**University of Management and Technology**

**School of Engineering**

**Department of Electrical Engineering**

**Course Outline**

Course code…… EE424 ………………… Course title…… Electrical Machine Design ……………………

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

**Chairman/Director signature………………………………….**

**Dean’s signature…………………………… Date………………………………………….**

**Learning Objective:**

Discussion of design and loading of Power Transformers and Induction motors is introduced, and installation, manufacturing, and testing practices are discussed.

**Learning Methodology:**

Interactive and participative

**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 Pyrh¨onen, 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 ……………**

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| --- | --- | --- |
| **Lectures** | **Course Contents**  | **Reference Chapter(s)** |
| 1 | Introduction of electric machinesEnergy generation and consumptionEnergy sourcesHistory of transformer & electric motorAC machines | Presentation slides |
| 2 | National and international standardsPrinciples of electrical machine design* 1. Design of machines
	2. Design factors
	3. Limitations in design

Materials for electric machines2.2 Conducting materials2.6 Magnetic materials2.7 Types of magnetic materials2.9 Insulating materials | Presentation slides & Ch. 1 & 2 of Book 1 |
| 3-6 | Transformers7.1 Introduction7.2 Types and construction7.3 Single and three phase transformers7.6 Distribution and power transformers7.7 Transformer core7.15 Transformer windings7.17 Cooling of transformers7.19 Transformer tank7.28 Transformer assembly7.29 Output equations of transformer | Presentation slides & Ch. 7 of Book 1 |
| 7-15 | 1.2 Magnetic circuits2.2 Transformer design introduction2.3 Problem formulation2.4 Transformer design method2.5 Transformer design data2.6 Calculation of volts per turn and thickness of core leg2.7 Calculation of layer insulation2.8 Calculation of winding and core dimensions2.9 Calculation of Core Weight and No-Load Loss2.12 Calculation of Impedance Voltage2.13 Calculation of coil length2.14 Calculation of tank dimensions2.23 Calculation of transformer manufacturing cost | Presentation slides & Ch. 1 & 2of Book 2 |
| 16-17 | **MID TERM EXAMINATION** |  |
| 18-22 | 10.1 Introduction of induction machine10.2 Stator10.4 Rotor10.5 Rotor windings10.9 Output equations of induction motor10.12 Efficiency and power factor10.13 Main dimensions | Presentation slides & Ch. 10of Book 1 |
| 23-25 | Stator design10.14 Stator winding10.17 Area of stator slots10.20 Stator coreDesign example | Presentation slides & Ch. 10of Book 1 |
| 26-28 | Rotor design10.21 Length of air gap10.22 Number of rotor slots10.23 Design of rotor bars and slots10.24 Design of end ringsDesign example | Presentation slides & Ch. 10of 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 |

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| 31-32 | **FINAL EXAMINATION** |  |