

## EE 439 - Radiowave Propagation in Communications

**Designation:** EE elective course for electrical engineering majors.

**University Bulletin Description:** EE 439: (3) Radiowave propagation in mobile, terrestrial, and satellite communications; applications at microwave and lower frequencies.

Prerequisite: EE 330.

### Prerequisites by Topics:

1. Electrical circuit analysis.
2. Electromagnetic waves (propagation, reflection, refraction, attenuation, radiation)

### Textbook/Required Materials:

*Course notes and handouts* prepared based on the text (which is not required because it is out of print): *Antennas & Radiowave Propagation*, Robert E. Collin, 1985, McGraw Hill. Several other texts are also utilized for special topics: *Antennas and Propagation for Wireless Communication Systems*, Simon R. Saunders and A. A. Zavala, 2007, 2<sup>nd</sup> Edition, John Wiley & Sons Ltd.; *Radio Communication*, D. C. Green, 2<sup>nd</sup> Edition, 2000, Longman.

### Learning Outcomes:

This course provides the communications oriented electrical engineering students an understanding of the fundamental principles of radiowave propagation phenomena and problems likely to be encountered in practice. Upon successful completion of this course students will be able to analyze and evaluate a communication link (as well as a radar system) from the output of the transmitter to the input of the receiver taking into account the antenna and the effects of the propagation medium.

### Topics:

1. Frequency bands and propagation mechanisms (2 classes)
2. Basic antenna parameters for transmission and reception (3 classes)
3. Noise evaluation of communication systems (3 classes)
4. Earth reflections and the effects of the atmosphere's index of refraction (6 classes)
5. Mid-path-obstacle diffraction loss (5 classes)
6. Surface wave propagation (4 classes)
7. Ionospheric propagation (7 classes)
8. Scattering and absorption of a wave by a single particle (4 classes)
9. Effects of rain, snow, and ice on microwaves and millimeter waves (6 classes)
10. Tests, quizzes and review sessions (5 classes)

**Class schedule:** Three 50-minute lectures per week.

### Contribution to Meeting the Requirements of Criterion 5. Curriculum:

This course contributes to both the engineering topics and design components.

### Relationship to Program Outcomes:

- O.1.1. Graduates will possess mathematics skills necessary for electrical engineering.
- O.1.2. Graduates will have a theoretical and practical background in both physics and chemistry.
- O.2.4. Graduates will understand fundamental electricity and magnetism concepts and be able to use them in applications.
- O.3.1. Graduates will have in-depth technical knowledge in one or more areas of specialization.
- O.3.2. Graduates will have practical understanding of the major electrical engineering concepts and demonstrate application of their theoretical knowledge of the concepts.
- O.4.2. Graduates will develop an appreciation of continuing educational and professional development.

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