

COE 549 – Special Topics in Computer Networking

Wireless Sensor Networks

Course Information – T141

Dr. Abdulaziz Barnawi

COE Dept.

KFUPM

Administrative Information

■ Class Schedule

- Time: M.W. 8:00-9:15PM (tentative)
- Location: 24-104

■ Office Hours

- U. T.: 11:00-12:00AM (tentative)
- or By appointment

■ Office

- Location: 59-2065
- Tel: 1038

■ Course pages

- My Webpage: <http://faculty.kfupm.edu.sa/COE/barnawi/COE549-131.htm>
- Blackboard course page

Course Goals

- Introducing some existing applications of wireless sensor networks.
- Presenting elements of network protocol design and how to apply these principles in the context of wireless sensor networks
- Learn the various hardware, software platforms that exist for sensor networks
- Providing an overview of the various network level protocols for MAC, routing, time synchronization, aggregation, etc.
- Strengthen research skills in the area of wireless sensor networks through paper presentations on various issues in sensor networks as well as a through a research project.

Course Material

- No specific textbook but, there is a couple of books that are recommended for reading:
 - **Protocols and Architectures for Wireless Sensor Networks** by Holger_Karl and Andreas Willig, *Wiley*, ISBN: 0-470-09510-5, June 2005
 - **Wireless Sensor Networks**, by Ian F. Akyildiz and Mehmet Can Vuran, John Wiley & Sons 2010, ISBN 978-0-470-03601-3
 - **Ad hoc Wireless Networks – Architecture and Protocols** by C. Siva Ram Murthy and B. S. Manoj,, Prentice Hall, 2004, ISBN – 013-147-023x

Course Material

- Reading list:
 - Journal and conference articles mainly from IEEE, ACM and Elisver. These will be posted in the course page within my homepage.

- Lecture slides
 - Check course webpage or Blackboard

Course Dynamics

- By instructor
 - This will include theory, fundamental information

- By the students
 - This will include focused surveys and presentations on selected research proposals or technologies, typically open for debate and discussion.

- By invited speakers
 - We will have a couple of lectures by invited speakers based on availability

Reading-list Presentation Details

- Each student will assigned and present a number of papers (2 to 3).
- Student reading list will be posted about 1-2 weeks in advance.
- Papers from journals and conference proceedings other than those in the reading list must be approved by the instructor.
- A short summary paper (2-3 pages max) must be submitted with the presentation one day in advance.
- Each presentation is 30-35 min at most.

Reading-list Presentation Details

- Each student presentation should have and will be evaluated based on:
 - The problem statement
 - Related background material
 - Discussing the main proposed research in the paper
 - Discussion of the major results and findings
 - Evaluating the merits of the proposed solution by identifying discrepancies, research holes, and potential improvements of the work
 - Propose few research directions out the paper

Course Research Project

■ Goals

- To experience the process of identifying and solving a research problem in the area of wireless sensor networks
- Learn and improve technical writing skills
- Learn and improve presentation skills

■ Simulation

- Use any simulation tool that you are familiar with (e.g. ns-2, Glomosim, MATLAB, etc.) or write your own code (C++, Java, etc)

■ Mathematically-oriented

- This may include the application of a theory towards design, optimization, modeling, etc.

Course Research Project Details

- Individual work
- A pre-proposal discussion with me including topic selection
 - A formal proposal write-up (2 to 4 pages max).
 - First draft project proposals must be submitted by November 21, 2013.
 - Proposal presentation and discussion.
 - Should include rough schedule of project milestones
- A final project presentation and peer grading (towards end of semester)
- A final paper (and, if applicable, a demo)
 - Conference-style research paper (6-12 pages max) detailing your project

Course Grading Policy

- Class participation: 5%
- Individual student reading-list lecture presentations: 15%
 - Student must be prepared to answer the questions that might (and will) come up during the talk.
 - Grading Criteria for Student Presentations Total (0-100)
 - Problem statement (0-10)
 - Critical thinking (0-30): identify discrepancies, research holes, and potential improvements of the work
 - Related background (0-20): Compare and relate the work to other works
 - Presentation (0-20): Stress and illustrate key ideas of the work, e.g., with examples and figures; clarity in delivery
 - Knowledge (0-20): The depth and breadth of knowledge of the presented material. Ability to identify unsolved problems.

Course Grading Policy

- Project: 50%
 - (see previous slides for project details)
 - Spend some time as soon as possible to explore various topics in the area and choose the one that you could contribute in, proposal discussions will also help.

- Short Mid-term Exam: 10%
 - Based one or two selected papers by instructor

- Final: 20%
 - Based on
 - Instructor class presentations
 - One or two selected papers by instructor

Topics to Cover

- Introduction
- Sensor node architecture
- Power and Energy Management
- Wireless Transmission
- MAC Protocols for Sensor Networks
- Network Bootstrapping and Clustering
- Routing and Data Aggregation
- Miscellaneous topics such as Synchronization, Localization, Security, Cross-layer optimization, etc.

