CS687/CS585/EE599	**Fall 2015**

Smart Grid Communications and Energy Efficient Computing

Syllabus	*August 27, 2015*

Location: RMB 323 (Robotics & Manufacturing Building)
Time: TR 3:30 pm – 4:45 pm (Tuesdays and Thursdays)
URL: `http://voip.netlab.uky.edu/~fei/teaching/cs687/index.html`

Instructor

Zongming Fei
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Office hours: TR 1:00pm – 2:00pm (or by appointment)

Course Description

Communications and information technologies are one of key enabling components of future Smart Grid, which will make current power grid more efficient and recover from outage more quickly, enable demand response and accommodate renewable and alternative energy into the grid. The focus of the course is on communications and information technologies that are essential to the evolution of the future smart grid. The course will also cover technologies for improving energy efficiency in computing and communications. Tentative topics include Introduction to Smart Grid, Networking Issues in Smart Grid, Home Area Networks (e.g., ITU G.hn, IEEE 802.15.4, IEEE 802.11), Field Area Networks (e.g., power-line communications, HomePlug/IEEE P1901, RF mesh), Wide-area Networks for Smart Grid (e.g., Fiber Optics, WiMAX, sensor networks), Information Management in Smart Grid (e.g., SCADA, CIM), Security & Privacy in Smart Grid, and Energy efficient Computing.

Prerequisites

Engineering standing for undergraduate students. Enrolled in the College of Engineering for graduate students.

Student Learning Outcomes

Students will develop knowledge and skills in communications and information technologies for Smart Grid. At the conclusion of the course, students will be able to:

1. Understand concepts and principles of communications technologies for smart grid;
2. Analyze the trade-off of different communication architectures and protocols;
3. Understand the data management issues associated with smart grid;
4. Understand the security issues in smart grid and solution approaches.
5. Analyze methods for improving energy efficiency in computing and communications.

Required Materials/Textbook

We do not have a textbook for this course. We will provide handouts or links for contents covered in class.

Course Activities, Assignments and Grading

The grade will be determined by your performance on homework assignments, two mid-term exams, a presentation, and a project. The tentative weights are as follows:

- Homework assignments - 20%
- Midterms - 40%
- Presentation - 15%
- Project - 25%

Final grades will be assigned according to the following scale:

A=90-100%, B=80-89%, C=70-79%, D=60-69%, E=0-59%.

For graduate students, grade D will automatically be replaced by E. Also, any grade normalization will be done against peer students, i.e. undergraduates will only be normalized with undergraduates, and graduates with graduates. No incomplete grades will be assigned unless there exist exceptional, extenuating circumstances.

Mid-term Grade

Mid-term grades for undergraduate students will be posted in myUK by the deadline established in the Academic Calendar (http://www.uky.edu/Registrar/AcademicCalendar.htm).

Course Policies

Submission of Assignments:

Late submissions of homework and projects will not be accepted with the exception of excused absences.

Make-up Policy for Missed Work with an Excused Absence:

Students have one week following an excused absence to make up any missed graded work or exams.

Attendance Policy:

Attendance is mandatory. For each unexcused absence, two points will be deducted from the final average.

Excused Absences:

Students need to notify the professor of absences prior to class when possible. S.R. 5.2.4.2 defines the following as acceptable reasons for excused absences: (a) serious illness, (b) illness or death of family member, (c) University-related trips, (d) major religious holidays, and (e) other circumstances found to fit "reasonable cause for nonattendance" by the professor.

Students anticipating an absence for a major religious holiday are responsible for notifying the instructor in writing of anticipated absences due to their observance of such holidays no later than the last day in the semester to add a class. Information regarding dates of major religious holidays may be obtained through the religious liaison, Mr. Jake Karnes (859-257-2754).

Students are expected to withdraw from the class if more than 20% of the classes scheduled for the semester are missed (excused or unexcused) per university policy.

Verification of Absences:

Students may be asked to verify their absences in order for them to be considered excused. Senate Rule 5.2.4.2 states that faculty have the right to request "appropriate verification" when students claim an excused absence because of illness or death in the family. Appropriate notification of absences due to university-related trips is required prior to the absence.

Academic Integrity:

Per university policy, students shall not plagiarize, cheat, or falsify or misuse academic records. Students are expected to adhere to University policy on cheating and plagiarism in all courses. The minimum penalty for a first offense is a zero on the assignment on which the offense occurred. If the offense is considered severe or the student has other academic offenses on their record, more serious penalties, up to suspension from the university may be imposed.

Plagiarism and cheating are serious breaches of academic conduct. Each student is advised to become familiar with the various forms of academic dishonesty as explained in the Code of Student Rights and Responsibilities. Complete information can be found at the following website: http://www.uky.edu/Ombud. A plea of ignorance is not acceptable as a defense against the charge of academic dishonesty. It is important that you review this information as all ideas borrowed from others need to be properly credited.

Part II of Student Rights and Responsibilities (available online http://www.uky.edu/StudentAffairs/ Code/part2.html) states that all academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research, or self-expression. In cases where students feel unsure about the question of plagiarism involving their own work, they are obliged to consult their instructors on the matter before submission.

When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording or anything else from another source without appropriate acknowledgement of the fact, the students are guilty of plagiarism. Plagiarism includes reproducing someone elses work, whether it be a published article, chapter of a book, a paper from a friend or some file, or something similar to this. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work which a student submits as his/her own, whoever that other person may be.

Students may discuss assignments among themselves or with an instructor or tutor, but when the actual work is done, it must be done by the student, and the student alone. When a students assignment involves research in outside sources of information, the student must carefully acknowledge exactly what, where and how he/she employed them. If the words of someone else are used, the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Making simple changes while leaving the organization, content and phraseology intact is plagiaristic. However, nothing in these Rules shall apply to those ideas which are so generally and freely circulated as to be a part of the public domain (Section 6.3.1).

Please note: Any assignment you turn in may be submitted to an electronic database to check for plagiarism.

Accommodations due to disability:

If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (Room 2, Alumni Gym, 257-2754, email address: jkarnes@email.uky.edu) for coordination of campus disability services available to students with disabilities.

Tentative Course Schedule

This schedule is tentative and subject to change.

Week	Start From	Topic
1	08/27	Introduction to Smart Grid
2	09/01	Networking Issues in Smart Grid – background concepts – NIST framework
3-4	09/08	Home Area Networks – access technologies – IEEE 802.11 – IEEE 802.15.4 – 6LoWPAN – ITU G.hn
5	09/22	Field Area Networks – radio over power-lines (BPL/PLC) – IEEE P1901/HomePlug – mesh networks
6	09/29	Midterm exam and flexible
7-8	10/06	Wide-area Networks for Smart Grid – fiber optics vs wireless network – cellular networks – WiMAX – sensor networks
9	10/20	Information Management for Smart Grid – Interoperability issues – AMI – CIM – SCADA
10-11	10/27	Security and Privacy in Smart Grid – vulnerabilities and threats – encryption and authentication – privacy issues
12-13	11/10	Energy Efficient Computing – green computing – power management in data centers – energy efficient routing protocols in wireless networks
14	11/24	Midterm exam and flexible (may be scheduled earlier)
15-16	12/01	Presentations