



Course Syllabus: Integrated Sensors - EE 310

Division	Computer, Electrical and Mathematical Sciences & Engineering
Course Number	EE 310
Course Title	Integrated Sensors
Academic Semester	Summer
Academic Year	2017/2018
Semester Start Date	06/10/2018
Semester End Date	08/09/2018
Class Schedule (Days & Time)	09:00 AM - 12:00 PM Wed Thu

Instructor(s)				
Name	Email	Phone	Office Location	Office Hours
Khaled Nabil Salama	khaled.salama@kaust.edu.sa	+966128084420		30min After each lecture
Jurgen Kosel	jurgen.kosel@kaust.edu.sa	+966128084360	3219, 3, Ibn Sina (bldg. 3)	

Teaching Assistant(s)	
Name	Email

Course Information	
Comprehensive Course Description	We will present the design and implementation of monolithic and hybrid sensors using integrated circuits, particularly in CMOS. We will begin by providing the definitions and performance metrics of sensors. Subsequently, we will discuss the advantages and shortcomings of sensors built in silicon-based fabrication processes and examine, in detail, their integrated circuit topologies. Next, we will provide a comprehensive study of the design and analysis of CMOS integrated image sensors, integrated biosensors, and electronic backbone of MEMS hybrid sensors including silicon photodetectors; CCD and CMOS sensor architectures and circuits; affinity-based detection and biochemical transduction, integrated microarrays, biochips, and sensor SoCs.
Course Description from Program Guide	The design and implementation of monolithic and hybrid sensors using integrated circuits, particularly in CMOS is presented. Performance metrics of sensors will be defined. The advantages and shortcomings of sensors built in silicon-based fabrication processes will be analyzed. A comprehensive study of the design and analysis of CMOS integrated image sensors, integrated biosensors, and electronic backbone of MEMS hybrid sensors including silicon photodetectors; CCD and CMOS sensor architectures and circuits; affinity-based detection and biochemical transduction, integrated microarrays, biochips, and sensor SoCs will be studied.
Goals and Objectives	1- The ability to compare various sensors 2- The ability to understand the operation of sensors 3- The ability to present their work to a wide audience
Required Knowledge	Basic Physics, material science and electrical engineering.
Reference Texts	1- lecture notes handed in class 2- Wikipedia pages for sensor project ideas 3- no text book
Method of evaluation	50.00% - Quiz(zes) 50.00% - Oral presentation

Nature of the assignments	The students are required to choose a sensor. They will conduct a presentation. The presentation is judged by both students and instructor. There are few quizzes during the semester
Course Policies	- maximum 2 lectures to miss - Attending the presentations at end of semester is mandatory
Additional Information	

Tentative Course Schedule

(Time, topic/emphasis & resources)

Week	Lectures	Topic
1	Wed 06/13/2018 Thu 06/14/2018	Sensor fundamentals Sensor fundamentals Passive element Active elements
2	Wed 06/20/2018 Thu 06/21/2018	Noise Analysis Sensor Architecture (Voltage, current) Sensor Architecture (sinusoidal, impedance)
3	Wed 06/27/2018 Thu 06/28/2018	Biosensors Biosensors Chemical sensors Chemical/gas sensors
4	Wed 07/04/2018 Thu 07/05/2018	MEMS sensors Magnetic sensors Image sensors Packaging and integration
5	Wed 07/11/2018 Thu 07/12/2018	Final exam presentations
6	Wed 07/18/2018 Thu 07/19/2018	N/A
7	Wed 07/25/2018 Thu 07/26/2018	N/A
8	Wed 08/01/2018 Thu 08/02/2018	N/A
9	Wed 08/08/2018 Thu 08/09/2018	N/A
10		N/A
11		N/A
12		N/A
13		N/A
14		N/A
15		N/A
16		
17		
18		

Note

The instructor reserves the right to make changes to this syllabus as necessary.