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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 course  contribute in achieving | Course ILOs |
| Knowledge &  Understanding | A1.    Understand    theory,    basics    and  practices of mathematics, sciences and  various      electrical power and machines  engineering technologies. | a1-1) Explain the fundamental of  Static Electromagnetic Fields. |
| A3. Understand the scientific  developments in electrical power and  machines engineering. | a3-1) Illustrate the different methods  of experimental mapping. |
| A5. Understand quality basics for working  in the power and machines engineering  field. | a5-1) Learn how to develop field  equations starting from a basic  knowledge of Maxwell’s, Poisson's,  Laplace's, and the wave equations  subject to the boundary conditions. |
| Intellectual  Skills | B1. Analyze and evaluate the data and use  it to solve electrical power and machines  problems. | b1-1) Select the appropriate  computer programming to get the  mathematical solution of the field  distributions in any configuration. |
| Professional  and Practical  Skills | C3. Evaluate the available methods and  tools    in    the    power    and    machines  engineering field. | c3-1 Obtain the scalar and vector  magnetic potential using Numerical  methods. |
| C4. Define, plan, analyze, and solve the  power and machines problems to reach  conclusions and compare the results with  others. | c4-1) Identify and formulate the  electromagnetic fields problems and  from real life situations, according to  their priorities. |
| General and  Transferrable  Skills | D1. Communicate effectively in writing,  verbally and through illustrations and  mathematical equations. | d1-1) Effective communication and  sharing ideas through solving  tutorials. |
| D3. Evaluate him-her and determine his  personal education needs. | d3-1) Measure his-her level by  ordinary investigations in regular  times. |
| D4. Use different resources to obtain  knowledge and information. | d4-1) Use textbooks, and databases  information in lectures. |

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| Field | Academic Reference Standards For Electrical Engineering  Postgraduates (ARSEP-ELE) | | | |
| Knowledge &  Understanding | Intellectual  Skills | Professional  and Practical  Skills | General and  Transferrable  Skills |
| Programme Academic  Standards that the course  contribute 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 the  retarded 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 boundary  value     problems,     Poisson's     and  Laplace's equations | 6 | 4 | 2 | - | a1-1, a3-1, a5-1,  b1-1, c3-1, c4-1 |
| *Week-*  *10* |     Boundary     value      problems      in  cartesian coordinates. | 6 | 4 | 2 | - | b1-1,b1-2,b2-1,  b3-1, c3-1 |
| *Week-*  *11* |     Boundary     value      problems      in  cylinderical coordinates. | 6 | 4 | 2 | - | b1-1, c3-1, d1-1,  d3-1, d4-1 |
| *Week-*  *12* |     Boundary     value      problems      in  spherical 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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| Topic  No. | 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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