**ECE 298: The Semiconductor Chips Revolution**

To be offered in Fall 2023 and every semester after that

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**Syllabus**

**Rationale and Overview:** The semiconductor technology continues to have a profound impact on human lives in areas such as energy, public health, security, business, transportation, manufacturing, and artificial intelligence. Semiconductor technology is ubiquitous and has transformed the way of how we interact and communication with each other. In the last five decades, the cost of computation has declined by over eight orders of magnitude, while the performance of microprocessor units has continued to improve at a rapid pace. Now, more than ever, it is important for our students to appreciate the diverse applications of semiconductor chips, discuss latest technological breakthroughs and scientific discoveries, and have an opportunity to meet and interact with experts to know about career prospects and skillset needed to succeed in this field. This course is expected to be the first in a series of courses constituting the college-wide Semiconductors Engineering minor, currently being co-developed by several departments in GCOE. After successfully completing this course, students will have the option to enroll in advanced semiconductor-related courses. Industry guest lecturers will come from companies like Intel, Synopsys, IBM, Cadence, TSMC, Samsung, NVIDIA, etc.

**Goals:** (1) Introduce engineering and non-engineering students to the world of semiconductor chips and discuss the remarkable impact of this technology on human lives. (2) Enable regular interactions between students and experts from academia and industry through guest lectures, which will allow students to learn about diverse career opportunities available to them in this field. (3) Motivate students to pursue advanced semiconductor-related courses offered in GCOE.

**Requirements:** There are no formal requirements for students to take this class. This course will be accessible to all students at Illinois as well as students from Parkland College.

**Course Components**

***Course Website:*** The course website will include information related to the guest lectures, reading for every lecture, and a discussion board for students to interact among themselves. The course website will also include a schedule of the lectures. If a guest lecturer assigns additional reading, we will post that on the course website.

***Reading:***Students will be assigned reading from the following reference book:

Tony Hey and Gyuri Papay. The Computing Universe: A Journey Through A Revolution (1st Ed.). Cambridge University Press. ISBN-13: 978-0521766456. (available from the digital library)

Additional readings may also be assigned by our guest speakers. These readings will be posted on the course website and made available to the students.

***Lectures:*** One 50-minute lecture per week. Lectures will cover contemporary topics in the field of semiconductor engineering, including topics on career prospects, latest and greatest technological breakthroughs, future prospects, historical perspectives, etc.

***Videos:*** Recordings of all lectures automatically generated on Illinois Media Space and available for streaming at most a few hours after each lecture. However, technical issues do happen and we cannot always guarantee a lecture recording; hence, we strongly encourage students to attend the lectures in person to get the most out of them.

**Homework and Exams:** None

**Grading Policy:** Students will earn one credit for this course by satisfying the following two requirements. (1) Students will attend at least 75% of the lectures during the semester. (2) Students will submit a 15-minute video, discussing one of the lecture topics that they were most inspired by.

In the video submission, students will demonstrate their understanding and perspective of the topic. Students may be required to do additional readings or research to prepare an impactful video. Top 15 videos will be selected and showcased at an appropriate venue to be determined. Students will also be invited to attend and present a poster at the same venue. Specific details are still under discussion.

**Topics:** TBD by the guest speakers. A general list of topics that would be relevant to this course is given below.

* History of semiconductors
* How are semiconductors manufactured and how are integrated circuits fabricated?
* Impact of semiconductors on daily lives
* Carbon footprint of semiconductor chips and how to reduce it
* Skills needed to succeed in semiconductor-related fields in industry
* Beyond silicon semiconductor materials and devices
* New types of computing models such as neuromorphic computing, brain-inspired computing, etc.
* Role of semiconductors in healthcare and bio-electronics
* Integration of photonics and electronics

**Office Hours:** The co-instructors will hold an OH for students wanting to discuss a specific guest lecture on as needed basis.