

Bioelectrical Systems

EEE 4260C Section 2A72, 22D1

Class Periods: Tuesdays, P4 (10:40AM-11:30AM), Thursdays P4-P5 (10:40AM-12:35PM),

Lab Periods: Section 22D1, M E1-E3; Section 2A72 R 09-11

Location: Lecture: LAR 239, Lab: NEB 213B

Academic Term: Fall 2018

1. **Catalog Description** – (4 credits) This course covers the theoretical and quantitative perspective of bioelectrical signals reflecting the activity of the brain and the muscles, and the heart. Bases of modeling, measuring, processing and analyzing bioelectrical signals are discussed, as well as common clinical applications
2. **Pre-requisites** – EEL 3008 and EEL 3112 or permission from the instructor
3. **Course Objectives** – The student will learn the physiological basis of bioelectrical signals; will be able to quantitatively describe and model physiologic systems; and will be able to process and analyze measurements from living systems.
Lab Objectives:
 - Illustrate, instantiate, extend material covered in lecture
 - Teach practical hands-on skills/knowledge
 - Stimulate interest/satisfy curiosity in the course
 - Teach experimental methods
4. Contribution of course to meeting the professional component (ABET only – undergraduate courses) – 4 hours of engineering science
5. Relationship of course to program outcomes: Skills student will develop in this course (ABET only undergraduate courses) – a, e, h, k
6. **Instructor** – Dr. Karim Oweiss
 - a. Office location: 457 NEB
 - b. Telephone: 352-294-1898
 - c. E-mail address: koweiss@ufl.edu
 - d. Class Web site: <https://ufl.instructure.com/courses>
 - e. Office hours: Tu 1:30-2:30 PM Th 1:30-2:30PM
7. **Teaching Assistants** – May Mansy, Rebeca Castro, and Brandon Parks
 - a. Lab location: NEB 213B
 - b. E-mail address: maymansy@ufl.edu, b.parks@ufl.edu, rcaastro4@ufl.edu
 - c. Office hours: May Mansy: Tuesdays 9:00-10:30AM
Brandon Parks: Wednesdays 3:00-4:30 PM
8. Class/laboratory schedule - 3 class periods each week consisting of 50 minutes each and 1 laboratory period every two weeks consisting of 150 minutes.
9. Material and Supply Fees - \$40.00

10. **Textbooks and Software Required** – Free e-book access at UF Library

- a. Title: **Bioelectricity: A Quantitative Approach**, by R. Plonsey and R. Barr, 3rd Edition, ISBN number: 0387488642
- b. Software:
 1. **Matlab** with Simulink Student Edition
 2. **Top Hat**
 - a. We will be using the Top Hat (www.tophat.com) classroom response system in class. You will be able to submit answers to in-class questions using Apple or Android smartphones and tablets, laptops, or through text message.
 - b. You can visit the Top Hat Overview (<https://success.tophat.com/s/article/Student-Top-Hat-Overview-and-Getting-Started-Guide>) within the Top Hat Success Center which outlines how you will register for a Top Hat account, as well as providing a brief overview to get you up and running on the system.
 - c. An email invitation will be sent to you by email, but if don't receive this email, you can register by simply visiting our course website: Unique Course URL
Note: our Course Join Code is **949647**
 - d. Top Hat may require a paid subscription, and a full breakdown of all subscription options available can be found here: www.tophat.com/pricing.
 - e. Should you require assistance with Top Hat at any time, due to the fact that they require specific user information to troubleshoot these issues, please contact their Support Team directly by way of email (support@tophat.com), the in app support button, or by calling 1-888-663-5491.

11. **Recommended Reading** – Supplemental material to be assigned and provided via course website

12. **Course Outline** –

Week 1: Introduction, Elements of Bioelectricity
Week 2: Vector Calculus Review & the Conservation Principle, HW1 due
Week 3: Lumped- and Distributed Parameter Models of Cells, HW2 due
Week 4: Biosignals, Bioelectric Potentials, and Noise, HW3 due
Week 5: Pumps and Channels, HW4 due
Week 6: H-H Model and Action Potentials, Exam 1
Week 7: Impulse Propagation, HW5 due
Week 8: Transmembrane and Field Stimulation, HW6 due
Week 9: Extracellular Fields, HW7 due
Week 10: Sensory Technology, HW8 due
Week 11: The Neuromuscular Junction and Skeletal Muscle, Exam 2
Week 12: Functional Electrical Stimulation, HW9 due
Week 13: Electrocardiography, HW 10 due
Week 14: Review
Final Exam

Laboratory Topics and dates

- Week 2: Lab Orientation (08/27)
- Week 3: Body Temperature (MATLAB/C) (09/04)*

- Week 5: Extracellular Spikes (09/17)
- Week 7: EEG Alpha Waves and Power Bands (10/01)
- Week 9: ECG Filters, Heart rate monitoring and variability (10/15)
- Week 11: EMG Acquisition and Display & Agonist and antagonist muscles (10/29)
- Week 13: Electrode Characterization/Bioelectric feedback (11/12)

* since 09/03 is a holiday, the Monday section lab will meet on the following Monday

13. **Attendance and Expectations** - **Attendance is required** for all lectures unless otherwise noted by a course website announcement. **YOU ARE EXPECTED TO ATTEND > 85% OF THE LECTURES TO PASS THE CLASS.** Cell phones and other electronic devices are to be silenced and used only upon instruction. No text messaging during class or exams.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found in the online catalog at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

14. Grading –

Homework - 15% Attendance - 5% Midterm 1 - 15% Midterm 2 - 15% Lab - 25% Final exam - 25%

Students are permitted to work together on homework but the work submitted **must be individual work.**

Exam	Grade	Date
Midterm 1	15%	09/27/2018 (in class)
Midterm 2	15%	11/8/2018 (in class)
Final Exam	25%	12/10/ 2018 (7:30a- 9:30a)

15. Grading Scale –

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
92 >	90-91	87-89	83-86	80-82	77-79	73-76	70-72	67-69	63-66	60-62	< 60

“A C- will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better).”

Note: a C- average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>

16. **Homework and Make-Up Exam Policy** – Late homework will receive a 20% deducted per day unless prior arrangements were made with the instructor.

If you have a **University-approved excuse and arrange for it in advance, or in case of documented emergency**, a make-up exam will be allowed and arrangements can be made for making up missed work. University attendance policies can be found at:

<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

Otherwise, make-up exams will be considered only in extraordinary cases, and must be taken before the scheduled exam. The student must submit a written petition to the instructor two weeks prior to the scheduled exam and the instructor must approve the petition.

17. **Honesty Policy** – UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.
18. **Accommodation for Students with Disabilities** – Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.
19. **Software Use** – All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.
20. **Course Evaluation** – Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at: <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at: <https://evaluations.ufl.edu/results>.

21. **Campus resources**

Health and Wellness

U Matter, We Care:

If you or a friend is in distress, please contact umatter@ufl.edu or 352 392-1575 so that a team member can reach out to the student.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS)
Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>.

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. <https://lss.at.ufl.edu/help.shtml>.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>.

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <https://teachingcenter.ufl.edu/>.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. <https://writing.ufl.edu/writing-studio/>.

Student Complaints Campus: https://www.dso.ufl.edu/documents/UF_Complaints_policy.pdf.

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process>.