ECE 3040 Syllabus

Microelectronic Circuits, Section C, 4-0-0-4

Fall 2026

Instructor Information

Instructor: Stephen E. Ralph

Email: seralph@gatech.edu

General Course Information

Description

Basic concepts of microelectronic materials, devices and circuits.

Microelectronics are ubiquitous in daily life and enable the creatin of mankind's ability to generate, process, transport and generally communicate with each other. The primary objectives of this class are:

- To understand the connection between the atomic and physical properties of semiconductor materials to device and circuit performance issues
- To understand the physical, electrical, and optical properties of semiconductor materials and their use in microelectronic circuits
- To understand basic semiconductor device operation principles as well as basic circuit building blocks

Course Learning Outcomes

1) Compute *and understand*
   carrier concentrations for *semiconductor materials*
2) Compute *and understand*
   conductivity and resistivity of *semiconductor materials*
3) Compute *and understand*
   terminal voltage and current characteristics for *pn junction diodes*

4) Compute *and understand*
   terminal voltage and current characteristics for *bipolar transistors*
5) Compute *and understand*
   terminal voltage and current characteristics for *MOS transistors*
   1) thru 5) under a variety of conditions
6) Analyze the AC and DC performance of
   single-stage *analog amplifiers* containing these circuit elements
7) Analyze the AC performance of
   multi-stage *analog amplifiers* containing these circuit elements

Required Course Materials

– Jaeger & Blalock, **Microelectronic Circuit Design (5th edition)**, McGraw Hill, 2010. (required)

– Pierret, **Semiconductor Device Fundamentals**, Addison Wesley, 1996. ISBN 0201543931 (required)

Available to purchase online and Georgia Tech Bookstore

Grading Policy:

- Exam 1, 20% week of 8 Sept
- Exam 2, 20% week of 6 Oct
- Exam 3, 20% week of 3 Nov
- Homework 10% 8 to 10 per term
- Final Exam 22%
- Unscheduled Quizzes 8%

Tentative letter grades will be provided for each exam allowing students to gauge their final grade expectations.

Homework Assignments

Assigned on weekly basis
Homework is due *before* class starts on the date assigned
Late Homework will not be accepted

- Format and guidelines
  - Use 8-1/2” × 11” (letter sized) paper only, one-sided, preferably on engineering ruled paper
  - Must be stapled
  - Write on first page:
    - Your name,
    - ID #
    - Homework number
    - Due date
    - Class session
  - All work leading to your answer must be shown
- Some problems will require handwritten solutions, not typed

Course Policies

Attendance and/or Participation

Academic Integrity

Expectations of students include

- Students are expected to act according to the highest ethical standards
- For information on Georgia Tech's Academic Honor Code, please visit http://www.catalog.gatech.edu/policies/honor-code/
- https://policylibrary.gatech.edu/student-life/academic-honor-code
- And code of conduct
- http://www.catalog.gatech.edu/rules/18/
- .

Core IMPACTS

NA

Accommodations for Students with Disabilities

Students who have registered with the Office of Disability Servies please see me as soon as possible to ensure we make appropriate accommodations.

Student-Faculty Expectations Agreement

Additional expectations include

- **Student-Faculty Expectations Agreement**
  - http://www.catalog.gatech.edu/rules/22/
  - You are required to read and follow the GT Honor code and Expectations agreement

Pre- &/or Co-Requisites

- **Prerequisites**
  - ECE 2040
  - Math 2551
  - Math 2552

Extra Credit Opportunities

NA

Collaboration, Group Work, and Use of Generative AI

- You are encouraged to form small study groups to discuss class materials, however homework should be done through individual effort: NO Plagiarism

Extensions, Late Assignments, & Re-Scheduled/Missed Exams

In general no late assignments or missed exams can be made up
However Institue approve absences will be accommodated

Inclement Weather and Digital Learning Days

Student Use of Mobile Devices in the Classroom

Additional Course Policies

- In the classroom

<u>Encouraged</u>

Questions in class
Keep up with reading
Arriving on time and prepared
If you are not 5 minutes early then you are late)

<u>Prohibited</u>

Recording of class
Use of Cell Phones
Food Hats (other than religious)
(https://emilypost.com/advice/hats-off-hat-etiquette-for-everyone)

<u>After class -</u>

- You are responsible for any materials discussed in the classroom regardless of whether you attend the class or not
    - If you miss class, speak to a classmate
- Early consistent effort with course material is key
- Visit the TA during the specified office hours
    - try to solve the problem or understand the concept first
    - write down a list of specific questions before you visit

Campus Resources for Students

Undergraduate Student Academic Success Resources:

Graduate Student Academic and Professional Success Resources:

Student Well-Being: