

BIOMEDICAL INSTRUMENTATION

BME 5500 Section 3A21

Class Periods: MWF Period 8 (3:00 – 3:50 PM)

Location: Synchronous Online (100%) via Zoom

Academic Term: Fall 2020

Instructor:

Dr. Aysegul Gunduz | agunduz@ufl.edu | Please send emails through Canvas.

Student Hours (100% Online): Tuesday 03:00-4:00PM

Thursday 03:00-4:00PM

Teaching Assistant:

Jorge Santini | jorge.santini@ufl.edu | Please send emails through Canvas.

Student Hours (100% Online): TBD

Course Description

3 credit course – Covers engineering and medical bases of application, measurement and processing of signals to and from living systems. Biomedical transducers for measurements of movement, biopotentials, pressure, flow, concentration and temperature are discussed.

Course Goal:

This course will introduce the student to the bases of biomedical instrumentation and the acquisition of physiological signals. Students will gain a fundamental understanding of amplifiers and the various roles they play in all biomedical measurement devices.

Learning Objectives:

Upon completion of the course, students expected to:

- Identify the design blocks of a biomedical instrument/measuring device
- Analyze the functionality and performance of the used amplifier
- Characterize sensors
- Describe instrumentation regulation and safety considerations

Materials and Supply Fees: None

Required Textbooks and Software

- Webster, John G. Medical Instrumentation: Application and Design, 4th Edition, John Wiley & Sons.
- Google Chrome with HonorLock Extension for exams.

Recommended Material

Resources and supplemental reading will be provided by the instructor on Canvas (Files/Resources).

Course Schedule

Week#	Week of	Topic
Module 1		
1	8/31	Basics of medical instrumentation & circuits primer (Ch.1)
2	9/7	Operational amplifiers I – basic configurations (Ch.3)

3	9/14	Operational amplifiers II – differential amplifier (Ch.3)
4	9/21	Passive filters (Ch.3)
5	9/28	Active filters (Ch.3)
Module 2		
6	10/5	Basic sensors (Ch. 2)
7	10/12	Biopotential electrodes (Ch.5)
8	10/19	EKG & the cardiac vector (Ch.6)
9	10/26	Instrumentation amplifier (Ch.3)
Module 3		
10	11/2	Common mode rejection ratio and gain (Ch.6)
11	11/9	Interference mitigation I (Ch.6)
12	11/16	Interference mitigation II (Ch.6)
13	11/23	Physiological signals and their measurements (Ch.7/8)
14	11/30	Safety codes (Ch. 14)
15	12/7	Overflow

Attendance Policy:

Attendance: Attendance of all lectures is mandatory and the responsibility of the student. According to University policy, students must attend 75% of the lectures to qualify for a passing grade.

Absence: Excused absences must be consistent with university policies in the undergraduate catalog and require appropriate documentation (<https://www.eng.ufl.edu/wp-content/uploads/sites/5/2014/06/UF-COLLEGE-OF-ENGINEERING-EXCUSED-ABSENCE-REQUEST.pdf>).

Students are responsible to make up the material or activities covered in their absence. After due warning, the instructor has the right to prohibit further attendance and subsequently assign a failing grade for excessive absences. More information can be found in the undergraduate catalog (<https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>).

Punctuality: Students are expected to login in on time for class. Classes will start on time.

Discussions:

Canvas discussions are highly encouraged for class material, and assignments. I will create discussion threads for every question I receive so that everyone benefits. These discussions also point out topics that might need a revisit (further examples) in class.

Class expectations:

Class format: Class will follow a classic lecture format using a tablet to replace the board and occasionally PowerPoint slides. Lecture notes taken during the online class and any powerpoint slides will be uploaded to canvas at the end of the lectures.

Make-up Policy:

Exams: Makeup is allowed for only **one** exam and **under the following conditions:** 1) The student has informed the instructor of the absence at least 24hrs before the exam. 2) the student has provided adequate documentation for the excused absence (see [Absence section](#)). 3) the make-up exam must be conducted within one week of the original exam date.

Communication Policy:

Communication is a cornerstone of the success of the student's learning experience. Hence, to ensure a message doesn't get lost and to receive a timely response all correspondence to/from the instructor and TA should be made via Canvas messages. All important dates, tips, and announcements will be made through Canvas. Students are fully responsible for every piece of information on Canvas and must check it regularly for updates (turn on notifications).

Class Material:

Lectures: Lecture notes (pdfs) will be uploaded to Canvas by the instructor before the class meeting. Students are strongly encouraged to read the notes before arriving to class and should take their own notes during the lecture to complement the pdf. The notes taken during the online class will be uploaded to canvas at the end of a lecture.

All material posted to Canvas is exam and homework relevant unless otherwise noted by the instructor.

Homework: Homework will be assigned on Canvas and are always due at midnight. Get an early start on your homework to avoid late submission. Late Homework, within 24 hours of the deadline, will be allowed 80% of the maximum grade. Homework received 24 hours past the deadline will not receive a grade.

Evaluation of Grades:

Assignments are educational tools to evaluate and assess the learning objectives listed above. This *happens* to result in a grade. As such, asking questions and seeking help early on can significantly improve the outcome. Evaluation is designed to allow for frequent low-stake assignments rather than few high-stake assignments to reduce pre-exam anxiety and stressful exam hours.

Assignment	% of Final Grade	Objective
Homework Sets - Canvas submission	35.3%	Practice newly introduced concepts. Solve problems that reinforcement the understanding of the theory Solve problems that extend the taught concepts
Attendance & Participation (A&P) - Canvas submission	20%	Monitoring of class attendance & engagement Real-time evaluation of the apprehensions/comprehension of the material
Test I (Module 1)	14.9%	Assess student comprehension of the theory and concepts introduced in module 1
Test II (Module 2)	14.9%	Assess student comprehension of the theory and concepts introduced in module 2
Test III (Module 3)	14.9%	Assess student comprehension of the theory and concepts introduced in module 3
Total	100%	Overall class performance

Grading Policy

Grade	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E
%	≥95	94-90	89-87	86-83	82-80	79-77	76-73	72-70	69-67	66-63	62-60	< 60

Percent grades will always be rounded to the next point (92.23 will become 93%).

<https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/>

Class Ethics:

- Team-work and discussions during online exams are strictly prohibited.

Any violations of the above, or attempts thereof, will be immediately reported to the Dean of Students as a UF Student Honor Code violation

Students Requiring Accommodations

No one is perfect and we all have something we struggle with. If you are aware of a particular difficulty, please do the following:

1. Register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation.
2. Email agunduz@bme.ufl.edu your accommodation letter, along with any additional information and set up an appointment to discuss your needs with the instructor.

***** This should be done as early as possible in the semester *****

Should you, however, feel the need for accommodation at any other point in the semester, please do not hesitate to contact the instructor immediately. This can manifest in various forms so inform the instructor of any sudden changes you experience regarding the class (see Communication Policy).

Course Evaluation

Course evaluations are mandatory. Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at <https://gatorevals.ua.ufl.edu/students/>. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via <https://ufl.bluera.com/ufl/>. Summaries of course evaluation results are available to students at <https://gatorevals.ua.ufl.edu/public-results/>.

University 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 (<https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-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.

Commitment to a Safe and Inclusive Learning Environment

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind (implicit or explicit), please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu

- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@eng.ufl.edu

Privacy Related Issues For online course with recorded materials: Our class sessions will be audio visually recorded for students in the class to refer back and for enrolled students who are unable to attend live. Students who participate with their camera engaged or utilize a profile image are agreeing to have their video or image recorded. If you are unwilling to consent to have your profile or video image recorded, be sure to keep your camera off and do not use a profile image. Likewise, students who un-mute during class and participate orally are agreeing to have their voices recorded. If you are not willing to consent to have your voice recorded during class, you will need to keep your mute button activated and communicate exclusively using the "chat" feature, which allows students to type questions and comments live. The chat will not be recorded or shared. As in all courses, unauthorized recording and unauthorized sharing of recorded materials is prohibited.

Software Use

All faculty, staff, and students 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.

Student Privacy

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <https://registrar.ufl.edu/ferpa.html>

Health and Rest:

[Your academic success relies on your physical, mental and emotional health. Take care of your health by dedicating at least \(bare minimum\) 1 hour per week to exercise and 6-8 hours per day to sleep. Please speak to the instructor if you feel drained or exhausted or reach out to the many resources available on campus \(see next section\).](#)

Campus Resources:

Health and Wellness

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

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 Discrimination, Harassment, Assault, or Violence

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the [Office of Title IX Compliance](#), located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

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>.