DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
COURSE SYLLABUS
EE 470: BIOMEDICAL SIGNALS AND SYSTEMS

<table>
<tr><th rowspan="2">COURSE TITLE</th><th rowspan="2">ENGLISH CODE/NO</th><th rowspan="2">SUBJECT AREA</th><th colspan="4">QUARTER CREDITS</th></tr>
<tr><th>Th.</th><th>Pr.</th><th>Tr.</th><th>Total</th></tr>
<tr><td>Biomedical Signals and Systems</td><td>EE 470</td><td>Engineering</td><td>4</td><td>2</td><td></td><td>6</td></tr>
<tr><td>Pre-requisites:</td><td colspan="6">EE 321, EE 370, EE 374, and IE 202</td></tr>
<tr><td rowspan="2">Course Role in Curriculum</td><td colspan="2">Required or Elective:</td><td colspan="4">Required</td></tr>
<tr><td colspan="2">A pre-requisite for:</td><td colspan="4">Graduation</td></tr>
<tr><td colspan="7">Catalogue Description:
Definition of signals and systems. Types of signals. Examples of biomedical signals and systems. Mathematical description of signals, continuous- and discrete-time signals, scaling and shifting transformations, differentiation and integration, differencing and accumulation. Description of systems, block diagrams, system terminology, system characteristics, and convolution integral. Analysis of signals and systems using Fourier series and Fourier transform. Introduction to z-transform and its applications in digital filtering. Biomedical signals and systems applications.</td></tr>
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***Primary Textbook*:**

1. Luis Chapparo, *Signals and Systems Using Matlab*, 2nd ed., Academic Press, 2015. (ISBN: 978-0-12-394812-0)

***Supplementary Materials*:**

- ***References:***
  - M. J. Roberts, Signals and Systems, Analysis Using Transform Methods and MATLAB, McGraw-Hill, International Edition 2004. (ISBN: 007-123268-0).
  - Simon Haykin & Barry Van Deen, Signals and Systems, 2nd ed., Prentice Hall, 2003.
  - Mrinal Mandal, and Amir Asif, Continuous and Discrete Time Signals and Systems, Cambridge University Press, 2007.
  - Michael C. K. Khoo, Physiological Control Systems: Analysis, Simulation, and Estimation, IEEE Press 2000. (ISBN 0-7803-3408-6)
- ***Web Resources:***
  - Instructor's course web site (additional handouts and lecture presentations)

Course Learning Outcomes:

By the completion of the course the student should be able to:

1. Identify signals and their classifications and manipulations
2. Identify systems and their classifications and manipulations
3. Apply mathematical transformations to process biomedical signals and systems
4. Explain sampling process in biomedical signals and systems
5. Design basic processing systems for biomedical signals
6. Analyze biomedical signals and systems using numerical software (e.g., MATLAB)
7. Apply concepts of signals and system to practical biomedical problems

	Topics to be Covered:	***Duration in Weeks***
1.	Continuous-Time Signals	1
2.	Continuous-Time Systems	1
3.	The Laplace Transform	1.5
4.	The Fourier Transform	1.5
5.	Sampling Theory	1
6.	Discrete-Time Signals and Systems	1
7.	The Z-Transform	1
8.	Fourier Analysis of Discrete-Time Signals and Systems	1
9.	Introduction to the Design of Discrete Filters	1

Student Outcomes addressed by the course: (Put a √ sign)

(1)	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	√
(2)	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	
(3)	An ability to communicate effectively with a range of audiences	
(4)	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
(5)	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	
(6)	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	√
(7)	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	

Key Student Outcomes assessed in the course: (1), (2), (5), and (6)

Instructor or course coordinator: Yasser Mostafa Kadah

Last updated: December 2020.