King Fahd University of Petroleum & Minerals
College of Chemicals and Materials, Bioengineering Department
BIOE 311: Bioinstrumentation (3-0-3)
Syllabus - Term 25A

Catalog Course Description: Basic concepts of bioinstrumentation systems. Basic sensors and principles. Static and dynamic characteristics of measurement systems. Biomedical signal detection, amplification, and filtering. Biopotential electrodes. Biopotential amplifiers. Blood pressure, flow and volume of blood, respiratory systems, lab instrumentation, and Imaging systems. Biosensors. Electrical safety in the medical environment.

Course Prerequisite: BIOE 211, EE236 **Co-requisite:** BIOE 312

Textbook: John G. Webster, Medical Instrumentation: Application and Design, 5th Ed., Wiley, 2020.

Instructor: Prof. Ibraheem Al-Naib /B7-R126-1 / Phone: 5518 / ibraheem.naib@kfupm.edu.sa

Office Hours: UTR 10:00 A.M.-11:00 A.M. and by appointment

Course Learning Outcomes:

1. Analyze the performance of bioinstrumentation systems using appropriate mathematical and computational tools.
2. Apply mathematical and scientific principles to model, simulate, and optimize bioinstrumentation systems.
3. Develop a bioinstrumentation device, incorporating appropriate sensor selection and signal conditioning techniques.
4. Design bioinstrumentation circuits and systems for measuring physiological parameters.
5. Produce high-quality engineering reports that include accurate explanations, and comprehensive scientific documentation.
6. Demonstrate the ability to understand and respond to questions thoughtfully and accurately during presentations.

Important Notes:

- The students are **encouraged** to use any AI tool, provided they highlight the parts written by such a tool and can answer any questions about it. A proper citation for the exact name and version of the tool should be given.
- Each student must be vigilant about academic integrity at all times.
- Only official excuses obtained from the Deanship of Students Affairs are accepted.
- If a student reaches more than 20% of unexcused absence (10 absences of the 45-lecture class), a DN grade will be issued.
- For every unexcused absence, 0.5 points will be deducted from the attendance marks.
- Excuses for officially authorized absences must be presented no later than one week following the resumption of class attendance.
- **No makeup will be accommodated for missed quizzes or exams.**
- Late assignments will not be accepted.
- A student caught cheating in any of the assignments will get ZERO in all assignments, and other proper action will be taken that may eventually lead to the transfer of the student to student affairs.
- The instructor reserves the right to modify the course outline and policies mentioned in this syllabus at any time during the semester.
- Refer to the registrar website for the academic calendar and important deadlines: https://registrar.kfupm.edu.sa/academic-calendar/current-semester/

Course Topics:

Week#	Topic	Sections #
1	Fundamental Concepts	1.1- 1.10
2	Amplifiers and Signal Processing	1.11-1.15, 1.18-1.27
2	Quiz #1	
3	The Origin of Biopotentials	4.1-4.3, 4.5-4.8
4	Biopotential Electrodes	5.1-5.2, 5.4-5.7
5	Biopotential Amplifiers	6.1-6.9
5	Assignment #1	
6	Major #1	
6	Blood Pressure and Sound Sensors	7.1-7.7, 7.9,7.13
7	Quiz #2	
7	Basic Sensors and Principles	2.1-2.4, 2.6-2.11 2.14-2.16
8	Measurement of Blood Flow and Volume of Blood	8.1-8.4, 8.6, 8.8
9	Quiz #3	
9	Measurement of the Respiratory System	9.1 - 9.8
10	Biosensors	10.1-10.9
10	Assignment #2	
11	Major #2	
11	Clinical Laboratory Instrumentation	11.1-11.5
12	Microcontrollers	3.1-3.5
13	Quiz #4	
13-14	Medical Imaging Systems	12.5-12.9, 12.12
15	Safety of Biomedical Instruments and Devices	14.1-14.2, 14.4 - 14.7, 14.10

The Grading Policy:

Attendance	**3%**
Assignments	**7%**
Quizzes	**15%**
Term Project	**10% (W#14)**
Majors	**30% (Weeks #6 and #11)**
Final	**35% (TBA by the registrar)**