جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

Course Syllabus: Electromagnetic Theory - EE 221

Division	Computer, Electrical and Mathematical Sciences & Engineering
Course Number	EE 221
Course Title	Electromagnetic Theory
Academic Semester	Fall
Academic Year	2018/2019
Semester Start Date	08/26/2018
Semester End Date	12/11/2018
Class Schedule (Days & Time)	09:00 AM - 10:30 AM | Sun Tue

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
Hakan Bagci	hakan.bagci@kaust.edu.sa	+966128084330		Thursday, 3:30-5pm

Teaching Assistant(s)

Name	Email

Course Information

Comprehensive Course Description	This course covers the following topics. Fundamental concepts of electromagnetics: Maxwell equations, Lorentz force relation, electric and magnetic polarizations, constitutive relations, boundary conditions, Poynting theorem in real and complex forms, energy relations. Solution of Helmholtz equation: plane, cylindrical, and spherical waves, dispersion, phase and group velocities, attenuation, wave propagation in anisotropic media. Guided wave propagation: mode expansions, metallic and dielectric waveguides, resonant cavities. Antennas: potentials, radiation, elementary antennas. Electromagnetic theorems: uniqueness, duality, reciprocity, equivalence, and induction theorems, Huygen and Babinet principles.
Course Description from Program Guide	Fundamental concepts of electromagnetics: Maxwell equations, Lorentz force relation, electric and magnetic polarizations, constitutive relations, boundary conditions, Poynting theorem in real and complex forms, energy relations. Solution of Helmholtz equation: plane, cylindrical, and spherical waves, dispersion, phase and group velocities, attenuation, wave propagation in anisotropic media. Electromagnetic theorems: uniqueness, duality, reciprocity, equivalence, and induction theorems, Huygen and Babinet principles. Guided wave propagation: mode expansions, metallic and dielectric waveguides, resonant cavities. Antennas: potentials, radiation, elementary antennas.
Goals and Objectives	Develop a strong background in electromagnetic theory and understand and use various mathematical tools to solve Maxwell equations in problems of wave propagation and radiation.
Required Knowledge	EE 122 or equivalent undergraduate-level course on Electromagnetics
Reference Texts	Theory and Computation of Electromagnetic Fields, J-M. Jin, 2010 (Required) Time Harmonic Electromagnetic Fields, R. F. Harrington, 2001 (Reference) Advanced Engineering Electromagnetics, C. A. Balanis, 1989 (Reference)
Method of evaluation	**25.00**% - Exam 1 **25.00**% - Exam 2 **10.00**% - Homework /Assignments **40.00**% - Final exam

Nature of the assignments	Each homework assignment requires students to solve several problems relevant to the topics discussed in class.
Course Policies	Attendance is strongly encouraged, but is not compulsory. Attending students are expected to be on time. Late homework solutions are not accepted without a valid excuse.
Additional Information	

Tentative Course Schedule
(Time, topic/emphasis & resources)

Week	Lectures	Topic
1	Sun 08/26/2018 Tue 08/28/2018	Review of vector algebra and calculus, coordinate transformations.
2	Sun 09/02/2018 Tue 09/04/2018	Maxwell equations.
3	Sun 09/09/2018 Tue 09/11/2018	Maxwell equations.
4	Sun 09/16/2018 Tue 09/18/2018	Constitutive relations and boundary conditions
5	Sun 09/23/2018 Tue 09/25/2018	Saudi National Day Time harmonic fields and Helmholtz equation.
6	Sun 09/30/2018 Tue 10/02/2018	Saudi National Day Plane wave solution of Helmholtz equation.
7	Sun 10/07/2018 Tue 10/09/2018	Plane wave solution of Helmholtz equation. Current sheets.
8	Sun 10/14/2018 Tue 10/16/2018	Wave propagation in planar medium: Dielectric half spaces.
9	Sun 10/21/2018 Tue 10/23/2018	Wave propagation in planar medium: Dielectric slabs.
10	Sun 10/28/2018 Tue 10/30/2018	Midsemester Break. Wave propagation in metamaterials.
11	Sun 11/04/2018 Tue 11/06/2018	Electromagnetic potentials and representation of fields.
12	Sun 11/11/2018 Tue 11/13/2018	Radiation.
13	Sun 11/18/2018 Tue 11/20/2018	Elementary antenna types and antenna arrays.
14	Sun 11/25/2018 Tue 11/27/2018	Guided field propagation and mode expansion of fields.
15	Sun 12/02/2018 Tue 12/04/2018	Metallic and dielectric waveguides.
16	Sun 12/09/2018 Tue 12/11/2018	Electromagnetic theorems.
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Note

The instructor reserves the right to make changes to this syllabus as necessary.