PHY 120 Introduction to Electronics

Summer 2024

Course Credits: 4
Contact Hours: 56 hours
Instructor: TBA
Email: TBA

COURSE OBJECTIVES

The objective of the course is to provide the fundamental knowledge for understanding the concepts of semiconductor devices and their applications in electronic circuits. This course build the knowledge base of the physics of semiconductors as related to the characteristics and design of solid-state electronic devices. It covers the fundamental principles of semiconductor physics, the operation and characteristics of various semiconductor devices including diodes, bipolar junction transistors (BJTs), and Junction Field Effect Transistors (JFETs), as well as their application circuits.

Upon completion of this course, students will be able to:

1. Understand the physics of semiconductors and their role in electronic devices;
2. Analyze the operation, characteristics, and application circuits of diodes and transistors;
3. Introduce the concepts of digital logic circuits, including the design and analysis of basic logic gates;
4. Investigate semiconductor power devices such as thyristors, triacs, and Insulated Gate Bipolar Transistors (IGBTs), and their applications in power electronics converters;
5. Analyze the operation and performance of AC-DC, DC-DC, and DC-AC converters in power electronics applications.

PREREQUISITES

N/A

GRADING

Grades will be determined by accumulating points, with 100 points being the maximum, as follows:

ITEM	POINTS
Quizzes	15 Points
Papers	20 Points
Midterm 1	15 Points
Midterm 2	15 Points
Final Exam	35 Points
Total	100 Points

Late submissions will be graded at the end of the course. Grades will be assigned according to the following rule:

$A \geq 90 > B \geq 80 > C \geq 70 > D \geq 60 > F$.

We reserve the right to make adjustments to the overall grading policy.

COURSE MATERIALS

Required Texts:

Fiore, J. M. (2018). ***Semiconductor Devices: Theory and Application,*** Dissidents.

Recommended (Optional) Texts or Other Materials:

None

COURSE TOPICS

MODULE	TASKS
Module 1	**Topics:** Topic 1: Semiconductor Fundamentals Topic 2: PN Junctions and Diodes Topic 3: Diode Applications **Assessments:** Quiz#1

Module 2	**Topics:** Topic 4: Bipolar Junction Transistors (BJTs) Topic 5: BJT Biasing Topic 6: Amplifier Concepts and Model Topic 7: BJT Small Signal Amplifiers **Assessments:** Quiz#2 Paper#1
Module 3	**Topics:** Topic 8: BJT Class A Power Amplifiers Topic 9: BJT Class B Power Amplifiers Topic 10: Junction Field Effect Transistors (JFETs) Topic 11: JFET Small Signal Amplfiers **Assessments:** Midterm#1
Module 4	**Topics:** Topic 12: Metal Oxide Semiconductor FETs (MOSFETs) Topic 13: MOSFET Small Signal Amplifiers Topic 14: Class D Power Amplifiers Topic 15: Insulated Gate Bipolar Transistors (IGBTs) Topic 16: Application of IGBTs **Assessments:** Paper#2 Midterm#2
Module 5	**Topics:** Topic 17: Decibels and Bode Plots Topic 18: Frequency Limits Topic 19: Emerging Device Technologies Topic 20: Conclusion and Reflection **Assessments:** Quiz#3 Final Exam

ATTENDANCE

1) Class attendance is required. Missing classes without permission will lead to decrease in overall grade.

Missing less than two classes: no penalty.

Missing more than two classes: 7% will be taken off from the overall grade.

If the instructor reports a student's frequent missing of class to the Soochow

University Academic Administration Office, the student might get a written warning and might be prohibited from attending final exam.

2) Participants in this course are expected to arrive in class promptly and adequately prepared. The primary objective of this course is to critically engage with the readings and the subject matter. Therefore, course participants are expected to have completed the reading prior to class and prepare thoughtful reflections/commentaries to share with fellow colleagues.

LEARNING REQUIREMENTS

1) Late assignments are not acceptable and are subjected to grade deductions.
2) Assignments submitted in the wrong format will be counted as not submitted.
3) Failure to submit or fulfill any required course component results in failure of the class.
4) Make-up for midterm and final exams only with valid excuses, as defined by the University.
5) In order to earn a Certificate of Completion, participants must thoughtfully complete all assignments by stated deadlines and earn an average quiz score of 50% or greater.

TECHNOLOGY POLICY

The use of electronic devices in class is distracting, both for the user and for the rest of the class. Only non-programmable calculators can be used in the tests and exam. Any attempts to use cell phones and other electronic communication devices will be seemed as cheating. Laptops are discouraged, unless you use them for activities DIRECTLY related to the course (eg., note taking, reading course documents).

ACEDEMIC INTEGRITY POLICY

Soochow University highly values the academic integrity and aims to promote the academic fairness, honesty and responsibility. Any academic dishonesty behaviors and any attempts to cheats and plagiarism will be reported to the university administration office. A written warning and the relevant penalties will be imposed. The record might be shown on the official university transcript.

DISABILITY ACCOMMODATION

Soochow University is committed to maintaining a barrier-free environment so that students with disabilities can fully access programs, courses, services, and activities at Soochow University. Students with disabilities who require accommodations for access to and/or participation in this course are welcome.

Note:

Please contact the University Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material.