Antennas and Electromagnetic Propagation

module Electromagnetic Propagation (90317)

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Outline

Motivations and goals

Motivations

- Electromagnetic propagation is pervasive to information engineering.
- Basic knowledge of e.m. propagation is needed to design new devices and systems.
- New 5G and 6G frameworks are not possible without a good understanding of e.m propagation

Motivations and goals (cont.)

Goals

- Review Maxwell's equation and understand how and when electromagnetic radiation and propagation happen
  - wanted (antennas, lenses, transmission lines)
  - unwanted (EMI, cross-talk, spurious couplings)
- Study in detail the propagation of the simplest wave (plane wave).
- Model TE and TM waves as superposition of plane waves.
- Use plane wave (and TE, TM) to describe some interesting propagation cases.

Reference book

Electromagnetic Waves and Antennas

Sophocles J. Orfanidis

Rutgers University

Can be downloaded for free:

Web page: www.ece.rutgers.edu/~orfanidi/ewa

Other material

- Corse notes
- Exercises with solutions
- Course materials are on AulaWeb and on the Teams channel

Program

Based on the Orfanidis book, the program of the course will cover (at large):

1. Review of Maxwell's Equations (ch. 1)
2. Review of Plane Waves (ch. 2)
3. Phase and group velocity (ch. 3)
4. Reflection and Transmission at normal incidence (ch. 5)
5. Multilayer Structures (ch. 6)
6. Oblique Incidence (ch. 7, ch. 8)
7. Waveguides (ch. 9)

Exam

- Exam will consist of one homework (theory and exercises) + an oral discussion (theory and exercises).
- Homework will consist in answering theoretical questions, as well as solving some exercises, covering all the topics dealt with in the course, included the initial part on the mathematical tools.
- You usually have 26 hours to turn in your paper.
- There are not maximum scores assigned to each single question or exercise. The homework will be considered as a whole.
  - Together with the topics dealt with in the course, also the necessary knowledge of basic electromagnetism and the related mathematics could be checked.
- You must pass one homework before the oral discussion
- Detailed rules can be found on AulaWeb