Course : **CS 591 / EE 591 – Introduction to Wireless Sensor Networks** (Fall 2010)

Course Format: 3 hr Lecture / Presentations, 3 hr Credit

Prerequisites:
For CS students – CS 415, CS 450, CS 350 (Or equivalent)
For EE or other disciplines – EE 329, EE 461 (Or equivalent)

Instructor:
Dr. Vinod Kulathumani, 727 Engineering Sciences Building
vinod.kulathumani@mail.wvu.edu
http://www.csee.wvu.edu/~vkkulathumani/wsn.html

Schedule: MWF 12:00 – 12:50

Location: ESB 215

Office Hours: Tuesday and Wednesday 1:00 – 2:00 p.m. or by appointment

Course Objectives:
Fueled in part by recent advances in MEMS and wireless communication technologies, sensor actuator networks and networks of embedded devices in general have become extremely popular and have been used in several applications such as environmental monitoring, perimeter security, structural control, asset tracking and personal healthcare systems. The objectives of this course are to introduce students to the state of the art in wireless sensor actuator networks and to provide hands on training in programming these networks.
We will have a significant reading list from recent literature to accompany the lectures. Lectures will emphasize aspects of distributed systems such as fault-tolerance, reliability, and security. Case studies from existing applications will be used. Each student will have to complete a project.
The course is aimed both at students who wish to do research in the sensor networks area, as well as at students from related disciplines, such as signal processing, wireless communications, databases, algorithms, etc., who wish to understand what new challenges sensor networks pose for their own discipline.

Expected Learning Outcomes:

Upon successful completion of this course,

1. Students will be introduced to some existing applications of wireless sensor actuator networks
2. Students will be introduced to elements of distributed computing and network protocol design and will learn to apply these principles in the context of wireless sensor networks
3. Students will learn the various hardware, software platforms that exist for sensor networks
4. Students will get an overview of the various network level protocols for MAC, routing, time synchronization, aggregation, consensus and distributed tracking
5. Students will learn to program sensor network platforms using TinyOS, C and Java and will get an opportunity to have hands on training in developing applications on wireless motes, smart phones and other embedded platforms
6. Students will read and present seminal papers on various issues in sensor networks, opening a path to research in this area
7. Students will understand what research problems sensor networks pose in disciplines such as signal processing, wireless communications and even control systems

Text:

Most of the reading for this course will be papers from a list of papers. Some reference books that might be of interest are:

Principles of Embedded Networked Systems Design
Gregory Pottie, William Kaiser
Hardback (ISBN-10: 0521840120 | ISBN-13: 9780521840125)

Wireless Sensor Networks: An Information Processing Approach,
Feng Zhao and Leonidas Guibas

Wireless Communications & Networks, 2nd Edition,
William Stallings. ISBN: 0131918354

Elements of network protocol design,
Mohammed G. Gouda

Elements of distributed computing,
Vijay K. Garg

Course Syllabus (and % of time per topic):

(1) Introduction and examples (5%)
(2) Elements of distributed computing and network protocol design (10%)
(3) Hardware and software platforms for sensor networks, (10%)
(4) Protocols for link layer, MAC layer, routing layer and localization (10%)
(5) Protocols for network reprogramming (10%)
(6) Concepts of topology control, coverage, power management (10%)
(7) Protocols for distributed consensus, in-network processing, information aggregation and querying (15%)
(8) Security for sensor networks (10%)
(9) Embedded camera networks (10%)
(10) TinyOS (10%)

Grading:

2 Exams (@ 15 % each)	30 %
Assignments	30 %
Project	40 %

Grade Assignment :

100 – 90 A
89 – 80 B
79 – 70 C
69 – 60 D
59 – 0 F

Grading Policy :

No make-up exams except by prior arrangement with instructor
Late assignment = no assignment

Exam grading appeals in writing on the day the exam is returned.

HW Assignments:
Homework assignments will be given approximately every week and each assignment will be worth approximately the same credit.

Project:
For this course, you will be required to work on a project, individually or in a team of at most two persons. The project will usually involve programming using TinyOS or C / Java or Matlab. Students will either use a remote sensor network testbed or in-house sensors for their project. (In case of students from non-CS background who are not comfortable with programming, alternate projects can be designed.) An oral presentation and a written report will be due in the finals week.

Attendance Policy:
Consistent with WVU guidelines, students absent from regularly scheduled examinations because of authorized University activities will have the opportunity to take them at an alternate time. Make-up exams for absences due to any other reason will be at the discretion of the instructor.

Social Justice Statement :
"West Virginia is committed to social justice. I concur with that commitment and expect to maintain a positive learning environment based upon open communication, mutual respect, and nondiscrimination. Our University does not discriminate on the basis of race, sex, age, disability, veteran status, religion, sexual orientation, color or national origin. Any suggestions as to how to further such a positive and open environment in this class will be appreciated and given serious consideration.

If you are a person with a disability and anticipate needing any type of accommodation in order to participate in this class. Please advise me and make appropriate arrangement with Disability Services (293-6700)."

Integrity Statement :
"The integrity of the classes offered by any academic institution solidifies the foundation of its mission and cannot be sacrificed to expediency, ignorance, or blatant fraud. Therefore, I will enforce rigorous standards of academic integrity in all aspects and assignments of this course. For the detailed policy of West Virginia University regarding the definitions of acts considered to fall under academic dishonesty and possible ensuing sanctions, please see the Student Conduct Code at http://www.arc.wvu.edu/admissions/integrity.html. Should you have any questions about possibly improper research citations or references, or any other activity that may be interpreted as an attempt at academic dishonesty, please see me before the assignment is due to discuss the matter. "