Model No.12
Course Specifications (2014-2015)
Measurements and Metrology

University: Benha university

Faculty : Shoubra Faculty of Engineering

Department offering the program: Mechanical Engineering Department

Department offering the course: Mechanical Engineering Department

1- Course Data

Course Code: MDP222   **Course Title**: Measurements and Metrology   **Study Year**: Second Year

Specialization: Mechanical Production Engineering

Teaching Hours: Lecture : 4   Tutorial/ Practical : 2

2- Course Aim

For students undertaking this course, the aims are to:
1- Identify the types and components of different mechanical measurement systems.
2- Introduce the different Sensors, Signal Conditioning, and Actuators.

3- Intended Learning Outcomes of Course (ILOS)

a- Knowledge and Understanding

On completing this course, students will acquire and understand:

a.1) The difference between sensor, transducer and actuator. (A 1)

a.2) The methods of measuring the temperature, velocity, acceleration, pressure and displacement. (A.2)

a.3) The different types of errors. (A.3)

a.4) The types of actuators. (A.4)

b- Intellectual Skills

At the end of this course, the students will be able to:

b.1) Evaluate and appraise designs of measuring temperature, velocity, displacement, and pressure. (B.3)

b.2) Analyze the performance of data acquisition systems. (B.2)

b.3) Compare between low pass, high pass and band pass filters. (B.1)

c- Professional Skills

On completing this course, the students are expected to be able to:

c.1) Use the sensors, transducers and data acquisition system to measure any physical quantity. (C.1)

c.2) Sketch schematic diagrams for different types of sensors, amplifiers and filters. (C.2)

d- General Skills

At the end of this course, the students will be able to:

d- 1 Communicate effectively. (D.3)

4- Course Contents

No.	Topics
1	INTRODUCTION – (Computer& Mechatronics Measurement systems – Examples of mechanical & computer controlled systems).
2	Performance terminology
3	Static& dynamic Characteristics - Errors
4	Sensors& transducers (Displacement, position, and proximity)
5	Sensors& transducers (Velocity –acceleration-force – pressure – flow – level –temperature)
6	Sensors& transducers (light sensors –inputting data by switches – selection of sensors)
7	Signal conditioning (Op.Am –Protection)
8	Signal conditioning (filtering – W. bridge)
9	Signal conditioning (digital signals –multiplexers)
10	Mechanical actuators
11	Hydraulic & pneumatics actuators
12	Electrical actuators
13	data acquisition systems – measurement systems – testing & calibrations- DSP.
14	Complete project

5- Teaching and Learning Methods

5.1- Lectures
5.2- Class activity
5.3- Case study
5.4- Assignments / homework

6- Teaching and Learning Methods of Disables

Nothing

7- Student Assessment

a- Student Assessment Methods

1	Seven Assignments to assess knowledge and intellectual skills.
2	Two Quiz to assess knowledge, intellectual and professional skills.
3	Mid-term exam to assess knowledge, intellectual, professional and general skills.
4	Oral exam to assess knowledge and intellectual skills.
5	Final exam to assess knowledge, intellectual, professional and general skills.

b- Assessment Schedule

No.	Assessment	Week
1	Assignments	2, 3, 5, 7, 9, 10, 12
2	Quiz	5, 10
3	Mid-term exam	8
4	Oral exam	14
5	Final exam	16

c- Weighting of Assessments

Assessment	Weight
Mid Term Examination	10 %
Final Term Examination	60 %
Oral Examination	20 %
Practical Examination	0 %
Semester work	05 %
Other types of assessment	05 %
Total	100 %

8- List of References

a- Course Notes
1- prepared by instructor

b- Books
1- Histand, M.B. &Alciatore,D.G.; "Introduction to Mechatronics & Measurement Systems."; 1999
2- W. Bolton; (Mechatronics; Electronic Control Systems in Mechanical and Electrical Engineering"; Longman, 2nd Edition; 1999

c- Recommended Books
1- Devdas Shetty, & Richard Klok ; " Mechatronics System Design"; PWS Publishing Company; 1997
2- Allan Bonnic; " Automotive Computer Controlled Systems".; B.H. ; 2001 (Application)

Course Coordinator: Prof. Dr. Saber Mahmoud Abed Rabbo

Head of Department: Prof. Dr. Osama Ezzat Abdelatif.

Model No.11A
Course Specifications: Measurements and Metrology

University : Benha university

Faculty : Shoubra Faculty of Engineering

Department offering the program: Mechanical Engineering Department

Department offering the course: Mechanical Engineering Department

Matrix of Knowledge and Skills of the course

No.	Topics	week	Basic Knowledge	Intellectual Skills	Professional Skills	General Skills
1	INTRODUCTION – (Computer& Mechatronics Measurement systems – Examples of mechanical & computer controlled systems).	1	a1,a2	b1	c1	
2	Performance terminology	2	a1		c1	
3	Static& dynamic Characteristics - Errors	3	a4	b1		d1
4	Sensors& transducers (Displacement, position, and proximity)	4	a1,a2	b1	c1,c2	
5	Sensors& transducers (Velocity – acceleration-force – pressure – flow – level –temperature)	5	a1	b1	c1	d1
6	Sensors& transducers (light sensors – inputting data by switches – selection of sensors)	6	a1,a2	b1	c1	
7	Signal conditioning (Op.Am –Protection)	7		b1,b3	c2	d1
8	Signal conditioning (filtering – W. bridge)	8	a2	b3	c2	
9	Signal conditioning (digital signals – multiplexers)	9	a3	b2,b3	c1,c2	d1
10	Mechanical actuators	10	a3		c1	
11	Hydraulic & pneumatics actuators	11	a4		c1	
12	Electrical actuators	12	a4		c1,c2	
13	Data acquisition systems – measurement systems – testing & calibrations- DSP.	13		b2	c1	d1
14	Complete project	14	a1,a2,a3,a4	b1,b2,b3	c1,c2	d1

Course Coordinator: Prof. Dr. Saber Mahmoud Abed Rabbo

Head of Department: Prof. Dr. Osama Ezzat Abdelatif.

Matrix of course aims and ILO's

Course Title: Measurement and Metrology

Code: MDP222   Lecture: 4   Tutorial / Practical: 2   Total: 6

Program on which the course is given: B.Sc. Mechanical Production Engineering

Major or minor element of program: Major

Department offering the program: Mechanical Engineering Department

Department offering the course: Mechanical Engineering Department

Academic year / level: 2014/2015   Second Year/Second semester

Date of specifications approval: 2014

Course aims	a	b	c	d
1. Identify the types and components of different mechanical measurement systems.	a1 a4	b1	c1 c2	d1
2. Introduce the different Sensors, Signal Conditioning, and Actuators.	a2 a3	b2 b3	c2	

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