Analyze the various power supply circuits.
- Select the field controlled elements.
- Explain the construction and working of Transformer.
- Compare the different types of Logic gates.
- Appreciate the safety practices followed in Electrical system.
- Compare the use of servo motors and stepper motors in electrical driving system
- Identify PLC Input outputs.
- Identify the use of Control elements.

**ELECTRICAL DRIVES & CONTROL
DETAILED SYLLABUS**

Contents: Theory

Unit	Name of the Topic	Hours
I	DC CIRCUITS AND DC MACHINES Definition- Electric current, voltage and resistance -Ohm’s law and Kirchoff’s law. Resistance in series and parallel and series, parallel – simple problems electromagnetism(definitions only) – magnetic flux, flux density magnetic field intensity, MMF, permeability, reluctance, Faraday’s law of electromagnetic induction, electrical and mechanical units DC generators – construction, principle of operation, types and application. DC motors: - construction, principle of operation, types and application. Necessity of starters: Three point, four point starters.	17

II AC CIRCUITS AND AC MACHINES **17**

Fundamentals of AC voltage, and current – peak, average, RMS value of sine wave, frequency, time period, amplitude, power and power factor (definition only)- star and delta connection relationship between phase, line voltage and current in star and delta connections.

Transformer: Principle of operation and construction – EMF equation (no definition)- losses in Transformer – efficiency – application.

Alternator construction – principle of operation – types and applications.

AC machine: AC motors- Principle of operation of single phase capacitor start and universal motor induction motor- applications- Three phase induction motors – Squirrel cage and slip ring Induction motors (construction and working principle only) - application – speed control of 3 Φ Induction motor -Necessity of starters – DOL and star/delta starter.

III STEPPER AND SERVO MOTORS & DRIVES: **17**

PMDC, Stepper motor- construction and working principle and applications - Servo motor – types: brushless servo motor, permanent magnet servo motor construction and applications.

Industrial drives- types, group drive, individual drive, multi motor drive, block diagram of Variable frequency drive , stepper motor drive: single stepping and half stepping. Servo drives.

Electrical safety: - importance of earthing - electric shock: first aid, precautions - causes of accident and their preventive measures.

Energy conservation

IV POWER SUPPLIES AND LOGIC GATES **16**

Diode – terminals: anode and cathode, forward biasing and reverse biasing – use of diode in rectifiers – half wave and full wave – necessity of filters- Regulated power supplies: IC voltage regulators – SMPS, UPS and Inverters – General description and their applications.

Display devices – LED, 7 segment LED, LCD

Logic gates: Positive and negative logic, definition, symbol truth table, Boolean expression for OR, AND, NOT, NOR, NAND, EXOR AND EXNOR gates – Universal logic Gates: NAND, and NOR.

V CONTROL ELEMENTS AND PLC

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Fuses – selection of fuse – necessity of fuse- fuse switch units.

Sensors: Photo electric sensor, Inductive proximity sensors, Temperature sensors.

Switches: Push button switch, selector switch, limit switch, pressure switch,

temperature switch, float switch and reed switch.

Relays – NO, NC – usage- bimetallic thermal overload relays.

Contactors- usage – necessity of contactor- Solenoid type contactor

Circuit breakers – Miniature case Circuit breaker (MCCB) and Miniature Circuit

breaker (MCB), Oil Circuit breakers (OCB), Earth leakage circuit breaker (ELCB)

Features of PLC-PLC Block diagram- PLC scan - Fixed and modular PLC Ladder logic-NO, NC contacts-Coils-AND, OR.

Text Books:

- 1) A course in electrical engineering - B.L.Theraja - Multi Colour Edition, S Chand & Co, Reprint 2006
- 2) Control of Machines - S.K Bhattacharya, Brijinder Singh – New Age Publishers, Second Edition- Reprint 2010
- 3) Electronic Circuits & System- Analog and Digital – Y.N.Bapat - Tata Mc Graw Hill.

Reference Books:

- 1) Electrical Technology – Hughes - 8th Edition, Pearson Education.
- 2) Electronic Device and Circuits- An introduction – Allen Mottershed - Prentice Hall of India.