

### EE 471: Biomedical Instrumentation

COURSE TITLE	ENGLISH CODE/NO	ARABIC CODE/NO	CREDIT			
			Th.	Pr.	Tr.	Total
Biomedical Instrumentation	EE 471	471 هك	2	3	0	3
Pre-requisites:	EE 312, EE 370, EE 372					
Course Role in Curriculum	Required or Elective:		Required			
	A pre-requisite for:					
Catalogue Description:						
Electrical safety and precautions required in medical applications. Electrocardiography (ECG), analog and digital processing of ECG signals. Measurement of blood pressure, heart sound, flow and volume of blood. Statistical analysis of heart rate and blood pressure measurements. Basic respiratory system measurements. Principles of clinical lab instrumentation. Term project.						

#### **Textbooks:**

1. Rüdiger Kramme, Klaus-Peter Hoffmann, Robert S. Pozos (Eds.), Springer Handbook of Medical Technology, Springer-Verlag, Berlin, 2011. (ISBN: 978-3-540-74657-7)
2. J.G. Webster (ed.), Medical Instrumentation: Application and Design, 4th ed., John Wiley & Sons, 2009. (ISBN: 978-0471676003)
3. Anders Brahme (ed.), Comprehensive Biomedical Physics, Elsevier, 2014. (ISBN: 978-0444536327)
4. Gillian McMahon, Analytical Instrumentation: A Guide to Laboratory, Portable and Miniaturized Instruments, Wiley Interscience, 2007. (ISBN: 978-0470027950)

#### **Supplementary Materials:**

1. Paul Horowitz, Winfield Hill, The Art of Electronics, 3rd ed., Cambridge University Press, 2015. (ISBN: 978-0521809269)
2. J.J. Carr, and J.M. Brown, Introduction to Biomedical Equipment Technology, 4th ed., Pearson Education, 2002.
3. Course Blackboard page (KAU account access)
4. Instructor's course web page

#### **Course Learning Outcomes:**

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

1.	Apply electronic design concepts in biosignal amplification problems
2.	Apply analog filter design methods in biosignal filtering problems
3.	Analyze building blocks of example biosignal acquisition device
4.	Apply engineering concepts in biomedical monitoring devices
5.	Apply engineering concepts in biomedical therapeutic devices
6.	Comprehend the design criteria for clinical analytical instrumentation

#### **Topics to be Covered:**

#### **Duration in Weeks:**

1. Biopotential amplifiers	1
2. Biopotential filters	1
3. Electrocardiography	2
4. Cardiovascular monitoring	2
5. Respiratory monitoring and oximetry	2
6. Defibrillators	2
7. High-frequency surgery	2

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|--|---|
| 8. Clinical analytical instrumentation   | 2 |
| 9. Term projects and their presentations | 1 |

**Student Outcomes addressed by the course:** (Put a "x" sign)

(a)	an ability to apply knowledge of mathematics, science, and engineering	x
(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	
(e)	an ability to identify, formulate, and solve engineering problems	x
(f)	an understanding of professional and ethical responsibility	
(g)	an ability to communicate effectively	
(h)	the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	
(i)	a recognition of the need for, and an ability to engage in life-long learning	
(j)	a knowledge of contemporary issues	
(k)	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	

**Key Student Outcomes assessed in the course:** (a) and (e)

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***Instructor or course coordinator:***

Yasser Mostafa Kadah  
 Professor, BME Program.  
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**Office:** Bldg#40, Rm24G05.  
**Office hours:** One Hour After Class Meeting Times.

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***Evaluation Criteria:***

Class Homework	10%
Lab Work and Reports	20%
Major Exams (2)	30%
Term Project	10%
Final Exam	30%

***Last updated:*** September 2016