Course Description Form

1. Course Name:
Electromechanical Design
2. Course Code:
WBM-52-03
3. Semester / Year:
Semester
4. Description Preparation Date:
19/3/2024
5. Available Attendance Forms:
Presence in the classroom
6. Number of Credit Hours (Total) / Number of Units (Total)
45 h/ 2 units
7. Course administrator's name (mention all, if more than one name)
Name: Hussain Ameer Aljawad Email: Hussein.aljawad@uowa.edu.iq
8. Course Objectives

Course Objectives	Microelectromechanical systems (MEMS), such as pressure sensors, accelerometers, and bio-mechanical assemblies and displays, require knowledge of a broad range of disciplines, from microfabrication to mechanics to electromechanical. This subject presents an introduction to this broad field, using examples and design projects drawn from real MEMS and Bio-MEMS applications. Learn about MEMS components, including microsensors and microactuators. In addition to its most important applications in the biomedical fields. Knowledge of the most important materials used in the design and micromanufacturing of microsystems, including basic and auxiliary materials.

9. Teaching and Learning Strategies	
Strategy	1- Knowledge of the basics of electromechanical design 2- Knowledge of applications of medical and bio-electromechanical systems 3- Knowing the most important materials used in manufacturing and their properties 4- Study the most important methods of precision manufacturing 5- Knowing the types of sensors and micro-actuators

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	3	Introduction to Electromechanical systems	Introduction to Electromechanical systems , classifications the systems, Introduction to Miro-Electromechanical systems	Presented the lectures and explain it.	Daily exams + classwork
2	3	MEMS components	(microstructures, microsensors, microactuators). (MEMS Advantages). (Ghallenge of MEMS Design). And Bio-MEMS.	Presented the lectures and explain it.	Daily exams + classwork
3+4	3	MEMS materials	Silicon and Other Compound Materials, Silicon Oxide and Silicon Nitride, Quartz, Glass, and Sapphire. metals, ceramic, polymer	Presented the lectures and explain it.	Daily exams + classwork
5-7	3	Microfabrication	Microfabrication (Bulk: Wet etching and Dry etching, LIGA process, Deposition techniques).	Presented the lectures and explain it.	Daily exams + classwork
8	3	Microfluidics	Introduction to Microfluidics, the continuity equation, surface tension in liquid	Presented the lectures and explain it.	Daily exams + classwork
9-11	3	Transducers	Transport processes, Biosensors, MEMS Actuators	Presented the lectures and explain it.	Daily exams + classwork

12-15	3	Bio-MEMS	Bio-MEMS (Surgical application, MEMS in drug Delivery system (micro-pump), bioelectric interfaces, MEMS based diagnostics)	Presented the lectures and explain it.	Daily exams + classwork

11. Course Evaluation

1- Theoretical lectures.
2- Discussion Tutorials.
3- Application in group design to activate the team spirit at work

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	The MEMS Handbook MEMS Design (2nd Ed) - M. Gad el Hak
Main references (sources)	The Science & Engineering of Microelectronic Fabrication by S. A. Campbell, Oxford
Recommended books and references (scientific journals, reports…)	https://www.nature.com/micronano
Electronic References, Websites	