



Wireless Sensor Networks CS-579: Course Outline

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Course: CS-579: 'Wireless Sensor Networks' (3 units)

Description: Recent advances in wireless communications and electronics have enabled the development of low-cost, low-power, multifunctional sensor nodes that are small in size and communicate untethered in short distances. These tiny sensor nodes, which consist of sensing, data processing, and communicating components, leverage the idea of sensor networks. The sensor networks can be used for various application areas (e.g., health, military, home). For different application areas, there are different technical issues that researchers are currently resolving.

CS-579 is a graduate-level class whose goals are:

1. To understand the state-of-the-art in sensor network protocols, architectures and applications.
2. To understand how sensor network research is done.
3. To investigate novel ideas in the area via research projects.

Core/Elective: Elective

Pre-requisites: Computer Networks OR Operating Systems

Text: Primary

- o Reading package compiled by Instructor(s) comprising of various published/refereed research papers.
- o The research papers are available at <http://suraj.lums.edu.pk/~cs579w04>

Some handouts may be given to supplement the text.

Lectures: There shall be 20 sessions of 100 minutes each.

Grading:

- 10% Quizzes (2-3 Quizzes) + Paper Summaries (Due before each class)
- 10% Programming Assignments. (2 Assignments)
- 20% Midterm Exam
- 30% Final Exam
- 25% Final Project/Paper
- 05% Attendance and Class Participation

Topics	Sessions	Readings
Introduction & Overview: (Overview of the course, Overview of sensor networks protocols, issues, and applications)	1	[Els04]
Sensor Node Hardware & Operating Systems: (Sensor hardware platforms (MOTES), TinyOS)	2	[Hill00, Levis04]
Medium Access Control: (MAC-layer issues, S-MAC Protocol, TRAMA Protocol)	2	[Ye04a, Ye04b, Rajendran03]
Localization: (GPS-less localization, self-configuring localization techniques)	2	[Bulusu00, Bulusu04]
Time Synchronization: (Clock skews, Optimal and global time synchronization)	1	[Karp03]
Network Layer Protocols: Multi-hop (Directed diffusion: a data dissemination network-layer protocol)	1	[Intanagonw-iwat03]
MIDTERM	1	
Network Layer Protocols: Cluster-based: (LEACH protocol, cluster head rotation)	1	[Heinzelman-02]

Topics	Sessions	Readings
Topology Control: (ASCENT protocol)	1	[Cerpa04]
Data Storage in Sensor Networks: (Data-centric storage with geographic hash tables)	1	[Ratnasamy-03]
Sensor Network Middle-ware: (Middleware to support sensor network applications)	1	[Heinzelman-04]
Querying Sensor Networks: (Acquisitional query processing, TinyDB, Model-driven data acquisition)	2	[Madden04, Deshpande-04]
Sensor Network Programming Languages: (The nesC programming)	1	[Gay03]
Simulation & Experiment Environments: (TOSSIM environment, Emstar environment)	1	[Levis03, Girod04]
Security issues in Sensor Networks: (SPINS protocol, Secure Information Aggregation)	1	[Perrig02, Perrig03]
<u>FINAL EXAM</u>	1	

Paper Summaries:

The students are supposed to write short summaries of the respective papers for the lecture and email them to the TA BEFORE class.

Attendance and Class Participation:

There is 5% attendance and class participation in order to discourage students from missing classes. Each student can miss a maximum of 2 TWO classes. Not attending more than two classes may result in a grade reduction.

Programming Assignments:

Two (2) programming assignments would be given (one before the midterm and another after). The assignments would provide students with hands-on experience with TinyOS and Emstar programming.

Final Project/Paper:

- Students would work in a group of two students for a quarter-long project/paper.
- We would work closely with the student groups during the projects to help investigate novel ideas in the field. We would upload project ideas on the course website; however students are welcome to come up with their own research problems.
- Survey papers (with no simulation/experimental results) are also acceptable.
- Projects/papers are officially due at the end of the quarter but the students may continue to work with us after the course towards a research publication.