**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.pk  Cell: 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 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. Design of machines   2. Design factors   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 | Presentation slides & 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  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 | Presentation slides & Ch. 1 & 2  of Book 2 |
| 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 |

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