COURSE PROFILE

Course Number : EE360	**Course Title :** Electromagnetic Field and Waves
Required / Elective : Required	**Pre-requisite :** Math201 or Math203 (Multivariable calculus and differential equations)
Catalog Description: Electrostatic fields. Dielectric properties of materials. Stationary electric currents and static magnetic fields. Time-varying electromagnetic fields. Faraday's induction. Maxwell's equations. Time-harmonic electro-magnetic waves. Uniform plane waves.	**Textbook / Required Material :** "Field and Wave Electromagnetics", 2nd Ed., David K. Cheng, Addison-Wesley, 2002
Course Structure / Schedule : (3+0+2) 4 / 7 ECTS	
Extended Description : - Static Electric Fields: Coulomb's Law, Gauss's Law, Electric Potential, Electric Flux density, Boundary conditions for electrostatic fields. - Electric and magnetic properties of materials, Dielectric constant. - Steady electric currents, Ohm's Law, Kirchoff's Law, Capacitive structures. - Static Magnetic Fields: Ampere's law, Biot-Savart law. Magnetic field intensity, - Electromagnetic induction and Faraday's Law, Inductive structures. - Maxwell's Equations, Time-Harmonic Fields. - Wave equations and Plane waves in lossless media. Plane waves in lossy media. - Flow of Electromagnetic Power, Poynting Vector. - Reflection and refraction of plane waves.	
Design content : Design exercises on electromagnetic induction structures and basic circuit components. Extraction of physical parameters for plane waves propagation in different media.	**Computer usage:** Experience MATLAB based solutions of various electromagnetic wave problems.
Course Outcomes: [relevant program outcomes in brackets]: a) An ability to apply differential equations, vector algebra, integral multivariate calculus and complex calculus to solve for basic electrostatic, magnetostatic and electromagnetic field problems[2] b) An ability to recognize the static electric and magnetic field parameters, the materials and their incorporation into the design of basic electrical circuit components.[3],[7] c) An ability to analyze the interaction of electromagnetic fields in different media [6] d) An ability to describe the electromagnetic induction phenomena and its usage in the construction of generators, transformers and antenna.[2],[6] e) An ability to demonstrate the completeness of Maxwell's relations for describing	

electromagnetic fields.[2],[6]

f) An ability to describe the propagation of plane electromagnetic waves in losless and lossy media [6]
g) An ability to solve for the reflection and transmission of uniform plane waves at planar interfaces [6]
h) An ability to identify, describe, evaluate and to solve engineering problems involving electric and magnetic fields, wave propagation and wave transmission in a multidisciplinary frame.[3],[6],[7]

Level of Contribution of Course to Program Outcomes:
Strong: [2]

Average: [6]

Some:[3,7]

Recommended reading:

- Introductory Engineering Electromagnetics, B. D. Popovic, AddisonWesley.
- Electromagnetic Waves, U.Inan and A.S. Inan, Prentice Hall.
- Principles and Applications of Electromagnetic Fields, R. Plonsey and R. Collin, McGraw-Hill.

Teaching Methods:

Pre-readings, lectures, problem sessions/discussions, homework, visual animation and demo videos.

Assessment Methods: [Related to course outcomes]

Homeworks, Quizzes, Midterm exams, Final exam, [a,b,c,d,e,f,g,h]

Class survey (suggested)

Student Workload:

Preparatory reading	65 hrs
Lectures	40 hrs
Problem sessions, discussions	30 hrs
Homework	30 hrs
Quiz and Midterm exams	7 hrs
Final Exam	3 hrs
TOTAL …… 175 hrs … to match 25 x 7 ECTS	

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