BME 20500 · Bioelectrical Circuits · Spring 2026

City College of New York — Grove School of Engineering
Credits: 4 · **Format:** Lecture + In-Class Laboratory
Locations/Times: - Mondays 2:00–4:45 PM — Steinman Hall C51 (lecture-heavy) - Wednesdays 1:00–2:50 PM — Steinman Hall C51 (lab-heavy)

Course at a glance
4 credits · Lecture + In-Class Lab · CCNY Grove School of Engineering · Spring 2026

People & Contact

- **Instructor:** Jacek Dmochowski · jdmochowski@ccny.cuny.edu
  - **Office Hours:** Mondays 11:00 AM–12:00 PM (ST 460) or by email appointment
- **Teaching Assistant:** Anthony Mathai · amathai000@citymail.cuny.edu
  - **Office Hours:** Mondays/Wednesday 9:30 AM - 10:30 AM (ST 460) or by email appointment

Course Description

Basic circuit theory and analysis with bioelectric emphasis: resistance, capacitance, inductance; complex algebra, sinusoids, and phasors; impedance/admittance; operational and instrumentation amplifiers. Hands-on labs use Digilent circuit kits and a circuit simulator.

Objectives

1. Instill the techniques needed to analyze and solve DC and AC electrical and bioelectrical circuits.
2. Apply mathematical tools (complex algebra, sinusoids, phasors) to interpret signals and circuit behavior in time and frequency domains.
3. Develop skill in building, testing, and interpreting DC and AC circuits in the lab.

Pre/Co-Requisites

Phys 20800 (C or better); Math 39100 (C or better).

Materials

- **Text (optional):** *Fundamentals of Electric Circuits* (Alexander & Sadiku, 4th ed., McGraw-Hill, ISBN 978-0077263195). Lecture slides are self-contained.
- **Tools:** Digilent circuit kit; access to circuit simulation software (details provided in class).

Assessment & Grading

Updated for Spring 2026.

- **In-class quizzes:** 10% (~10, short, closed-notes)
- **Homework (completion-based):** 10% (~6, credit for sincere, timely submission)
- **In-class labs:** 20% (~3 labs + final lab project)
- **Midterm exam:** 30% (in class; closed-notes)
- **Final exam:** 30% (in class; closed-notes; date per registrar finals schedule)

Attendance & Integrity

- Attend every lecture/lab; email the instructor in advance if illness or conflict arises.
- Homework may be discussed collaboratively, but submitted work must be your own.
- Cheating on any quiz or exam results in a zero and referral to the Department Chair.

> **Generative AI policy**
> Generative AI tools may be used for idea generation or checking, but all submitted work must reflect your own understanding; you are accountable for accuracy and academic integrity.

Course Modules (sequence & emphasis)

- **Module 1 (~1.5 wks):** Ohm's Law; KVL/KCL; voltage/current division; series/parallel resistor combinations.
- **Module 2 (~2 wks):** Nodal analysis (incl. supernodes); mesh analysis (incl. supermeshes).
- **Module 3 (~1.5 wks):** Linearity and superposition; source transformation; Thevenin & Norton equivalents.
- **Module 4 (~1 wk):** Ideal op-amps—summer, inverter, difference amp, instrumentation amp.
- **Module 5 (~2 wks):** Capacitors & inductors; first-order RC and RL transients.
- **Module 6 (~2 wks):** Second-order RLC circuits; damping behavior.
- **Module 7 (~2 wks):** Complex numbers & phasors; representing elements as phasors; impedance/admittance.
- **Module 8 (~1 wk):** Steady-state AC analysis; intro to frequency response, filters, resonance.

Assessment Mapping to Program Outcomes

1. Knowledge of basic electric/bioelectric circuits — quizzes, homework, midterm, final.
2. Use of mathematical tools for material/tissue electrical response — quizzes, homework, midterm, final.
3. Understanding of DC/AC circuits — quizzes, homework, midterm, final.
4. Ability to build/test DC/AC circuits — labs.

Brightspace is the official course home. We may also utilize Github for submission of work and material sharing (TBA).