University of Wisconsin - Madison
College of Engineering [EGR]
Last Offered: 2014-2015 Spring [1154]

Direct Link to this Syllabus :
http://aefis.wisc.edu/index.cfm/page/CourseAdmin.ViewABET?coursecatalogid=605&pdf=True

1. E C E 547, Advanced Communications Circuit Design
2. Credits : 3    Contact Hours : 3.0

a. Other Supplemental Materials : Additional notes

- Specific Course Information :

  a. Brief description of the content of the course (Course Catalog Description) : Principles underlying the design of r.f. and microwave communications circuits. Analysis and design of wideband nonlinear power amplifiers, S-parameter techniques for r.f. active circuit design, computer aided design techniques, r.f. integrated circuits, fundamentals of low noise r.f. design.
  b. Pre-requisites or Co-requisites : ECE 447, ECE 420 or con reg, or cons inst
  c. Selected Elective

- Specific Goals for the Course :

  a. Course Outcomes :

    1. Students learn to apply network analysis and design in wireless communication systems, combining mathematical, graphical and computer-aided design (CAD) tools for impedance matching, transmission line design, device measurement/modeling, and component analysis and design in IC environments with nonlinearities and other nonidealities of the materials system.
    2. Students learn to understand time- and frequency-domain analysis and instrumentation used in characterizing microwave networks, with emphasis on time-domain and large-
signal measurements
3. Students learn to understand the technical and economic constraints and advantages of different wireless communication system architectures, both narrowband and wideband, emphasizing integrated component.
4. Working in a group, to propose, build and report on the design and realization (at least by simulation using CAD and at best in the lab) of a wireless subsystem, such as a combination of antenna and LNA, or mixer and LO.

- **ABET Student Learning Outcomes:**

  (a) Ability to apply mathematics, science and engineering principles.
  (b) Ability to design and conduct experiments, analyze and interpret data.
  (c) Ability to design a system, component, or process to meet desired needs.
  (e) Ability to identify, formulate and solve engineering problems.
  (g) Ability to communicate effectively.
  (j) Knowledge of contemporary issues.
  (k) Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

- **Brief List of Topics to be Covered:**

  1. Filters, couplers, hybrids; emphasis on planar IC-compatible realizations
  2. Error rates vs SNR for different modulation types
  3. MMIC design: amplifiers, oscillators, mixers in Si and GaAs
  4. CAD (Agilent ADS) and layout of above circuits, nonlinearities, large-signal design
  5. Subsystems and their interactions
  6. Device measurement and modeling