

Instructor: N. Garry Tarr ME5160 ngt@doe.carleton.ca

Marking scheme:

Best of: Final exam 60% *or* Final exam 100%
Quizzes 40% (best 4 out of 5)

Note: The final exam is exclusively for the purpose of evaluating student performance and will not be returned

Note: Friday, May 23 will be used to make up for classes missed on Victoria Day

PA sessions:

There will be a PA session from 13:30 to 16:30 every Monday afternoon starting May 26 and ending June 23. PAs will be based on problem sets handed out in the preceding week. The first 2 hours of the PA will be used to answer questions and do sample problems. In the last hour of the PA there will be a quiz.

TA: Rony Amaya ME5128 ramaya@doe.carleton.ca

Web site: Course information will be available at <http://www.doe.carleton.ca/~ngt/97399>.

Textbooks: (Recommended but not compulsory)-

U.S. Inan and A.S. Inan, *Engineering Electromagnetics* Addison-Wesley 1999 (this was the text in 97.315)

U.S. Inan and A.S. Inan, *Electromagnetics Waves*, Prentice Hall 1999.

There are many other good electromagnetics textbooks in the library under the catalogue headings QC661 and QC670.

Topics:

1. Plane Wave Solutions of Maxwell's Equations

Review of Gauss' law, Ampère's law, Faraday's law

Displacement current: generalized Ampère's law

Maxwell's equations

Plane wave solution to Maxwell's equations

Phase velocity: relation between c , ϵ and μ

The EM spectrum

Propagation of an arbitrary waveform

Relation between E and H

Generalized equation for plane wave moving in direction \mathbf{k}

Polarization: linear, circular, elliptical

Poynting Vector: power flow in an EM wave

2. EM Wave Propagation in Matter

Plane waves in a lossless dielectric

Refractive index, characteristic impedance

EM wave propagation in a good conductor

Skin depth

Lossy dielectrics

EM wave propagation in a lossy dielectric

3. EM Wave Reflection at Normal Incidence

Reflection at a perfect conductor

Standing waves

Reflection at a dielectric interface- normal incidence

Antireflection coatings

Reflection from a real conductor

Standing wave ratio

Stealth aircraft

4. EM Wave Reflection at Oblique Incidence

Law of reflection

Snell's Law

Total internal reflection

Fresnel coefficients

Brewster angle

5. Non-Cartesian Co-ordinate Systems

Maxwell's equations in cylindrical and spherical co-ordinates

6. Transmission Lines

EM wave propagation in a coaxial transmission line

Circuit view of transmission line: distributed L and C

Applications: coax cable, parallel wire line

Voltage and current waves on transmission line

Reflection and transmission

Termination of lines: impedance matching

Smith charts

7. Guided Waves

Parallel plate waveguide

Waveguide modes

Phase velocity and group velocity; dispersion

Approximate treatment of optical fiber guides

Overview of optical fiber communication systems