Ministry of Higher Education and Scientific Research

Supervision and Scientific Evaluation Body

Quality Assurance and Academic Accreditation Office

Course Description Sample

Subject: ------Instrumentation and measurements----------

This course description provides a brief survey of the most important characteristics, expected learning output, showing whether students have made full use f the learning opportunities. These characteristics have to be matched with the description of the program.

1. Educational Institution	Shatt Al-Arab University College
2. Department / Center	Department of Computer Technology Engineering
3. Course Title /Code	Instrumentation and measurements
4. Lecturer Name	Asst. prof. Dr. Mazin Abdulelah Alawan
5. Type of Teaching	Attendance
6. Academic Year /Term	Year
7. Total No. of Teaching Hours	120
8. Date f Preparing this Course Description	3/10/2022

9. **Course Objectives**

• Getting acquainted with the international units of measurement, especially those related to electrical engineering.
• Analyzing the work of the components of the measurement system and determining the duties of each of them in detail.
• Classification of measuring devices and designing some of them.
•Proficiency in measurements that can be made on the electric wave.
• Designing a system for sensing physical quantities and converting them into electrical signals using sensors.

10. **Course Output, Methodology and Evaluation**

(A) **Cognitive Objectives**

A1- Identify the measurements that can be made on the electrical signal. A 2- Analyze the measurement system. A3- Identifying how and what the internal and external sources of errors affect on the measurement system and its devices, and determining the mathematical laws necessary to calculate the amount of error and the acceptable rate of the signal. A4- Identify the basics of the sensing system (analogue and digital) for physical quantities. A5- Identifying the types and installation of measuring devices and the differences between those based on a magnetic field and those based on an electric field, as well as the differences between digital and analogue ones. A6 - Designing the components of the computer-digital measurement system. A 7- Study and application of the method used in designing the multi-metering device.

(B) **Skill Objectives Related to the Program**:

B 1 - Basic skills for the foundations of electrical engineering, basic electrical circuit theories, and the basics of physics. B 2 - the basic skills of mathematics and electronics, digital and analogue. B3 - Basic skills for using and analyzing the performance of electrical engineering measuring devices. B - the basic skills of measurements that can be made on the electrical signal.

Methods of Teaching and Learning

a. Using already- prepared lectures.
b. Using up-to-date data shows.
c. Homework
d. Adopting group discussions.

Methods of Evaluation

a. Oral tests
b. Monthly tests
c. Daily quizzes
d. Students' Regular Attendance

(C) **Sentimental and Value Objectives**

C 1- Observation and perception. C - analysis and interpretation. C 3- Conclusion and evaluation. C 4 - numbers and calendar. C 5 - Testing students' attention through surprise questions during the explanation. C6 - Breaking the stereotypical aspect of the lecture by using different methods to transform the student from the role of the passive recipient to the role of active participation.

Methods of Teaching and Learning

a. Lectures on university instructions.
b. Educational guidance lectures.
c. Continuous directing.
d. Visiting State and private institutions.
e. Showing practical cases.

Methods of Evaluation

a. Daily quizzes.
b. Classroom discussions and commitment to ethics and sublime values.
c. Special marks for class activities.
d. Monthly and quarterly evaluation.

D) **General and Qualitative Skills (other skills related to the ability of employment and personal development)**

D1 - Develop the student's leadership skill. D2 - Develop the student's mental fitness during the lecture by constantly directing questions. D3 - Develop skills related to the foundations of electrical engineering and in the field of electrical circuit theory. D4 - Develop the student's language skills to increase the ability to express his ideas. D5 - Developing and testing circuit design skills by applying electronic circuit simulators to the student. D6 - Developing the skill of using measuring devices and their initial maintenance.

11. **Course Structure**

Week	No of Hours	Required Learning Output	Title of Subject	Teaching Method	Evaluation
1	2	Knowing and using S.I. units . Understanding measurement system .	Units of measurements SI system ,block diagram and description of measurement system components .	- lectures - case study -discussions	- oral tests -questions
2	2	Understanding measuring instruments classification methods	Active and passive instruments . Analogue and digital instruments .	- lectures - case study -discussions	- oral tests -questions
3	2	Analyzing ,calculating error in measuring devices	Important sources of instrument reading error ,introduction to signal processing element of measurement system	- lectures - case study -discussions	- oral tests -questions
4	2	Understanding /designing filters .	1^{st} order and 2^{nd} order LPF design for measurement signal noise removing .	- lectures - case study -discussions	- lectures - case study -discussions
5	2	Understanding /designing amplifier ,integrator ,and differentiator .	Op. amp application in signal processing :Signal amplification and attenuation ,signal integration and differentiating.	- lectures - case study -discussions	- lectures - case study -discussions
6	2	Understanding ,Designing Summer ,voltage follower circuits	Op. amp application in signal processing :signals summing , voltage follower application in instrument protection and inputs buffering .	- lectures - case study -discussions	- lectures - case study -discussions
7	2	Understanding basics of digital measuring instruments	Digital instruments basics :analogue to digital convertors ,sampling ,quantization .	- lectures - case study -discussions	- lectures - case study -discussions
8	2	Understanding basics of computerized measurement system .	Digital instruments basics :design of computerized measurement system (protocol ,components ,usage)	- lectures - case study -discussions	- lectures - case study -discussions
9	2	Understanding ,designing heart of digital measuring	Digital instruments basics :flash ADC design principles and	- lectures - case study	- lectures - case study

		device .	implementation .	-discussions	-discussions
10	2	Understanding basic construction and operation	Magnetic field measuring devices basics :moving coil instrument ,moving iron instrument .	- lectures - case study -discussions	- lectures - case study -discussions
11	2	Understanding basic construction and operation	Magnetic field measuring devices : clamp on meter . Electric field devices : electro static voltmeter .	- lectures - case study -discussions	- lectures - case study -discussions
12	2	Understanding basic construction and operation	Ohm meter : multi range ohmmeter design ,main sources of error , Light meter basic principles .	- lectures - case study -discussions	- lectures - case study -discussions
13	2	Understanding ,applying calculations needed .	Design of multi range voltmeter (rules ,calculations ,examples) .	- lectures - case study -discussions	- lectures - case study -discussions
14	2	Understanding ,applying calculations needed .	Design of multi range ammeter (rules ,calculations ,examples) .	- lectures - case study -discussions	- lectures - case study -discussions
15	2	Understanding ,applying calculations needed .	Make before break switch basics ,determination of voltmeter and ammeter sensitivities .	- lectures - case study -discussions	- lectures - case study -discussions
16	2	Practicing with practical examples	Multi range instruments worked examples solving .	- lectures - case study -discussions	- oral tests -questions
17	2	Understanding basic construction and operation	Digital instruments :measuring frequency (frequency counter) basics ,Events counter basics and usage .	- lectures - case study -discussions	- oral tests -questions
18	2	Understanding basic construction and operation	An introduction to wave form generation :what is wave form ,wave form types .	- lectures - case study -discussions	- oral tests -questions
19	2	Understanding basic construction and operation	An introduction to wave form generation : (function generator basics) ,function generator building blocks .	- lectures - case study -discussions	- lectures - case study -discussions
20	2	Understanding basic construction and	Cathode ray oscilloscope :CRT internal	- lectures	- lectures

		operation	construction and building blocks jobs .	- case study -discussions	- case study -discussions
21	2	Understanding basic construction and operation	Cathode ray oscilloscope :internal control circuits building blocks jobs .	- lectures - case study -discussions	- lectures - case study -discussions
22	2	Understanding basic construction and operation	Measurement signal recording :Galvanometric recorder ,Ultra violet light recorder .	- lectures - case study -discussions	- lectures - case study -discussions
23	2	Understanding basic construction and operation	Measurement signal recording : analogue storage oscilloscope ,digital storage oscilloscope	- lectures - case study -discussions	- lectures - case study -discussions
24	2	Understanding ,analyzing working principles	Sensor technologies basics :what is sensor ?,why we need sensor ? ,examples of sensor .	- lectures - case study -discussions	- lectures - case study -discussions
25	2	Understanding ,analyzing working principles	Analogue sensor :basics ,sound sensor ,thermocouple .	- lectures - case study -discussions	- lectures - case study -discussions
26	2	Understanding ,analyzing working principles	Light dependent resistor LDR ,LDR applications	- lectures - case study -discussions	- lectures - case study -discussions
27	2	Understanding ,analyzing working principles	Digital sensor :basics ,measuring rotating shaft speed using light sensor .	- lectures - case study -discussions	- lectures - case study -discussions
28	2	Applying ,practicing	Metric Prefix Table worked examples .	- lectures - case study -discussions	- lectures - case study -discussions
29	2	Analyzing	Wheatstone D.C. bridge .	- lectures - case study -discussions	- lectures - case study -discussions
30	2	Practicing	Wheatstone D.C. bridge example .	- lectures - case study -discussions	- lectures - case study -discussions

12.**Infrastructure**

a. Textbooks	**Measurement and Instrumentation Principles : by *Alan S. Morris.* \third edition 2003 \ Butterworth-Heinemann**
b. References	Introduction to INSTRUMENTATION AND MEASUREMENTS :by Robert B. Northrop \ **Second Edition © 2005 by Taylor & Francis Group, LLC**
c. Recommended books and periodicals (journals, reports, etc.)	
d. Electronic references, internet websites, etc	Google books

13. **The Plan of Improving the Course**

Introducing changes to the devices shown within the curriculum to match the development in the labor market and modern technical development.