

NORTHERN TECHNICAL UNIVERSITY — MOSUL POLYTECHNIC COLLEGE

Electrical Techniques Department — Second Year Course Description

1. Electrical Machines & Power Systems — Total: 60 Hours

WEEK	THEORETICAL SYLLABUS	PRACTICAL & LABORATORY WORK
Week 1	DC Generators: Construction, Operating Principles, and Types	DC Generator No-Load Characteristic Test
Week 2	DC Generators: Armature Reaction and Load Characteristics	DC Generator Load Testing
Week 3	DC Motors: Working Principles, Torque, and Back EMF	DC Shunt Motor Speed Control
Week 4	DC Motors: Speed Control and Starting Methods	DC Series Motor Characteristics
Week 5	Transformers: Single-Phase Construction and Ideal Transformer	Transformer Open & Short Circuit Test
Week 6	Transformers: Equivalent Circuit, Losses, and Efficiency	Transformer Efficiency & Regulation Test
Week 7	Three-Phase Transformers: Connections and Vector Groups	Three-Phase Transformer Wiring
Week 8	Three-Phase Induction Motors: Construction and Rotating Field	Induction Motor No-Load & Blocked Rotor Test
Week 9	Three-Phase Induction Motors: Torque-Speed Characteristics	Speed-Torque Measurement Lab
Week 10	Synchronous Generators: Construction and Operation Principles	Alternator Synchronization Test
Week 11	Synchronous Motors: Starting Methods and V-Curves	Synchronous Motor V-Curve Plotting
Week 12	Power Transmission Lines: Parameters (R, L, C) and Models	Transmission Line Model Experiment
Week 13	Power Distribution Systems & Substation Components	Substation Diagram & Relay Test
Week 14	Fault Analysis: Symmetrical and Unsymmetrical Faults	Short-Circuit Fault Simulation
Week 15	Protection Systems: Circuit Breakers and Protection Relays	Relay Protection Calibration Test

2. Power Electronics & Drives — Total: 60 Hours

WEEK	THEORETICAL SYLLABUS	PRACTICAL & LABORATORY WORK
Week 1	Power Semiconductor Devices (Power Diodes, SCR, MOSFET, IGBT)	Power Device Switching Characteristics
Week 2	Uncontrolled Rectifiers: Single-Phase Half and Full Wave	Diode Rectifier Circuits Assembly
Week 3	Controlled Rectifiers: Single-Phase Thyristor Circuits	SCR Firing Angle Control Circuit
Week 4	Three-Phase Rectifiers: Uncontrolled and Controlled	Three-Phase Rectifier Waveform Measurement
Week 5	AC Voltage Controllers: Single-Phase Circuits	AC Voltage Regulator Testing
Week 6	DC-DC Converters (Choppers): Buck, Boost, and Buck-Boost	Buck & Boost Converter Design Lab
Week 7	Inverters: Single-Phase Half & Full Bridge Inverters	DC-AC Inverter Construction & Testing
Week 8	Pulse Width Modulation (PWM) Techniques in Inverters	PWM Signal Generation Exercises
Week 9	DC Motor Drives: Phase-Controlled DC Drives	DC Motor Speed Drive Control
Week 10	DC Motor Drives: Chopper-Fed Drives	Chopper Motor Control Circuit
Week 11	AC Motor Drives: Variable Frequency Drives (VFD)	VFD Setup and Parameter Configuration
Week 12	Industrial Control Systems and Sensors Integration	Sensor Signals Calibration
Week 13	Programmable Logic Controllers (PLC) Fundamentals	PLC Ladder Logic Programming
Week 14	PLC Applications in Industrial Automation	PLC Controlled Motor Automation
Week 15	Comprehensive System Design and Performance Testing	Final Practical Drive Project Test