General Information

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Office Hours: Wednesday and Thursday, 11am–12pm, and by appointment

Course Objectives

Over the last decade, we have witnessed significant advances in wireless communications and networks. On the access side, 802.11-based wireless LANs (WLANs) have been deployed in campuses, corporations, airports, hotels, restaurants, etc., forming wireless clouds at the edge of the Internet. Wireless mesh and regional-area networks (RANs) are starting to emerge, facilitated by opportunistic access to low-frequency bands (e.g., TV spectrum) that allow for extended coverage. Through advanced beam-forming and MIMO capabilities, broadband wireless access with speeds in the hundreds of Mbps and higher are now possible. Wireless sensor networks (WSNs) have been deployed for various civilian and military applications, including environment monitoring, detection of chemical hazards, border crossing, weather forecasting, etc. The Internet-of-Things (IoT) is currently being researched, with a vision to enable the networking of a large number of IP-capable smart devices, including home appliances, sensors, smart meters, UAVs, etc. Frequency-adaptive radios (a.k.a. cognitive radios) are emerging as a new platform for agile wireless communications with dynamic spectrum access (DSA) capabilities. Given the significance of the RF spectrum, new architectures for spectrum sharing and coexistence among heterogeneous wireless technologies are being explored (e.g., LTE/WiFi, radar/LTE, etc.), with significant implications on the overall wireless ecosystem.

The purpose of this seminar course is to expose students to recent advances in wireless networks, focusing on novel protocol designs, and architectural concepts. Various topics will be covered (see attached list) through representative papers from top-tier conferences (e.g., MobiCom, MobiHoc, Sigcomm, INFOCOM, etc.), IEEE and ACM journals, magazines, and regulatory documents and standards (including FCC specifications). The class will emphasize discussion and debate, with the goal of strengthening students’ critical and analytical thinking.
Prerequisites

- Introductory course on computer networking (e.g., ECE 478/578 or ECE 564).
- Graduate course in probability theory and random processes (e.g., ECE 503).

Class Structure

- **Class Material:** The class material will consist of assigned research papers, tutorial/survey articles, and standards documents (including FCC specifications). In addition, the slides of presentations given by the instructor and students will be made available to the class, and will constitute part of the class material. In each lecture, 1-2 papers will typically be assigned as “required”. Additional papers may be provided as “recommended reading”.

- **Presentations/Discussions:** The lectures will consist of slide presentations and moderated discussions. A fraction of these presentations will be given by the instructor. The rest will be given by students and invited speakers. Each student will give at most two presentations throughout the semester, one of them possibly as a team presentation. Each presentation will be related to a specific topic, described in the attached list of topics, and will be based on assigned papers. The list of speakers and assigned papers will be announced later.

  For each seminar, all students must read the the assigned “required papers” before coming to class. The presentation will last for one hour, including discussion, questions, etc. The presenter(s) is required to send his/her slides to the instructor at least 2 days before the presentation (I will post all presentations on the class web page). Depending on the complexity and value of the discussed paper, the discussion of a given paper may extend over 1-2 lectures (including the quiz).

  **Some Guidelines to Presenters:**

  - Presenters should motivate the paper(s), discuss its goals, limitations, major assumptions, and contributions. Sufficient background on the topic should also be provided.
  - In preparing your presentation, you are allowed to cut-and-paste graphs and tables from the paper(s) being presented. You may also use slides already prepared by the original authors of the paper (if available online), but with proper acknowledgement and reference to the source of the material.
  - In addition to the “required papers”, the presenter should also read the “recommended” papers (if any) of his/her assigned topic. Reading the “recommended” papers is optional for the rest of the class.

- **Class Interaction and Participation:** Because this is a seminar, students are expected to be fully engaged in the discussion by asking questions, raising issues, critiquing the presented ideas, responding to questions, etc. Part of the grade will be based on class participation. For their part, presenters need to be engaging and ensure an interactive and lively discussion with the audience.
• **Quizzes:** Following most presentations, there will be a short (e.g., 15 minutes) unan-
nounced quiz to be taken by the whole class, except the presenters. The quiz will test
your overall understanding of the assigned (and presented) paper, including its overall
theme, its contributions, lessons learned, limitations, strong assumptions, main conclu-
sions, etc. The quiz may also address issues brought (or missed) by the presenters. To
be ready for the quiz, you should definitely read the paper(s) before coming to class.

**Grading**

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<td>Presentations</td>
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<td>Class Participation/Interaction</td>
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<td>Quizzes</td>
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