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