E&C-ENG 674: Green Computing
Syllabus for Spring 2019

General Info

Instructor: David Irwin
Email: deirwin@umass.edu
Credits: 3
Office: Knowles Engineering Building 211D
Office Hours: Tuesdays 10am-11am, or by appointment
Class Meetings: Tuesdays and Thursdays 1pm-2:15pm
Class Location: Hasbrouck 104A
Webpage: http://www.ecs.umass.edu/ece697gc/
Textbook: No required textbook. Any readings will be provided in class

Recommended Pre/co-requisites

E&C-ENG 570 System Software Design or E&C-ENG 670 Advanced System Software Design
serve as either co-requisites or pre-requisites for the course.

Course Description

This course will introduce students to the area of Green Computing. The goal will be to enable students to acquire the knowledge and skills required to do research in this area. The course is divided into two separate tracks. The first track focuses on energy-efficient computing, which examines techniques for improving the energy efficiency of computing devices and infrastructure, ranging from small-scale mobile devices to large-scale data centers. The course will cover energy-efficiency issues across the entire hardware/software stack, starting from individual components, such as processors and memory, up to systems-level architectures and optimizations. The second track will focus on leveraging computation, networking, and sensing to improve society’s energy-efficiency. In particular, the course will focus on enabling smart buildings and smart grids that are able to automatically manage their energy usage. The topics covered will enable students to develop the diverse range of skills required to perform research in Green Computing, including background in sensor/actuator networks (to monitor and control loads), operating systems (for scheduling loads), economics (to understand electricity markets), privacy (to prevent leaking information on occupant behavior), and electrical engineering (to understand characteristics of the smart grid).

Organization

This is a graduate-level course and will comprise lectures, presentations, and research discussions. Students will be required to read approximately ∼35 research papers (or book chapters) in the area, including both seminal work and current work, and write critical reviews of
these research papers. These reviews will be similar to conference- or journal-style reviews for research papers. There is no required textbook for the course: all papers and book chapters required for reading will be provided to students. Students will give approximately two presentations throughout the course of the semester on research papers, dependent on the number of students enrolled, and lead a discussion on the papers topic.

The primary component of the grade will be a semester-long project on a topic related to the class, which will require a formal written proposal and a final deliverable in the form of a research-style paper 10-12 pages in length. The topic of the project will be made in consultation with the professor. The project may be done individually or in groups. The final project presentation and paper will be in lieu of a final exam.

The course will alternate on topics from each of its two tracks: improving the energy-efficiency of computing and improving the energy-efficiency of society. A tentative list of per-week topics on computing includes: Renewable Integration, Leveraging Energy Storage, Designing Balanced Systems, Energy-efficient Networking, Green Storage, and Power Proportionality. A tentative list of per-week topics on improving society’s energy-efficiency includes: Smart Buildings, Grid Peak Reduction, Non-intrusive Load Monitoring, Security and Privacy, Renewables and Storage, and Demand Response.

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**Grading Policy**

Grades will be computed as follows:

- 5% Class Participation
- 10% Project Proposal
- 15% Paper Reviews
- 30% Paper Presentations
- 40% Final Project

The grading will follow the graduate grade scale with no grades of C-, D+, or D.

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**Class Participation**

Lectures are mandatory and students are expected to attend regularly. One goal of this course is to promote discussion of current research in Green Computing among all class members. As such, you are encouraged and expected to ask questions, point out weaknesses, and make observations during class.

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**Objectives and Program Outcomes**

The objective of the course is to enable students to acquire the knowledge and skills required to do research in this area. The learning objectives include improving critical thinking, oral and written communication, technology literacy, and applying technology to solve societal problems.

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**Inclusivity Statement**
We are all members of an academic community with a shared responsibility to cultivate a climate where all students/individuals are valued and where both they and their ideas are treated with respect. The diversity of the participants in this course is a valuable source of ideas, problem solving strategies, and engineering creativity. If you feel that your contribution is not being valued for any reason, please speak with me privately. If you wish to communicate anonymously, you may do so in writing or speak with Dr. Paula Rees, Director of Engineering Diversity Programs (rees@umass.edu, 413.545.6324, Marston 128).

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**Accommodation Policy Statement**

The University of Massachusetts Amherst is committed to providing an equal educational opportunity for all students. If you have a documented physical, psychological, or learning disability on file with Disability Services (DS), you may be eligible for reasonable academic accommodations to help you succeed in this course. If you have a documented disability that requires an accommodation, please notify me within the first two weeks of the semester so that we may make appropriate arrangements.

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**Academic Honesty Policy**

Since the integrity of the academic enterprise of any institution of higher education requires honesty in scholarship and research, academic honesty is required of all students at the University of Massachusetts Amherst. Academic dishonesty is prohibited in all programs of the University. Academic dishonesty includes but is not limited to: cheating, fabrication, plagiarism, and facilitating dishonesty. Appropriate sanctions may be imposed on any student who has committed an act of academic dishonesty. Instructors should take reasonable steps to address academic misconduct. Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible. Instances of academic dishonesty not related to a specific course should be brought to the attention of the appropriate department Head or Chair. Since students are expected to be familiar with this policy and the commonly accepted standards of academic integrity, ignorance of such standards is not normally sufficient evidence of lack of intent (http://www.umass.edu/dean_students/codeofconduct/acadhonesty/).