**Minoufiya University,**

**Faculty of Engineering,**

**Electrical Eng. Dept.,**

**Post Graduate Studies and Research.**

**Minoufiya University**

Faculty of Engineering

**Course Specification**

***Title: Theories of Electrical Machines***

***Code Symbol: ELE 501***

***Department offering the course: Electrical Eng. Dept***

***Date of specification approval: / / 2012***

***A- COURSE IDENTIFICATION AND INFORMATION:***

***B - Professional Information***

***B.1 Course Aims:***

This course aims to provide a deep understanding of the generalized theories of

electrical machines, analyze the construction of the magnetic circuit of electrical machines,

derive the mathmatical model of different types of electrical machines in d-q reference

frame and study linear transformations of electrical machines.

***B.2 Course Objectives***

**1. Definition of the generalized theories of electrical machines.**

**2. Demonstration of the knowledge and understanding of the basic principles of theories of**

**electrical machines.**

**3. Analyzing and studying the construction of the magnetic circuit of electrical machines**

**4. Obtaining magnetic field energy and torque expressions for both single and double**

**excitations of electrical machines.**

**5. Studying the two axis representation theory of electrical machines.**

**6. Analyzing the performance of induction motors current during starting.**

**7. Applying of linear transformations of electrical machines, to get easier solutions.**

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| Field | Programme ILOs that the coursecontribute in achieving | Course ILOs |
| Knowledge&Understanding | A1. Integrate theories, fundamentals andknowledge of electrical machinesin practice. | a1-1) Integrate the definitions ofgeneralization     and      unificationtheories of electrical machines |
| A2. Understand the basics of quality inprofessional engineering practiceaccording to electrical machinesspecialization. | a2-1) Explain the basic principlesof electrical machines theories. |
| Intellectual skills | B1. Identify and analyze problems in thearea of electrical machines specializationand rank the results according to theirpriorities. | b1-1) Identify and formulate theproblems of electrical machinesfrom real life situations, accordingto their priorities. |
| B2.      Solve      electrical      engineeringproblems    in    the    area    of    electricalmachines specialization. | b2-1) Solve electrical engineeringproblems of electrical machineswith modeling, analysis, design,and computer simulation as tools. |
| Professional andPractical Skills | C1. Apply the professional engineeringtechnologies    in    the    field    ofelectrical machines specialization. | c1-1)            Apply            computerprogrammers to solve problems ofelectrical machines. |
| General andTransferrableSkills | D1. Effective communication of all kindsand sharing ideas with differentrelevant teams. | d1-1) Effective communicationand collaborative learning affordsstudents enormous advantages andsolve problems better than anyindividual can alone. |

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| Field | Academic Reference Standards For Electrical EngineeringPostgraduates (ARSEP-ELE) |
| Knowledge &Understanding | IntellectualSkills | Professionaland PracticalSkills | General andTransferrableSkills |
| Programme AcademicStandards that the coursecontribute in achieving | A1 and A2 | B1and B2 | C1 | D1, D2, D3, D4and D7 |



***B.3 Relationship between the course and the programme***

***B.4 Course Intended Learning Outcomes (ILOs)***

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| ***Week******No.*** | ***Sub. Topics*** | ***Total******Hours*** | ***Contact hrs*** | ***Course ILOs******Covered (By No.)*** |
| **Lec.** | **Tut.** | **Lab.** |
| *Week-1* | Definition of generalized theories ofelectrical machines | 3 | 3 | - | - | a1-1, a2-1 |
| *Week-2* | Basic principles of theories of electricalmachines. | 3 | 3 | - | - | a1-1, a2-1 |
| *Week-3* | Magnetic field, magnetic circuit andmagnetic field energy. | 3 | 3 | - | - | a1-1, a2-1, b2-1,c1-1 |
| *Week-4* | Alignment forces and torques. | 3 | 3 | - | - | a1-1, a2-1, b2-1,c1-1, d3-1, d4-1,d7-1 |
| *Week-5* | Magnetic field energy for both singleand double excitations of electricalmachines. | 3 | 3 | - | - | c1-1, d3-1, d4-1,d7-1 |
| *Week-6* | Winding     inductances     in     electricalmachines. | 3 | 3 | - | - | b1-1, b2-1, c1-1, |
| *Week-7* | Electromotive force | 3 | 3 | - | - | b2-1, c1-1, d3-1,d4-1, d7-1 |

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|  | D2. Use of information technology toserve      the      development      ofengineering professional practice. | d2-1) Use electroniccommunication and computer-based systems of hardware andsoftware and associated processesthrough emphasis on theinformation basis for engineering. |
| D3.      Self-assessment      to      identifypersonal learning needs. | d3-1) Use a wide range of formalways of identifying their ownlearning needs like ordinaryinvestigations. |
| D4.    Use    of    different    sources    forinformation knowledge | d4-1) Refer to textbooks, anddatabases information in lectures. |
| D7. Self- learning continuously speciallyin electrical machines branch. | d7-1) Apply statistical reports andweekly auctions. |

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| TopicNo. | General Topics | Weeks |
| 1st | Basic principles of theories of electrical machines. | 1-2 |
| 2nd | Magnetic field energy and forces | 3-5 |
| 3rd | Winding inductances in electrical machines | 6-7 |
| 4th | Doubly fed machines. | 8-9 |
| 5th | Two axis representation theory of electrical machines. | 10-11 |
| 6th | Performance of induction motors current during starting | 12-13 |
| 7th | Linear transformations of electrical machines | 14-15 |



***B.5 Course Topics.***

***B.6 Course Topics/hours/ILOS***

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| *Week-8* |     Introduction to doubly fedmachines operation.    Cylindrical doubly fedmachines. | 3 | 3 | - | - | a1-1, a2-1, b2-1,c1-1, d3-1, d4-1,d7-1 |
| *Week-9* | Torque in doubly fed machines. | 3 | 3 | - | - | b1-1, b2-1, c1-1, |
| *Week-**10* | Two    axis    representation    theory    ofelectrical machines. | 3 | 3 | - | - | a1-1, a2-1, b2-1,c1-1, d3-1, d4-1,d7-1 |
| *Week-**11* | Aplications on two axis theory ofelectrical machines. | 3 | 3 | - | - | d1-1, d2-1 d3-1,d4-1, d7-1 |
| *Week-**12* | Performance of induction motors, usingtwo axis theory. | 3 | 3 | - | - | a1-1, a2-1, b2-1,c1-1 |
| *Week-**13* | Sarting current of induction motors. | 3 | 3 | - | - | b1-1, b2-1, c1-1,d1-1, d2-1 d3-1,d4-1, d7-1 |
| *Week-**14* | Linear    transformations    of    electricalmachines | 3 | 3 | - | - | b1-1, b2-1, c1-1,d1-1, d2-1 d3-1,d4-1, d7-1 |
| *Week-**15* | Aplications on linear transformations ofelectrical machines | 3 | 3 | - | - | d1-1, d2-1 d3-1,d4-1, d7-1 |

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| **Course Intended****learning outcomes****(ILOs)** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Knowledge &****understanding** | **a1-1** | **x** | **x** |  |  |  |  |  |  |  |  |  |  |  |
| **a2-1** | **x** | **x** |  |  |  | **x** |  |  |  |  |  |  |  |
| **Intellectual****Skills** | **b1-1** | **x** |  | **x** | **x** | **x** | **x** |  |  | **x** |  |  | **x** |  |
| **b2-1** | **x** |  | **x** | **x** | **x** | **x** |  |  | **x** |  |  | **x** |  |
| **Professional****and Practical****Skills** | **c1-1** | **x** |  |  | **x** | **x** | **x** | **x** |  | **x** |  |  | **x** |  |
| **General and****Transferrable****Skills** | **d1-1** | **x** |  | **x** | **x** | **x** |  | **x** |  | **x** | **x** |  | **x** |  |
| **d2-1** | **x** |  | **x** | **x** | **x** |  | **x** |  | **x** | **x** |  | **x** |  |
| **d3-1** | **x** |  | **x** | **x** | **x** |  | **x** |  | **x** | **x** |  | **x** |  |
| **d4-1** | **x** |  | **x** | **x** | **x** |  | **x** |  | **x** | **x** |  |  |  |
| **d7-1** | **x** |  | **x** | **x** | **x** |  | **x** |  | **x** | **x** |  | **x** |  |

**B.7*Teaching and Learning Method:***

**Selflearning**

**Presentation**

**andMovies**

**Cooperative**

**Discovering**

**Discussion**

**Modelling**

**Sitevisits**

**Problem**

**solving**

**Brain**

**storming**

**Tutorial**

**Projects**

**Lecture**

**Playing**

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| **Assessment Method** | **Mark** | **Percentage** |
| **Final Examination (*written*)** | **100** | **100%** |
| **Total** | **100** | **100%** |

**B. 8*Assessments:***

***B.9 Facilities required for teaching and learning:***

***Weighting of assessments:***

**A. Library Usage:** Students should be encouraged to use library technical resources in the

preparation of reports.

***B.10 List of references:***

1- J. B. Gupta “Theory & Performance of Electrical Machines” 14th edition, 2010.

2- M. G. Say “Introduction to the unified theory of electromagnetic machines.”1980.

3- N. N. Hancock "Matrix Analysis of Electrical Machinery" 2nd edition, Pergamon Press Lid.,

Toronto, Canada, 1974.

4- Course notes (updated yearly)

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**Course Coordinators** **Head of Department**

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**Date:**