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| **8** | **External Evaluator(s)** | **Prof. Dr.** |

**Minoufiya University,**

**Faculty of Engineering,**

**Electrical Eng. Dept.,**

**Post Graduate Studies and Research.**

**Course Specification**

**Minoufiya University**

Faculty of Engineering

***Title: Electromagnetic Fields***

***Code Symbol: ELE 601***

***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 give the graduate powerful electromagnetic tools to discuss,

analyze and solve some problems occurring in electrical machines. This course presents

more advanced topics than the students have been taught through the undergraduate course.

This course helps the graduates to solve boundary value problems in Cartesian, cylindrical

and spherical axes. It contains also some numerical methods for the purpose of calculations

of electromagnetic parameters.

***B.2 Course Objectives***

**1. Demonstration of the knowledge and understanding of the importance of electromagnetic**

**field theory for the graduates.**

**2. Definition of the requirements for the electromagnetic field theory in electrical**

**engineering.**

**3. Knowledge of different experimental mapping methods.**

**4. Obtaining the scalar and vector magnetic potential.**

**5. Analyzing boundary value problems in different system of axes.**

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| Field | Programme ILOs that the coursecontribute in achieving | Course ILOs |
| Knowledge &Understanding | A1.    Understand    theory,    basics    andpractices of mathematics, sciences andvarious      electrical power and machinesengineering technologies. | a1-1) Explain the fundamental ofStatic Electromagnetic Fields. |
| A3. Understand the scientificdevelopments in electrical power andmachines engineering. | a3-1) Illustrate the different methodsof experimental mapping. |
| A5. Understand quality basics for workingin the power and machines engineeringfield. | a5-1) Learn how to develop fieldequations starting from a basicknowledge of Maxwell’s, Poisson's,Laplace's, and the wave equationssubject to the boundary conditions. |
| IntellectualSkills | B1. Analyze and evaluate the data and useit to solve electrical power and machinesproblems. | b1-1) Select the appropriatecomputer programming to get themathematical solution of the fielddistributions in any configuration. |
| Professionaland PracticalSkills | C3. Evaluate the available methods andtools    in    the    power    and    machinesengineering field. | c3-1 Obtain the scalar and vectormagnetic potential using Numericalmethods. |
| C4. Define, plan, analyze, and solve thepower and machines problems to reachconclusions and compare the results withothers. | c4-1) Identify and formulate theelectromagnetic fields problems andfrom real life situations, according totheir priorities. |
| General andTransferrableSkills | D1. Communicate effectively in writing,verbally and through illustrations andmathematical equations. | d1-1) Effective communication andsharing ideas through solvingtutorials. |
| D3. Evaluate him-her and determine hispersonal education needs. | d3-1) Measure his-her level byordinary investigations in regulartimes. |
| D4. Use different resources to obtainknowledge and information. | d4-1) Use textbooks, and databasesinformation in lectures. |

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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, A3, A5 | B1 | C3,C4 | D1,D3,D4 |

**6. Application of different numerical methods in electromagnetic field theory.**

***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* |     The objectives of the course    Why this course is important? | 6 | 4 | 2 | - | a1-1, a3-1, a5-1, |
| *Week-2* |     Experimental     mapping     methods:Curvilinear squares. | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1, c3-1, c4-1, |
| *Week-3* |     Experimental    mapping     methods:The iteration method. | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1, c3-1, c4-1 |
| *Week-4* |     Experimental    mapping     methods:Current Analogies | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1, c3-1, c4-1 |
| *Week-5* |     Experimental mapping methods:Physical models | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1, c3-1, c4-1 |
| *Week-6* |     Scalar magnetic potential | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1, c3-1, c4-1 |
| *Week-7* |     Vector magnetic potential | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1, c3-1, c4-1 |
| *Week-8* |     Maxwell's equations and theretarded potential. | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1, c3-1, c4-1,d1-1 , d3-1, d4-1 |
| *Week-9* |     Solution of electrostatic boundaryvalue     problems,     Poisson's     andLaplace's equations | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1, c3-1, c4-1 |
| *Week-**10* |     Boundary     value      problems      incartesian coordinates. | 6 | 4 | 2 | - | b1-1,b1-2,b2-1,b3-1, c3-1 |
| *Week-**11* |     Boundary     value      problems      incylinderical coordinates. | 6 | 4 | 2 | - | b1-1, c3-1, d1-1,d3-1, d4-1 |
| *Week-**12* |     Boundary     value      problems      inspherical coordinates. | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1, c3-1, d1-1,d3-1, d4-1 |
| *Week-**13* |     Numerical methods: Field plotting. | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,b1-1, c3-1, d1-1,d3-1, d4-1 |

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| TopicNo. | General Topics | Weeks |
| 1st | Experimental mapping methods | 1-4 |
| 2nd | Scalar magnetic potential | 5-6 |
| 3rd | Vector magnetic potential | 7 |
| 4th | Maxwell's equations and the retarded potential. | 8-9 |
| 5th | Solution of electrostatic boundary value problems. | 10-12 |
| 6th | Numerical methods. | 13-15 |



***B.5 Course Topics.***

***B.6 Course Topics/hours/ILOS***

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| **Course Intended****learning outcomes****(ILOs)** |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Knowledge &****understanding** | **a1-1** | **x** |  | **x** | **x** | **x** | **x** |  | **x** |  |  |  |  |  |
| **a3-1** | **x** |  | **x** | **x** | **x** | **x** |  | **x** |  |  |  |  |  |
| **a5-1** | **x** |  | **x** | **x** | **x** | **x** |  | **x** |  |  |  |  |  |
| **Intellectual****Skills** | **b1-1** | **x** |  | **x** | **x** | **x** | **x** |  | **x** |  |  |  |  |  |
| **Professional****and practical****Skills** | **c3-1** | **x** |  | **x** | **x** | **x** | **x** |  | **x** |  |  |  |  |  |
| **c4-1** | **x** |  | **x** | **x** | **x** | **x** |  | **x** |  |  |  |  |  |
| **General and****Transferrable****Skills** | **d1-1** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |  |  |  |
| **d2-1** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |  |  |  |
| **d3-1** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |  |  |  |
| **d4-1** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** | **x** |  |  |  |

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| *Week-**14* |     The finite difference method. | 6 | 4 | 2 | - | b1-1, c3-1, d1-1,d3-1, d4-1 |
| *Week-**15* |     The finite element method. | 6 | 4 | 2 | - | d1-1, d3-1, d4-1 |

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



**B. 8 Assessments*:***

**Selflearning**

**Presentation**

**andMovies**

**Cooperative**

**Discovering**

**Discussion**

**Modelling**

**Sitevisits**

**Problem**

**solving**

**Brain**

**storming**

**Tutorial**

**Projects**

**Lecture**

**Playing**

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

***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- WILLIAM h. Hayt, Jr. and John A. Buck "Engineering Electromagnetics" 6th Edition,

McGrow – Hill International Edition, 2001.

2- David K. Cheng "Fundamentals of Engineering Electromagnetics" Addison – Wesley

publishing Company, 1993.

3- Nathan Ida and Joao P. A. Bastos "Electromagnetics and Calculation of Fields" 2nd

Edition, Springer, 1997.

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