جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

Course Syllabus: Advanced MEMS Devices and Technology - EE 305

Division	Computer, Electrical and Mathematical Sciences & Engineering
Course Number	EE 305
Course Title	Advanced MEMS Devices and Technology
Academic Semester	Summer
Academic Year	2016/2017
Semester Start Date	06/04/2017
Semester End Date	08/03/2017
Class Schedule (Days & Time)	01:00 PM - 04:00 PM | Sun Wed

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
Jurgen Kosel	jurgen.kosel@kaust.edu.sa	+966128084360	3219, 3, Ibn Sina (bldg. 3)	**Sun. 9am - 10am**

Teaching Assistant(s)

Name	Email

Course Information

Comprehensive Course Description	**The course consists of theory lectures given by the instructor and literature reviews presented by the students.** **Content Transduction techniques, including piezoelectric, magnetic, electrothermal and resonant techniques. RF devices; chemical, gas and biological sensors; microfluidic and biomedical devices; spintronics. Note, the content depends on the progress made during the semester, and some topics mentioned above might not be covered.** **Simulation and modeling project: A complex problem needs to be solved using the finite element modeling software COMSOL. A project proposal is required, which needs to be approved by the instructor. An IEEE format paper needs to be prepared at the end as a project report.**
Course Description from Program Guide	Transduction techniques, including piezoelectric, electrothermal and resonant techniques. Chemical, gas and biological sensors; microfluidic and biomedical devices. Micromachining technologies such as laser machining and microdrilling, EDM, materials such as SiC and diamond. Sensor and actuator analysis and design through CAD.
Goals and Objectives	**Describe different Transduction techniques, including piezoelectric, magnetic and resonant techniques.** **Understand various design and fabrication methods for microsystems.** **Understand various concepts of microsystems for different applications.** **Explain the concepts of biological and biomedical micro sensors.** **Explain microfluidic systems and devices.** **Explain the concept of spintronics and devices.** **Design, model and simulate a Microdevice.**

Required Knowledge	**Prerequisite: EE205. Introduction to micro electro mechanical systems (MEMS) devices and technologies or EE203 Solid State Device Laboratory.** **Knowledge of fundamentals of Electrical Engineering, Chemical Engineering, Material Science and Mechanical Engineering** **Basic electronic circuits knowledge.** **Note: This course is not fully self-contained, i.e. students lacking background knowledge in a particular area will have to do some reading on their own. Since this is a graduate level course, the expectation is that students will be able to learn independently.**
Reference Texts	**N/A**
Method of evaluation	**30.00**% - Course Project(s) **30.00**% - Presentation **40.00**% - Oral Quizzes
Nature of the assignments	**Presentations: 30 %** **Projects: 30 %** **Quizzes: 40 %** **Presentations:** -Students present summaries of research papers. -Students select relevant and interesting research papers out of a topic assigned by the instructor -Presentations should be 10 – 15 minutes -Use this to practice your presentation skills and style -Add background material to make sure your colleagues understand the topic and to add quality to the presentation. -Be creative, add videos etc. -The files containing the presentations need to be submitted to the instructor the day before the presentation takes place. -The grade for the presentation will depend on the chosen paper, the slides, the presentation, the ability to answer questions and whether the audience could follow the presentation and understand the content. **Projects:** -Every student develops a research proposal for a microsystem. -After approval by the instructor, the students will carry out the design and simulation of the microsystem in COMSOL. -A final report in form of an IEEE research manuscript has to be prepared and submitted to the instructor together with the design and simulation files. -At the end of the semester, there will be oral presentations of the projects. -The grade for the project will depend on the quality of the proposal, the simulation model and results, the presentation and the report. -An introduction to COMSOL will be given during the lecture. Beyond that, students are expected to get familiar with the software on their own to an extend required to finish the project.
Course Policies	-Students are supposed to attend all lectures. -Attendance at quizzes is mandatory -A missed quiz counts as 0% unless a medical report is produced. -Quiz: In case of an excused miss a quiz will not count towards the average. If more than one quiz is missed, a replacement quiz needs to be taken as soon as possible after the original quiz date.
Additional Information	The students are responsible for all material covered in the lectures, and the supplementary materials assigned for reading or handed out in class. **Please be prepared for reading a lot of material on your own as this is a graduate level class.**

Tentative Course Schedule *(Time, topic/emphasis & resources)*		
Week	**Lectures**	**Topic**
1	Sun 06/04/2017 Wed 06/07/2017	Introduction
2	Sun 06/11/2017 Wed 06/14/2017	Piezoelectric Transducers
3	Sun 06/18/2017 Wed 06/21/2017	COMSOL
4	Sun 06/25/2017 Wed 06/28/2017	Eid break
5	Sun 07/02/2017 Wed 07/05/2017	Piezoelectric Transducers
6	Sun 07/09/2017 Wed 07/12/2017	Magnetic Sensors and Actuators
7	Sun 07/16/2017 Wed 07/19/2017	Magnetic Sensors and Actuators
8	Sun 07/23/2017 Wed 07/26/2017	Microfluidic Systems
9	Sun 07/30/2017 Wed 08/02/2017	Microfluidic Systems
10		NA
11		NA
12		NA
13		NA
14		NA
15		NA
16		NA
17		NA
18		NA

Note

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