Course Outline

Instructor Eran Ukwatta, Office: CB 6202, Phone: 613-520-2600 ext. 2963, Email: ukwatta@sce.carleton.ca

Office hours Thursday from 12 pm - 1 pm
Appointments may be possible also by email, make sure to specify three different time slots in which you are available for an appointment.

Content
- Introduction to bioinstrumentation
- Origin of biopotentials
- Biopotentials electrodes
- Biopotentials amplifiers
- Measurement of blood pressure and sound
- Measurement of blood flow and volume
- Measurement of respiratory system
- Physiologic data acquisition and digitization
- Biomedical signal processing
- Medical imaging systems

Learning Outcomes: By the end of this course students will be able to:
- Visualize the anatomy and electrophysiology of humans and animals
- Describe the origin and characteristics of common biological signals
- Assess the performance of a biopotential acquisition system in terms of noise and interference
- Appraise biomedical measurement methods for blood pressure, flow, and oxygenation
- Choose appropriate signal conditioning and processing methods to analyze biomedical signals
- Build a biomedical system to measure and correlate common biological signals
- Describe high-level operation of medical imaging systems

Prerequisites
- SYSC 3203 Bioelectrical Systems
- SYSC 3610 Biomedical Systems Modelling and Control
- Fourth-year status in Biomedical and Electrical Engineering or Biomedical and Mechanical Engineering


Reference Textbooks
Course Delivery

Website  Accessed through https://carleton.ca/culearn/

Lectures Location: SA 303  Time: Wed & Fri: 8:35 am - 9:55 am

Laboratories  Five mandatory labs, 3 hours each, held biweekly starting from Sept 18, 2017
Lab: Minto Centre MC 6070  L2E Mon Time: 2:35 pm- 5:25 pm  L1E Thurs Time: 2:35 pm - 5:25 pm

Marking Scheme
To pass the course, a student must pass the final examination (D- or better). For these students, the marks will be calculated as follows:

<table>
<thead>
<tr>
<th>Item</th>
<th>Weight (%)</th>
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<tbody>
<tr>
<td>5 Laboratories</td>
<td>15</td>
</tr>
<tr>
<td>Design project</td>
<td>10</td>
</tr>
<tr>
<td>2 Quizzes</td>
<td>5</td>
</tr>
<tr>
<td>Midterm 1</td>
<td>10</td>
</tr>
<tr>
<td>Midterm 2</td>
<td>15</td>
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<tr>
<td>Final exam</td>
<td>45</td>
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Design Project  This involves information-rich biomedical engineering research and design. Introduction, reinforcement, mastery and assessment of a) engineering skills including software, hardware and systems level design, and (b) communication skills practiced through documenting the design process and writing up a report. The department requires a deposit of $50 for each design project kit, which includes a breadboard, active and passive components. Return of all the borrowed items are necessary to refund the full deposit.

Quizzes  Two in-class quizzes. Dates: September 29 and November 3

Exams  Two midterm exams during class time, and one final exam. All exams are closed book.

Midterm dates:  October 13 (during class)
               November 17 (during class)

Midterm exam papers will be returned to the students. Reevaluations may be considered based on specific requests, but will be performed without the student’s presence. Students who are unable to write the exam because of illness or other circumstances beyond their control must provide evidence. In the case of illness, this requires a medical certificate dated no later than one working day after the exam. The certificate must specify the date of the onset of the illness, the (expected) date of recovery, and the extent to which the student was/is incapacitated during the time of the examination. If this information is provided to the instructor no later than five working days after the exam, the final exam mark will be used as the midterm exam mark; otherwise, the mark for the missed exam will be 0.

Final Exam is for the evaluation purposes only and will not be returned to the student. The final exam will be held during the University’s December examination period. Only students who
completed all the labs and design project are eligible to write the final examination or, where circumstances warrant, apply to the Registrar’s Office for deferral of the final exam. Completed means any mark greater than 0 (note that in case of confirmed cases of plagiarism, the usual penalty is to be awarded zero).

**TA office hours** You may see the TA during the last hour of lab sessions or email him your availability in three different time slots to setup an appointment.

**Note!** You will receive all course emails on your official Carleton email. The instructor and TA will respond only to emails sent from your official Carleton email.

**Academic Integrity**

From the Academic Integrity Policy (found [http://www.carleton.ca/sasc/academic-integrity/](http://www.carleton.ca/sasc/academic-integrity/))

“Carleton University is a community of scholars dedicated to teaching, learning and research. Sound scholarship rests on a commitment to a code of academic integrity that stresses principles of honesty, trust, respect, fairness and responsibility. The University demands integrity of scholarship from all of its members including students. The quality and integrity of academic work is paramount in achieving student success.

The University states unequivocally that it demands academic integrity from all its members. Academic dishonesty, in whatever form is ultimately destructive to the values of the University. Furthermore, it is unfair and discouraging to those students who pursue their studies honestly. The integrity of university academic life and the degrees conferred by the university is dependent upon the honesty and soundness of scholarship. Conduct by any person that adversely affects this process is a serious matter. Students who violate the principles of academic integrity through dishonest practices undermine the value of the Carleton degree. Dishonesty in scholarly activity cannot be tolerated. Any student who violates the standards of academic integrity will be subject to appropriate sanctions.”

Students should be aware of their obligations with regards to Academic Integrity (refer to the Academic Integrity Policy for additional details).

**Copyright of course material**

“Classroom teaching and learning activities, including lectures, discussions, presentations, etc., by both instructors and students, are copy protected and remain the intellectual property of their respective author(s). All course materials, including PowerPoint presentations, outlines, and other materials, are also protected by copyright and remain the intellectual property of their respective author(s). Students registered in the course may take notes and make copies of course materials for their own educational use only. Students are not permitted to reproduce or distribute lecture notes and course materials publicly for commercial or non-commercial purposes without express written consent from the copyright holder(s).” *Statement from the office of the Provost and Vice-President (Academic).*

**Guide to Academic Accommodations**

**Pregnancy obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more
Religious obligation: write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details visit the Equity Services website: http://www.carleton.ca/equity/

Academic Accommodations for Students with Disabilities: The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or pmc@carleton.ca for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). Requests made within two weeks will be reviewed on a case-by-case basis. After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the PMC website (www.carleton.ca PMC) for the deadline to request accommodations for the formally-scheduled exam (if applicable).

You can visit the Equity Services website to view the policies and to obtain more detailed information on academic accommodation at http://www.carleton.ca/equity/