Blended Classroom
In this course, students learn through a blended model of (1) face-to-face instruction and (2) pre-class readings and assignments where students have control over instructional delivery method, time, and pace. Students are expected to come prepared to class to discuss and clarify concepts, to solve problem sets, and to collaborate with their classmates. In this model, your instructor is less of a lecturer and more of a facilitator.

Work Load
For every hour spent in class, you will spend approximately two to three hours outside of class studying.

3 hours in class per week  6-9 hours study time per week

Textbook

Course Goals
- To gain an understanding of semiconductor physics, and apply that knowledge to comprehend the characteristics, operation, and limitations of semiconductor devices.
- To be able to use derivations, calculations, and models to acquire a basic sense of how semiconductor devices work.
- To be able to design semiconductor-based devices to meet desired performance specifications.

To be able to recognize the mechanisms of new semiconductor devices as they materialize and evolve in the near future.

Course Objectives
Students who complete this course should be able to...

1. Describe the basic principles of quantum mechanics and solid state physics, and relate these principles to semiconductor band structure and carrier concentration using appropriate diagrams and equations.
2. Describe charge transport, and carrier generation and recombination processes in both equilibrium and non-equilibrium conditions using appropriate diagrams and equations.
3. Describe the band structure, charge distribution and electric field and potential distribution for semiconductor devices in both equilibrium and non-equilibrium conditions using appropriate diagrams and equations.
4. Relate internal characteristics of the device such as charge distribution and electric field to externally measurable properties such as current or capacitance.
5. Relate device parameters such as material choice, doping levels and dimensions to device performance, such as current-voltage relationship, including non-ideal effects.
6. Design a diode or transistor by determining dimensions, materials and doping parameters in order to meet a set of desired performance specifications.

7. Identify critical issues for semiconductor devices including the environmental and safety issues related to semiconductor manufacturing.

8. Describe current trends and future needs in the semiconductor industry and identify the educational preparation necessary to meet those needs.

9. Evaluate how a new development in semiconductor technology fits into the arc of semiconductor development and evaluate the worth and impact of that new technology.

Grading
- Lowest in-class problem set (per grading period) will be dropped
- Lowest pre-class assignment (per grading period) will be dropped

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<th>Activity</th>
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<th>12-week</th>
<th>End of Term</th>
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Pre-class assignments
1- Read textbook section(s). Additional resources (videos, animations, ...) will be provided.
2- Print the skeleton notes and fill it.
3- Check your understanding of the learning outcomes and take the online survey.
4- Start working on the problem set

In-class problem sets
- Your skeleton notes can be used.
- Problem sets include guided questions to emphasize your understanding. Problem sets will be graded for effort and completeness, based on the rubric below. Problem sets will have a strict in-class due date (at the end of class meeting).
- Late submission will not be accepted.

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Adapted from Mazur group JiTT rubric and Kathy Marrs' rubric
Take-home exams
- One per grading period.
- Due on the review day before an exam.
- Open book, open notes, and open web.
- May not be discussed with anyone else (in real time or virtually).

Special Topics Presentation
Advanced topic related to semiconductor physics or devices. A list of suggested topics will be provided.
- Format: 15-minute tutorial-style presentation
- Date: Week of April 18
- Evaluation: A rubric will be provided several weeks in advance

Plagiarism
Plagiarism is the act of presenting someone else's work or ideas as your own. Examples include (but are not limited to) copying homework from a colleague or from a solution manual, copying computer code, copying text or figures from the internet, or using another's data in a lab report. It is your responsibility to use proper documentation to always give credit where it is due. You must properly reference the work of others and ensure that your contribution is clear in your writing and presentations.

- When presenting information that you gathered from another source, be sure to paraphrase rather than directly copy text. If directly quoting, the text should be set apart with italics or quotation marks. Direct quotation of this sort is rarely necessary for technical writing, and paraphrasing is preferred.
- Paraphrasing is not just taking the same sentences and changing a few words. Paraphrasing is presenting the ideas of the referenced text in your own words.
- Always reference information that you gathered from another source, either using a footnote or an endnote, with a citation to the reference at the point in the text where the information is used; don't just put a list at the end of the document of "sources used."
- When referencing material that was found on-line, you should include the name of the organization that produced the web site, if known, and the access date. Be wary of on-line sources.
- You should provide a citation for every figure that you do not generate yourself in presentations and in written work. This can be done with small-font text on the edge of the figure, like a photo credit. For this purpose it is sufficient to provide the web address if no more is known about the figure than its web location. This is not common practice, unfortunately, but it is easy to do and a good professional habit.

Plagiarism is a dishonorable act. It diminishes both the perpetrator and the institution. Err on the side of too much documentation, and if you have any questions ask your instructor.

Calculators
Only calculators that have been approved for the Fundamentals of Engineering Exam (FE) are allowed. Acceptable calculators are listed at: http://ncees.org/exams/calculator-policy/