



University of Management and Technology
School of Engineering
Department of Electrical Engineering

Course Outline

Course code: EE424

Course title: Electrical Machine Design

Program	BSEE
Credit Hours	3
Duration	One semester
Prerequisites	None
Resource Person(s)	Dr. Irfan Ullah Zafar Iqbal
Counseling Timing	Please see on the SEN-EE website
Contact	Email: irfanullah@umt.edu.pk Cell: 03009572152 zafar_iqbal@umt.edu.pk

Chairman/Director signature.....

Dean's signature..... Date.....

Course Learning Outcomes (CLOs):

CLO:1. Explain the working of electric machine and their role in energy generation, transmission and consumption and the principles of electrical machine design and related standards (Level: C2).

CLO:2. Analyze the design step of single-phase and three-phase transformer and rotating AC machines (Level: C4).

CLO:3. Design of core, LV winding, HV winding and transformer dimensions (Level: C6).

CLO:4. Design of stator winding, rotor winding of induction machines. (Level: C6).

Mapping of CLOs to Program Learning Outcomes

PLOs/CLOs	CLO 1	CLO 2	CLO 3	CLO 4
PLO:1 (Engineering Knowledge)	✓			
PLO:2 (Problem Analysis)		✓		
PLO:3 (Design and Development of Solution)			✓	✓
PLO:4 (Investigation)				
PLO:5 (Modern Tool Usage)				
PLO:6 (The Engineer and Society)				
PLO:7 (Environment and Sustainability)				
PLO:8 (Ethics)				
PLO:9 (Individual and Team Work)				
PLO:10 (Communication)				
PLO:11 (Project Management)				
PLO:12 (Life Long Learning)				

Grade Evaluation Criteria

Following is the criteria for the distribution of marks to evaluate final grade in the semester.

Marks Evaluation	Marks (%)
Assignments and Quizzes	25
Mid Term	25
Final exam	50
Total	100

Recommended Text Books:

- 1) A. K. Sawhnby, A course in electrical machine design, 1st Edition
- 2) Pavlos S. Georgilakis, Spotlight on Modern Transformers Design, 1st Edition

Reference Books:

- 1) M. G. Say, Alternating Current Machines", 4th Edition
- 2) Juha Pyrhönen, et al., Design of Rotating Electrical Machines, 1st Edition

Calendar of Course contents to be covered during semester

Course code EE424 Course title ... Electrical Machine Design

Lectures	Course Contents	Reference Chapter(s)
1	Introduction of electric machines Energy generation and consumption Energy sources History of transformer & electric motor AC machines	Presentation slides
2	National and international standards Principles of electrical machine design 1.1 Design of machines 1.2 Design factors 1.3 Limitations in design Materials for electric machines 2.2 Conducting materials 2.6 Magnetic materials 2.7 Types of magnetic materials 2.9 Insulating materials	Presentation slides & Ch. 1 & 2 of Book 1
3-6	Transformers 7.1 Introduction 7.2 Types and construction 7.3 Single and three phase transformers 7.6 Distribution and power transformers 7.7 Transformer core 7.15 Transformer windings 7.17 Cooling of transformers 7.19 Transformer tank 7.28 Transformer assembly 7.29 Output equations of transformer Example	Presentation slides, notes, & Ch. 7 of Book 1
7-15	1.2 Magnetic circuits 2.2 Transformer design introduction 2.3 Problem formulation 2.4 Transformer design method 2.5 Transformer design data 2.6 Calculation of volts per turn and thickness of core leg 2.7 Calculation of layer insulation 2.8 Calculation of winding and core dimensions 2.9 Calculation of Core Weight and No-Load Loss	Presentation slides & Ch. 1 & 2 of Book 2

	2.12 Calculation of Impedance Voltage 2.13 Calculation of coil length 2.14 Calculation of tank dimensions 2.23 Calculation of transformer manufacturing cost	
16-17	MID TERM EXAMINATION	
18-22	10.1 Introduction of induction machine 10.2 Stator 10.4 Rotor 10.5 Rotor windings 10.9 Output equations of induction motor 10.12 Efficiency and power factor 10.13 Main dimensions	Presentation slides & Ch. 10 of Book 1
23-25	Stator design 10.14 Stator winding 10.17 Area of stator slots 10.20 Stator core Design example	Presentation slides & Ch. 10 of Book 1
26-28	Rotor design 10.21 Length of air gap 10.22 Number of rotor slots 10.23 Design of rotor bars and slots 10.24 Design of end rings Design example	Presentation slides & Ch. 10 of Book 1
29	Mechanical design issues and manufacturing practices of electric machines	Presentation slides
30	Introduction to computer aided design (CAD) and computer aided manufacturing (CAM)	Presentation slides
31-32	FINAL EXAMINATION	