Form: Course Syllabus		
	Form Number	EXC-01-02-02A
	Issue Number and Date	2/3/24/2022/2963 05/12/2022
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	Deans Council Approval Decision Number	2/3/24/2023
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	Number of Pages	06

1.	**Course Title**	Transducers and Sensors
2.	**Course Number**	0908472
3.	**Credit Hours (Theory, Practical)**	2
	Contact Hours (Theory, Practical)	2 Theoretical Hours
4.	**Prerequisites/ Corequisites**	Engineering Measurement and Signal Processing (0908371)
5.	**Program Title**	B.Sc. in Mechatronics Engineering
6.	**Program Code**	08
7.	**School/ Center**	Engineering
8.	**Department**	Mechatronics Engineering Department
9.	**Course Level**	4th Year
10.	**Year of Study and Semester (s)**	2023/2024 2nd Semester
11.	**Other Department(s) Involved in Teaching the Course**	None
12.	**Main Learning Language**	English
13.	**Learning Types**	☒Face to face learning ☐Blended ☐Fully online
14.	**Online Platforms(s)**	☒Moodle ☐Microsoft Teams
15.	**Issuing Date**	
16.	**Revision Date**	

17. Course Coordinator:

Name: Prof. Riad Taha Al-Kasasbeh
Contact hours: As per schedule

Office number: Mechatronics Dept., 3rd Floor Phone number: 065355000 ext. 23031

Email: R.Al-kasasbeh@ju.edu.jo

18. Other Instructors:

None

19. Course Description:

Transducer Technologies. Signal Conditioning and Signal processing. The measurement of non-electrical quantities is discussed in detail, covering temperature, pressure, flow, humidity, displacement, force, strain, torque, acceleration and vibration.

20. Program Intended Learning Outcomes: (To be used in designing the matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program)

1. Understand the principles and operation of various transducer technologies used in engineering applications.
2. Demonstrate proficiency in signal conditioning and processing techniques for accurate measurement of non-electrical quantities.
3. Apply knowledge of transducer technologies to select appropriate sensors for measuring temperature, pressure, flow, humidity, displacement, force, strain, torque, acceleration, and vibration.
4. Design and implement systems using Linear Variable Differential Transformers (LVDTs) for precise measurement of displacement and pressure.
5. Evaluate and utilize photo transducers such as phototransistors, photodiodes, and photoresistors for light-based sensing applications.
6. Analyze and apply the piezoelectric effect in transducers for measuring force and pressure in various engineering contexts.
7. Integrate Hall effect sensors for magnetic field measurement and capacitive transducers for liquid level and pressure measurements into engineering systems.
8. Collaborate effectively in multidisciplinary teams to solve engineering problems related to sensor selection, signal processing, and transducer integration.
9. Communicate technical information related to transducer technologies clearly and effectively in written reports and presentations.
10. Demonstrate professional and ethical behavior in the use of transducer technologies, considering societal and environmental impacts.

21. Course Intended Learning Outcomes: (Upon completion of the course, the student will be able to achieve the following intended learning outcomes)

1. Be able to prepare an effective presentation for a full measurement system designed by a team to measure mechanical variable(s).
2. Be able to design a brochure to market for the designed measurement system and get introduced to technical marketing.
3. Be able to produce a video that comprehensively describes the designed measurement system in technical terms.

Course ILOs	The learning levels to be achieved					
	Remembering	**Understanding**	**Applying**	**Analysing**	**evaluating**	**Creating**
1	✓	✓	✓	✓		
2	✓	✓	✓	✓	✓	✓
3	✓	✓	✓	✓		

22. The matrix linking the intended learning outcomes of the course with the intended learning outcomes of the program:

Program ILOs / Course ILOs	**ILO (1) SO: 1**	**ILO (2) SO: 2**	**ILO (3) SO: 3**	**ILO (4) SO: 4**	**ILO (5) SO: 5**	**ILO (6) SO: 6**	**ILO (7) SO: 7**
1			✓				
2			✓				
3			✓				

23. Topic Outline and Schedule:

Week	Lecture	Topic	ILO/s Linked to the Topic	Learning Types (Face to Face/ Blended/ Fully Online)	Platform Used	Synchronous / Asynchronous Lecturing	Evaluation Methods	Learning Resources
1	1.1	Introduction/Outlines	1	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
	1.2	Transducer (Design components)	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
2	2.1	Transducers Technologies	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
	2.2	piezoelectric transducers	1,2, 3,6	Face to Face	Moodle Teams	Synchronous	Exams ,Project	Book+ E-Learning
3	3.1	magnetic transducers for flow measurement	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams ,Project	Book+ E-Learning
	3.2	Resistance Temperature Detector (RTD)	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
4	4.1	Thermistor	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
	4.2	Thermoelectric effect (thermocouple)	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
5	5.1	MATLAB/ Simulink/ Simscape platform	2,3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
	5.2	Hall effect sensors	1,2, 7	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
6	6.1	photo-transducers (such as phototransistors, photodiodes, and photoresistors),	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
	6.2	Linear Variable Differential Transformer (LVDT)	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
7	7.1	Strain gauge and load cells	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
	7.2	Strain gauges in bridges (design, characteristics)	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
8	8.1	MATLAB/ Simulink/ Simscape platform	2,3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
	8.2	Measurement of pressure	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
9	9.1	capacitive transducers for liquid level and pressure measurements.	1,2, 7	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning

	9.2	diaphragm and bellows type; commercial examples of pressure transducers	1,2, 7	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
10	10.3	MATLAB/ Simulink/ Simscape platform	2,3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
	10.2	Measurement of flow	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
11	11.1	Positive displacement methods	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
	12.3	Obstruction methods	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
12	13.1	drag effect methods; hot wire anemometers	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
	11.2	hot wire anemometers	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
13	13.1	Design Project	8,9, 10	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
	13.2	Measurement of moisture & humidity	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
14	14.1	Measurement of acceleration and vibration	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
	14.2	Seismic instruments	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
15	15.1	MEMS accelerometer	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning
	15.2	Inertial methods of motion measurement	1,2, 3	Face to Face	Moodle Teams	Synchronous	Exams	Book+ E-Learning

24. Evaluation Methods:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

Evaluation Activity	Mark	Topic(s)	ILO/s Linked to the Evaluation activity	Period (Week)	Platform
Midterm	30			8th week	
Quizzes	10				
Project	10		SO (3)	14	
Final	50	All topics			

25. Course Requirements:

(e.g.: students should have a computer, internet connection, webcam, account on a specific software/platform…etc.):

26. Course Policies:

A- Attendance policies: Attendance will be taken every class and University policy will be enforced.

B- Absences from exams and submitting assignments on time: Absence not allowed and no Late submission.

C- Health and safety procedures: As per University policy

D- Honesty policy regarding cheating, plagiarism, misbehavior: Not tolerated as per University policy

E- Grading policy: As mentioned in Evaluation Methods above.

F- Available university services that support achievement in the course: Platforms, Instructor support, administrative support.

27. References:

A- Required book(s), assigned reading and audio-visuals:

Mechanical Measurements", Thomas Beckwith, Roy Marangoni, John Lienhard, Pearson Education, Pearson International Edition, Sixth Edition.

B- Recommended books, materials, and media:

- Measurement & Instrumentation Principles", Alan S. Morris, Elsevier.
- Experimental Methods for Engineers", J.P. Holman, 7th Edition, McGraw Hill International Edition.
- Principles of Measurement Systems", John P. Bentley, Pearson Prentice Hall, Fourth Edition.
- Measurement Systems: Application and Design", Ernest O. Doebelin, Fifth Edition, McGraw Hill.

28. Additional information:

Name of the Instructor or the Course Coordinator: Prof. Riad Taha Al-Kasasbeh	Signature: ……..……	Date: ……..……
Name of the Head of Quality Assurance Committee/ Department …….	Signature: ……..……	Date: ……..……
Name of the Head of Department …….	Signature: ……..……	Date: ……..……
Name of the Head of Quality Assurance Committee/ School or Center …….	Signature: ……..……	Date: ……..……
Name of the Dean or the Director …….	Signature: ……..……	Date: ……..……