**EEE 4260C  Bioelectrical Systems**

1. **Catalog Description** – (4 credits) This course covers the theoretical and quantitative perspective of bioelectrical signals reflecting the activity of the brain, 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

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 3:00P-4:00 PM Th 4:00-5:00PM

7. **Teaching Assistant** – Islam Badreldin
   a. Office location: NEB 213B
   b. E-mail address: ibadreldin@ufl.edu
   c. Office hours: TBD

8. **Meeting Times & Location** – Lecture: LAR 330; Lab: NEB 213B

9. **Class/laboratory schedule** - 3 class periods each week consisting of 50 minutes each and 1 laboratory period every two weeks consisting of 150 minutes.

10. **Material and Supply Fees** - $40.00

11. **Textbooks and Software Required** – Free e-book access at UF Library
   b. Software: Matlab with Simulink Student Edition
12. Recommended Reading – Supplemental material to be assigned and provided via course website

13. Course Outline –
   Week 1: Introduction, Elements of Bioelectricity & Conservation Principles
   Week 2: Conservation of Charge, HW1 due
   Week 3: Biosignals and Noise, HW2 due
   Week 4: Bioelectric Potentials, HW3 due
   Week 5: Pumps and Channels, HW4 due
   Week 6: H-H Model and Action Potentials, Test 1
   Week 7: Impulse Propagation, HW5 due
   Week 8: Transmembrane and Field Stimulation, HW6 due
   Week 9: Extracellular Fields, HW7 due
   Week 10: Electrocardiography, HW8 due
   Week 11: The Neuromuscular Junction, Test 2
   Week 12: Skeletal Muscle, HW9 due
   Week 13: Functional Electrical Stimulation, HW10 due
   Week 14: BioFeedback Control, HW 11 due
   Week 15: Review
   Final Exam

Laboratory Topics
• Body Temperature (MATLAB/C)
• Extracellular Spikes
• EEG Alpha Waves and Power Bands
• ECG Filters, Heart rate monitoring and variability
• EMG Acquisition and Display & Agonist and antagonist muscles
• Bioelectric feedback control

14. Attendance and Expectations - Attendance is required for all lectures unless otherwise noted by a course website announcement. Attendance is part of the final grade. Cell phones and other electronic devices are to be silenced. No text messaging during class or exams.

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

   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

15. Grading –
   Homework - 20%
   Exam 1 - 15%
   Exam 2 - 15%
   Final exam - 30%
Lab - 20%

16. **Grading Scale** –

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>92+</td>
</tr>
<tr>
<td>A-</td>
<td>90-91</td>
</tr>
<tr>
<td>B+</td>
<td>87-89</td>
</tr>
<tr>
<td>B</td>
<td>83-86</td>
</tr>
<tr>
<td>B-</td>
<td>80-82</td>
</tr>
<tr>
<td>C+</td>
<td>77-79</td>
</tr>
<tr>
<td>C</td>
<td>73-76</td>
</tr>
<tr>
<td>C-</td>
<td>70-72</td>
</tr>
<tr>
<td>D+</td>
<td>67-69</td>
</tr>
<tr>
<td>D</td>
<td>63-66</td>
</tr>
<tr>
<td>D-</td>
<td>60-62</td>
</tr>
<tr>
<td>E</td>
<td>&lt; 60</td>
</tr>
</tbody>
</table>

“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](https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx)

17. **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](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.

18. **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/scr/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.

19. **Accommodation for Students with Disabilities** – Students requesting classroom accommodation must first register with the Dean of Students Office. That office will provide documentation to the student who must then provide this documentation to the course instructor when requesting accommodation.

20. **UF Counseling Services** – Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
   - UF Counseling & Wellness Center, psychological and psychiatric services, 3190 Radio Rd, 392-1575, online: [http://www.counseling.ufl.edu/cwc/Default.aspx](http://www.counseling.ufl.edu/cwc/Default.aspx),
   - Career Resource Center, Reitz Union, career and job search services, 392-1601.
   - University Police Department, 392-1111 or 911 for emergencies
21. **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.

22. **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](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](https://evaluations.ufl.edu/results).