

ECE 4141: Introduction to RF/Microwave Wireless Systems

Credits and contact hours: 3 Credits (Two 75-minute lectures per week)

Instructor: Rajeev Bansal

Textbook: Microwave Engineering, D. Pozar (2012)

- a. *Other supplemental materials:* Selected reference materials/articles posted online

Specific course information:

- a. *Catalog Description:* An introduction to the general hardware components, system parameters, and architectures of radio-frequency (RF) and microwave wireless systems. Practical examples will be drawn from communication as well as radar/sensor systems.
- b. *Prerequisite:* ECE 3001; open only to the students in the School of Engineering
- c. *Required, elective, or selected elective:* Elective

Specific goals for the course:

- a. *Specific outcomes of instruction:* Students will be able to
 - apply the principles of EM field theory (from ECE 3001) to the analysis of transmission lines, waveguides, impedance-matching networks, and resonators.
 - use s-parameters for the analysis of passive components (e.g., power dividers) and simple microwave networks.
 - select, specify, and design basic radio frequency (RF) and microwave components and subsystems for various applications.
 - communicate the analysis/operation/design of an RF/microwave component/subsystem/application in the form of a technical report.
 - search for, acquire and use new knowledge from multiple sources.
- b. *ABET Criterion 3 Student Outcomes addressed by the course:*

(1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

Students learn to identify the RF/microwave aspects of typical EE problems in wireless systems and formulate their solutions by applying techniques from mathematics, science and engineering,

(2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

n/a

(3) an ability to communicate effectively with a range of audiences

Students write a technical report on the analysis/operation/design of an RF/microwave component/subsystem/application.

- (4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts**

n/a

- (5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives**

n/a

- (6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions**

n/a

- (7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.**

Students use the web, library databases, and other resources for their technical reports.

Topics covered:

- Introduction to RF/microwave systems
- Transmission lines and waveguides
- Impedance matching and tuning
- Resonators and filters
- Network analysis
- RF/microwave passive components
- Overview of RF/microwave sources
- Systems and applications
- Safety issues