

2019

## BME 20500 Bioelectrical Circuits

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# BME20500: Bioelectrical Circuits

## Spring 2019

Course code: BME 20500 - EFG(63711), 4 credits

**Course Description:** This course covers basic circuit theory and analysis with reference to bioelectric concepts. We will cover resistance, capacitance and inductance; complex algebra, sinusoids and phasors; impedance and admittance; Operational and instrumentation amplifiers. Includes hands-on laboratory.

**Course Objectives:**

1. To introduce the students to electrical and bioelectrical concepts.
2. To introduce the students to the use of mathematical tools such as complex algebra, sinusoids and phasors to understand signals and the behavior of electrical circuits in the time and frequency domains.
3. To develop the student's ability to effectively perform basic DC and AC electric circuit testing in the laboratory.

**Lectures:** Monday 2:00-4:40PM Shepard S-304  
Wednesday 1:00-2:50PM Shepard S-210

**Labs:** Monday 3:00-4:40PM ST-B41, 3-4 sections, starting in late February

**Instructor:** Jacek Dmochowski  
jdmochowski@ccny.cuny.edu  
Biomedical Engineering, ST-460  
212.650.8626

**Teaching Assistants:** (1) Christian Fong  
(2) Forouzan Farahani

**Lab Technician:** Zhiyong Qiu (ST-430)

**Office Hours:** Dmochowski: WED 4:00-5:00pm and by email appointment  
TA location and hours TBA

**Pre/Co-Requisites:** Phys 20800 (min. C grade); Math 39100 (min. C grade)

**Books:** **Fundamentals of electrical Circuits.** (OPTIONAL – slides on blackboard are self-contained)  
*Charles Alexander and Matthew Sadiku*  
**ISBN-10:** 0077263197  
**ISBN-13:** 978-0077263195  
**Publisher:** McGraw-Hill Science/Engineering/Math; 4th edition (August 27, 2008)

**Software:** The use of the MATLAB software package is installed in our computer lab B-2.

**Topics Covered:**

- Basic electrical concepts

# *BME20500: Bioelectrical Circuits*

## *Spring 2019*

- Series and parallel direct current circuits
- DC circuit analysis, equivalent circuits & network theorems
- Capacitors and capacitance
- Inductors and inductance
- Sinusoidal alternating current (AC) and voltage
- Complex algebra and phasors
- AC circuit analysis, impedance, admittance
- Mesh, loop & nodal analysis of DC & AC circuits
- Operational amplifiers circuits
- Intro to Bioinstrumentation and instrumentation amplifiers
- Intro to Frequency response, filters and resonance

### Performance Criteria: [Program Outcome codes]

1. Demonstrates knowledge of basic electric and bioelectric circuits [a, e, k]
2. Demonstrates the ability to use mathematical tools to study the electrical response of materials and tissues. [a,i,j]
3. Demonstrates understanding of DC and AC electric circuits. [a, e, k]
4. Demonstrates the ability to understand, build and test basic DC and AC electrical circuits. [a, e, k]

### Assessment Tools:

Performance Criterion 1: Evaluation of midterm and final exams.

Performance Criterion 2: Evaluation of homework.

Performance Criterion 3: Evaluation of laboratory reports.

### Final Grade:

Homework	20%
Lab reports	20%
Midterm exam	30%
Final exam	30%

### Rules:

Students are expected to attend every lecture. Please turn off all cell phones before class begins. The instructor reserves the right to wake up any student that has fallen asleep during class.

### Academic integrity:

*Homework assignments:* students may discuss homework but the turned-in work must be that of the individual student only, i.e., DO YOUR OWN WORK. If the work of two students is very similar, they will be called to meet with the instructor to address the issue, and will be given a score of 0 on the assignment.

*Exams:* **Students found copying (or letting someone copy) or found cheating in any other way will be given a score of 0.** Repeated offenses will lead to investigation and critical evaluation in accordance with school authorities.