Description
Radios are becoming more flexible as more functional blocks are implemented in software. This enables the radios to adapt to different situations and to communicate using a variety of wireless protocols. This course will first examine the fundamental radio components and how these components are implemented in software. The principles of a software architecture to support the software defined radio (SDR) will also be examined. We will then look at the emerging concept of cognitive radios (CR), which build on the capabilities of SDRs by adding the ability for the radio to intelligently sense and respond to its environment. Policy and cooperation mechanisms that enable CRs to interoperate will be developed. The course will take the form of a seminar rather than a traditional lecture-based course. Students who take this course will be expected to collaborate in active discussions in class and write a research-oriented paper on the topic.

Prerequisites
TLEN 5330 (Data Communications 1) or an equivalent course/background and background in radio/wireless networking.

Professors:
Ken Baker
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Course Homepage
On CULearn

TA
TBD

Office hours and location
Professor Sicker – Monday 1-2 pm or by appointment, ECCR 1B5A
Professor Baker – Monday 11-12 pm or by appointment, ECOT 347

Books:
None. Readings will be selected papers from various journals, conferences and workshops.

Important Material
If you qualify for accommodations because of a disability, please submit to me a letter from Disability Services in a timely manner so that your needs may be addressed. Disability Services determines accommodations based on documented disabilities. (303-492-8671, www.Colorado.edu/disabilityservices) More info can be found at: www.colorado.edu/disabilityservices

The Chancellor and the President have recently fielded several valid complaints from students and parents regarding the lack of adequate faculty accommodation for some students who have serious religious obligations which may conflict with academic requirements such as scheduled exams.
Therefore, I encourage students to notify me of anticipated conflicts as early in the semester as possible so that there is adequate time to make necessary arrangements. The full text of the Boulder campus policy can be read on the web at: http://www.colorado.edu/policies/fac_relig.html

The University has recently adopted a student Honor Code. Individual faculty members are encouraged to familiarize themselves with its tenets and procedures. The Honor Code can be found at: http://www.colorado.edu/policies/honor.html and at http://www.colorado.edu/academics/honorcode/

The University of Colorado at Boulder policy on Discrimination and Harassment (http://www.colorado.edu/policies/discrimination.html), the University of Colorado policy on Sexual Harassment and the University of Colorado policy on Amorous Relationships applies to all students, staff and faculty. Any student, staff or faculty member who believes s/he has been the subject of discrimination or harassment based upon race, color, national origin, sex, age, disability, religion, sexual orientation, or veteran status should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Judicial Affairs at 303-492-5550. Information about the ODH and the campus resources available to assist individuals regarding discrimination or harassment can be obtained at http://www.colorado.edu/odh

Students and faculty each have responsibility for maintaining an appropriate learning environment. Students who fail to adhere to such behavioral standards may be subject to discipline. Faculty have the professional responsibility to treat all students with understanding, dignity and respect, to guide classroom discussion and to set reasonable limits on the manner in which they and their students express opinions. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender variance, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. See polices at http://www.colorado.edu/policies/classbehavior.html and at http://www.colorado.edu/studentaffairs/judicialaffairs/code.html#student_code

Grading

10% Participation
30% Presentation lead
30% Presentation support
30% Project

Before each presentation, the presenting group will meet with the professors to discuss the paper and their presentation.

Schedule

Lecture 1: Overview of cognitive radio


Lecture 3: We dissect a paper as a group.
Lecture 4: Radio and Wireless Fundamentals

Lecture 5: SDR and application to cognitive radio networking

The remainder of the term we will discuss the following papers. Papers will not be assigned until the week prior since this is likely to change. The goal will be to complete 2 papers each week.

PAPERS

Technology
Papers addressing background on radio, including


The following 3 from IEEE Communications 2007


The following 3 from IEEE Communications 2009
Daniel Willkomm, Technische Universität Berlin, Germany; Sridhar Machiraju, Sprint, USA; Jean Bolot, Sprint, USA; and Adam Wolisz, Technische Universität Berlin, Germany, “Approved Primary Users in Cellular Networks: A Large-scale Measurement Study,”


George Atia, Boston University, Anant Sahai, UC Berkeley, and Venkatesh Saligrama, Boston University, “Approved Spectrum Enforcement and Liability Assignment in Cognitive Radio Systems,”

Possibly the following paper:

Topics to added depending on interest and direction:
Sensing, Networking, Reasoning, Security as well as papers on Cyclostationary, Interference Temperature, Group sensing, Biologically inspired algorithms
Standards
A set of papers will be assembled to cover the following standards:
IEEE 802.22
IEEE 802.11Y
IEEE 802.11 K
SCC41 overview

Policy/Economics


“Software Defined Radio Technology for Public Safety,” Approved Document SDRF-06-A-0001-V0.00

Gerald R. Faulhaber, “The Question Of Spectrum: Technology, Management, And Regime Change, <citation?>

R. Paul Margie, Efficiency, Predictability, And The Need For An Improved Interference Standard At The FCC,” <citation?>

