ECE-GY 6713, Electromagnetic Theory and Applications

Department of Electrical and Computer Engineering
Tandon School of Engineering, New York University

This course is an introductory graduate level course on electromagnetic theory. It is founded on students' basic understanding of electromagnetic fields at the undergraduate level, and students are expected to have completed at least one semester of undergraduate electromagnetic theory. The undergraduate course EE3604 offered at NYU-Tandon, or an equivalent course from any other university, is the pre-requisite for this course. The scope of the class will cover: (a) physical understanding and mathematical treatment of the Maxwell's equations, (b) deduction of useful theorems and basic concepts applicable to general electromagnetic fields and radiation, (c) study of plane waves and wave propagation in planar structures (reflection/refraction at planar interfaces, rectangular waveguides, surface waveguides,) (d) introduction to wave propagation in cylindrical and spherical structures. The material covered in the class will be valuable in many areas of applications that require understanding of electromagnetic waves, radiation and propagation, such as in mobile/cellular communication, satellite communication, and radar systems.

Text: R. F. Harrington, *Time Harmonic Electromagnetic Fields*, IEEE Press/John Wiley and Sons, Most Recent Edition.

Topics to be Covered

CHAPTER	TOPIC	Weeks
Ch.1	Fundamental concepts as background for general treatment of electromagnetic fields and waves. Circuit concepts, displacement current, induced emf, complex power. Maxwell's equations, Poynting vector.	1-2
Ch.2	Introduction to electromagnetic waves. Wave equation, waves in perfect dielectrics, waves in lossy matter, reflection and transmission from dielectric interfaces.	3-4
Ch.3	Useful general theorems and concepts. General source concept, duality, uniqueness theorem, image theory, equivalence principle, reciprocity.	5-7
	TEST-I and Review	8

Ch.4	Plane wave functions. Plane waves, rectangular waveguide and resonator, decomposition into TE and TM waves, surface waves in dielectric slabs.	9-11
Ch.5	Introduction to cylindrical wave functions	12
Ch.6	Introduction to spherical wave functions	13
	Final Examination	

Fall 2019

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Grading: Homeworks, Quizes and Assignments: 20%, Mid-Term Examination: 30%, Final Examination: 50%
