Department offering the program: Electronics and Electrical Communications Engineering
Department offering the course: Electronics and Communications Engineering

Course Specification

1- Course basic information :		
Course Code: ECE 214 **Department requirement**	**Course Title:** Fields and Waves	**Academic year:** 2015-2016 **Level (2) – Semester : 1st**
Field: Basic Eng. Science	**Teaching hours: Lecture** 2 **Tutorial** 1 **Lab** 0	

2- Course Objectives	1- To define for students the fundamentals of electrostatic fields; the static charges, Coulomb's law and the electrostatic field intensity. 2- To define for students the electric flux, flux density and Gauss' law. 3- To introduce students to the definition of work done in moving a static charge in an electrostatic field and the concept of electric potential. 4- To develop student's skills to derive the electric boundary conditions and demonstrate the dipole moment. 5- To provide students with the definition of capacitance and use Poisson's and Laplace's equation to solve electrostatic field problems. 6- To introduce students to the concept of steady magnetic field due to direct current. 7- To teach students the use of Biot & Savart law, and Ampere's law to derive steady magnetic field intensity due to DC currents. 8- To introduce students to the concept of Magnetic Vector Potential. 9- To develop student's skills to derive the Magnetic boundary conditions and demonstrate the concepts of magnetic flux, flux density, magnetic force and energy. 10- To introduce the concepts of time varying fields and re-derive Maxwell's equations for time varying fields.

3- Intended Learning Outcomes: ARS		**Course ILOs**
	A.1 Explain Concepts and theories of mathematics and sciences, appropriate to the Electromagnetic Theory.	A1.1 Explain Concepts and theories of mathematics and sciences, appropriate to electrostatic fields. A1.2 Explain Concepts and theories of mathematics and sciences, appropriate to steady magnetic fields. A1.3 Explain Concepts of Maxwell's equations appropriate to time varying fields.
	A.3 Define characteristics of engineering materials related to electromagnetic wave theory.	A3.1 Define characteristics of dielectrics and conductors composites of Capacitance related to Electrostatic Fields. A3.2 Define characteristics of magnetic materials composites of coils related to Steady magnetic fields.

A- Knowledge and Understanding:	A.5 Demonstrate methodologies of solving engineering problems, data collection and interpretation.	A5.1 Demonstrate the use of Coulomb's law for finding electric force between static charges problems. A5.2 Demonstrate the use of Gauss' law for finding electric flux density due to static charged bodies problems. A5.3 Demonstrate the use of linear, surface and volume integrals to find the electric potentials due to static charges problems. A5.4 Demonstrate integral techniques to derive the boundary conditions. A5.5 Demonstrate the use of Poisson's and Laplace's equations to solve capacitance problems. A5.6 Demonstrate methodologies of solving Steady magnetic fields problems. A5.7 Demonstrate Biot & Savart law for finding steady magnetic field intensity due to direct currents. A5.8 Demonstrate Ampere's law for finding steady magnetic field intensity due to direct currents. A5.9 Demonstrate methodologies of solving Force and energy in magnetic field and Coils problems.
B- Intellectual Skills	B.2 Select appropriate solutions for engineering problems based on analytical thinking. B.5 Assess and evaluate the characteristics and performance of components, systems and processes.	B2.1 Select appropriate solutions for electrostatic field problems based on using Colum's or Gauss's Law. B2.2 Select appropriate integral technique to determine the electric potential in the field due to definite static charges. B2.3 Select appropriate Maxwell's equation for deriving the boundary conditions. B2.4 Select appropriate solutions for Capacitors problems based on using integral or differential techniques. B2.5 Select appropriate solutions for steady magnetic field problems based on using Ampere's or Biot-Savart Law. B2.6 Select appropriate solutions for electromagnetic problems based on time varying fields. B5.1 Assess and evaluate the characteristics and performance of dielectrics and conductors. B5.2 Assess and evaluate the characteristics and performance of Capacitors. B5.3 Assess and evaluate the characteristics and performance of Coils. B5.4 Assess and evaluate the characteristics and performance of time varying fields.

C- Professional Skills	C1) Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to solve engineering problems.	C1.1 Apply knowledge of Coulomb's law for finding electric force between static charges problems. C1.2 Apply knowledge of Gauss' law for finding electric flux density due to static charged bodies problems. C1.3 Apply knowledge of linear, surface and volume integrals to find the electric potentials due to static charges problems. C1.4 Apply knowledge of integral techniques to derive the boundary conditions. C1.5 Apply knowledge of Poisson's and Laplace's equations to solve capacitance problems. C1.6 Apply knowledge of mathematics and science to solve Steady magnetic fields problems. C1.7 Apply knowledge of Biot & Savart law for finding steady magnetic field intensity due to direct currents. C1.8 Apply knowledge of Ampere's law for finding steady magnetic field intensity due to direct currents. C1.9 Apply knowledge of mathematics and science for solving Force and energy in magnetic field and Coils problems.
	C12) Prepare and present technical reports.	C12.1 Prepare and present technical reports for topics related to electrostatics, steady magnetic and time varying fields.
D- General Skills	D3) Communicate effectively.	D3.1) Communicate effectively with colleagues and demonstrator in tutorial times.
	D6) Effectively manage tasks, time, and resources.	D6.1) Effectively manage tasks, time, and resources in solving problems related to electrostatics, and steady magnetic fields.
	D7) Search for information and engage in life-long self-learning in Electromagnetic wave Theory.	D7.1) Search for information and engage in life-long self-learning in topics related to electrostatics, steady magnetic and time varying fields.

4- Course Contents	Electrostatic Fields, Coulomb's law- Electric flux and gauss's law- Electrical Potential – Dielectrics, Conductors, Electric boundary conditions – Dipole moment – Capacitance- Poisson and Laplace equations – Steady magnetic fields- Direct currents, Biot & Savart law- Amperes law- Magnetic Vector potentials- Magnetic boundary conditions- Magnetic flux – Force and energy in magnetic field- Coils – Time varying field- Maxwell's equations in time varying fields.
5- Teaching and Learning Methods	- Lectures - Tutorials - Reports
6- Teaching and	➢ Official low cost special classes for developing student skills, arranged

Learning Methods for disable students	by the faculty administration. ➢ Assign a part of the office hours for those students, to follow up their status. ➢ Give them specific tasks with ascending level of difficulty. ➢ Repeat the explanation of some of concepts related to course topics in lectures and tutorial times.
7- Student Assessment	
a- Assessment Methods	- Weekly exercises at class room - Reports - Quizzes - Midterm, and final exams
b- Assessment Schedule	- Exercise sheet: Weekly - Quizz-1: Week no 4 - Mid-Term exam: Week no 8 - Quizz-2: Week no 12 - Final – term examination: Week no 16
c- Weighting of Assessment	- Class activity and quizzes : 10 % - Mid-term examination: 20 % - Final – term examination: 70 % Total 100 %
8- List of text books and references:	
a- Course notes	There are lectures notes prepared in the form of a book authorized by the department
b- Text books	[1] W. H, Hayt, J. A. Buck, ”Engineering Electromagntics”, sixth edition, Mc-GRAW HILL. 2001.
c- Recommended books	[1] V.A. Bakshi , Electromagnetic Fields Theory, Technical Publication 2009
d- Periodicals, Web sites ….etc	➢ Stanford University Web site “Electromagnetic Waves Course”. ➢ MIT Courseware web site “Fundamentals of Electromagnetics Course”. ➢ Some publications from research gate web site related to Electromagnetic wave theory.

Course contents - ILOs Matrix

Content Topics	Week	A- Knowledge & Understanding	B- Intellectual skills	C- Professional and practical skills	D- General and transferable skills
Electrostatic Fields Coulomb’s law	1-2	A1.1, A5.1	B2.1	C1.1, C12.1	D3.1, D6.1, D7.1
Electric flux and gauss's law-	3	A1.1, A5.2	B2.1	C1.2, C12.1	D3.1, D6.1, D7.1
Electrical Potential	4	A1.1, A5.3	B2.2	C1.3, C12.1	D3.1, D6.1, D7.1
Dielectrics, Conductors, Electric boundary conditions – Dipole moment	5	A1.1, A3.1, A5.4	B2.3, B5.1	C1.4, C12.1	D3.1, D6.1, D7.1

Capacitance- Poisson and Laplace equations	6-7	A1.1, A5.5	B2.4, B5.2	C1.5, C12.1	D3.1, D6.1, D7.1
Steady Magnetic Fields- Direct currents	9	A1.2, A5.6	B2.5	C1.6, C12.1	D3.1, D6.1, D7.1
Biot & Savart law	10	A1.2, A5.7	B2.5	C1.7, C12.1	D3.1, D6.1, D7.1
Amperes law	11	A1.2, A5.8	B2.5	C1.8, C12.1	D3.1, D6.1, D7.1
Magnetic Vector potentials- Magnetic boundary conditions- Magnetic flux	12	A1.2	B2.3	C1.4, C12.1	D3.1, D6.1, D7.1
Force and energy in magnetic field- Coils	13	A1.2, A3.2, A5.9	B5.3	C1.9, C12.1	D3.1, D6.1, D7.1
Time varying field- Maxwell's equations in time varying fields	14-15	A1.3	B2.6, B5.4		D3.1, D6.1, D7.1

Teaching and Learning Methods - ILOs Matrix

Teaching and Learning Methods	A- Knowledge & Understanding	B- Intellectual skills	C- Professional and practical skills	D- General and transferable skills
Lectures	A1, A3, A5	B2, B5	C1	D3
Tutorials.	A1, A3, A5	B2, B5	C1	D3,D6,D7
Reports and assignments	A1, A3, A5	B2, B5	C1,C12	D6,D7

Assessment Methods - ILOs Matrix

Assessment Methods	A- Knowledge & Understanding	B- Intellectual skills	C- Professional and practical skills	D- General and transferable skills
Weekly sheet exercises	A1, A3, A5	B2	C1	D3,D6,D7
Reports	A1, A3, A5	B2	C1,C12	D6,D7
Quizzes	A1, A3, A5	B2	C1	D6, D7
Midterm, and Final Written exams	A1, A3, A5	B2	C1	D6, D7

Authorized from department board at 15/05/2016
Authorized from college board at 05/06/2016

Course coordinator:
Dr. Abdel Mageed Sharshar

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Prof. Fathi El-Sayed Abd El-Samie