

BME362 3 credits , Spring 2021

Lec.: Th 5-7:45PM Beaupre 105 and WebEx

BME363 1 credit , Spring 2021

Labs: Tu, Th 11-1:45PM Fascitelli 110

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week	date	lecture topics	Reference
1	1/28	introduction to biomedical instrumentation design basic electronics: diodes transistors	Ch. 1, 2
2	2/4	i-v characteristics and bias of transistors transistor circuits noninvasive measurement of arterial oxygen saturation	Ch. 2 notes/handout
3	2/11	pulse oximetry, photoplethysmogram (PPG) circuit applications of PPG electrical safety: current levels for various electrical hazards	notes/handout
4	2/18	circuit breaker, ground fault circuit interrupter; CITI training FDA regulations on medical devices, IRB, IDE, 510k, PMA engineering standards, IEC 60601 Medical electrical equipment	notes/handout handout handout
5	2/25	Exam 1 AAMI EC11 and other standard examples, CITI certificate due	Ch. 3 notes/handout
6	3/4	review of electrocardiogram (ECG) and ECG amplifier amplifiers for biopotentials design with embedded and handheld systems	Ch. 3 Ch. 3 Ch. 6
7	3/11	introduction to Android Studio IDE and SDK tools Java programming for Android devices performance evaluation of QRS detection	notes/handout
8	3/18	receiver operating characteristic (ROC) analysis false positive and false negative, sensitivity and specificity introduction to data communication using packet switching	notes/handout notes/handout handout
9	3/25	Exam 2 TCP/IP and Bluetooth protocols	handout
10	4/1	flow measurement: electromagnetic flow probe, ultrasonic flow probe mean flow measurement by indicator dilution method Fick principle for measuring cardiac output	notes/handout
11	4/8	pacemaker, biventricular pacing, cardioverter defibrillator left ventricular assist device (LVAD), artificial heart neuronal action potentials and ionic currents	handout notes/handout
12	4/15	voltage clamp, current clamp, dynamic clamp, & patch clamp the Universal Clamp project DNA sequencing technologies	notes/handout
13	4/22	microarray technologies microfluidic systems, polydimethylsiloxane (PDMS) devices biochips for point-of-care diagnostics	notes/handout
14	4/29	Distribute Exam #3 (return by 5/6)	

Text 1: Medical Instrumentation: Application and Design, John G. Webster (Ed.), Any edition.

****NOTE**** This is the same textbook used in BME 360.

Text 2: Diodes and Transistors - University of California, Berkeley, Dept. EECS, 2007.

Grading: Exam #1 (33%), Exam # 2 (33%), Exam # 3 (34%). Open book, notes.

Graduate TA: John McLinden john_mclinden@my.uri.edu

Catalog Description

BME 362: Fundamentals of diagnostic and therapeutic devices, engineering standards, and regulations for medical devices; basic electronics, safety, noise rejection, and biomedical signal processing; design of embedded and handheld systems. (Lec. 3); Pre: (BME 360 and BME 361) or permission of instructor.

BME 363: Hands-on applications of electronics, embedded and handheld devices to biomedical instrumentation systems including electrocardiogram, photoplethysmogram, motion sensor, and electronic stethoscope. (Lab. 3) Prerequisites: Concurrent enrollment in BME 362 or permission of instructor.

ABET Student Outcomes

BME 362:

A: an ability to apply knowledge of mathematics, science, and engineering

B: an ability to design and conduct experiments, as well as to analyze and interpret data

F*: an understanding of professional and ethical responsibility (* assessment data required)

J: a knowledge of contemporary issues

BME 363:

B: an ability to design and conduct experiments, as well as to analyze and interpret data

C*: an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

D*: an ability to function on multidisciplinary teams

G*: an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

(* indicates that assessment data will be collected.)

Laboratories

1. PIC18F4525 Breadboard Upgrade
2. Intro to Android Studio / Waveform Display
3. Photoplethysmogram (PPG) Circuit
4. BMI Calculation
5. Mode Change Button on Android
6. Beat-to-Beat Heart Rate from PPG
7. Real-time Video Processing

Classroom Protocol

Our course webpages are at <https://www.ele.uri.edu/courses/bme362/> and <https://www.ele.uri.edu/courses/bme363/> which will be constantly updated for handouts, announcements, and sample exams.

Accommodations for Special Needs

Any student with a documented disability is welcome to contact me as early in the semester as possible so that we may arrange reasonable accommodations. As part of this process, please be in touch with Disability Services for Students Office at 302 Memorial Union, Phone 401-874-2098.