SULTAN QABOOS UNIVERSITY

COURSE OUTLINE

PROGRAM: Soils, Water & Agricultural Engineering

1. Course Code	SWAE3308	
2. Course Title	Instrumentation & Control Systems	
3. Credits	3CR, 12 CP, 6 ECTS	
4. Pre-requisite Course(s)	Calculus I (MATH2107), Physics I (PHYS2101) or Physics for Engineering (PHYS2107)	
5. Co-requisite Course(s)	N/A	
6. Equivalent Course(s)	None	
7. Incompatible Course(s)	None	
8. Course Category	☐ University Requirement	☐ University Elective
	☐ College Requirement	☐ College Elective
	☐ Department Requirement	☐ Department Elective
	☒ Specialization Requirement	☐ Specialization Elective
	☐ Other (specify):	
9. Course Owner	College: CAMS	Department: SWAE
10. Course Type	☐ Lecture	☒ Lecture/Lab
	☐ Lecture/Seminar	☐ Lecture/Studio
	☐ Lecture/Tutorial	☐ Lecture/Lab/Tutorial or Seminar
	☐ Tutorial	☐ Laboratory (Practical)
	☐ Field or Work Placement	☐ Studio
	☐ Seminar	☐ Internship
	☐ Workshop	☐ Project
11. Language of Instruction	English	

12. Course Description

This three-credit engineering course introduces students to design of instrumentation and control systems. Once introduced to basic measurements of physical and engineering parameters, such as temperature, humidity, flow, moisture, pressure, speed, radiation, etc and to their terminology and characteristic, students will learn 1) how common sensors work and how they connect to modular acquisition decks of analog and counter channels 2) how calibration of measurement systems are made and 3) how to program a control application which triggers a relay connected to an actuator (light, solenoid, electrical motor, pump). The students will learn also about microcontrollers and their applications. On completion of the course students will 1) have a good understanding of the theory behind instrumentation and control systems 2) be able to carry out calibration of measurement systems and 3) be able to design simple datalogging and control systems.

13. Teaching/Learning Strategies

14. Assessment Components and Weight [%]

☒ Quizzes 10%	☒ Practical 5%	☐ Other (specify):
☒ Homework assignments 5%	☒ Project 20%	
☒ In-term examination(s) 20%	☒ Final examination 40%	

15. Grading Method

☒ A-F Scale ☐ Pass/Not passed

16. Textbook(s) and Supplemental Material

Textbooks: Industrial instrumentation and process control by W. C. Dunn. 2005. McGraw Hill.

Reference Books: (These books are available at SQU library):

1.	Digital and analogue instrumentation : testing and measurement by Kularatna, N. TK7878 .K84 2003
2.	Instrumentation fundamentals for process control by DeSa, Douglas O. J. TP155.75 .D47 2001
3.	Digital control system analysis and design by Phillips, Charles L. TJ223 .M53 P47 1995
4.	Basic control system technology by Chesmond, C. J. TJ213 .C486 1990A

17. Matching Course Objectives with Program Outcomes and SQU Graduate Attributes SQU Graduate Attributes

A. SQU graduates should be able to:	B. SQU graduates possess	C. SQU graduates should
1. apply the knowledge and skills relevant to the specialization 2. communicate effectively and use information and communication technologies 3. critically analyze complex information and present it in simple clear manner	1. interpersonal communication skills and alignment with culture of international labour market to assist them in practical life and in living successfully 2. skills and motivation for independent learning and engagement in lifelong learning and research 3. work ethics and positive values, and intellectual independence and autonomy 4. teamwork skills and display potential leadership qualities	relish good citizenship qualities, be conscious of their national identity and be socially responsible, engage in community affairs and be mindful of contemporary issues.

#	Intended Student Learning Outcome /Course Learning Objective	Relevant Program Outcome(s)	Applicable Attribute(s)
1.	To make students have a good understanding of the theory behind instrumentation and control systems	- An ability to apply knowledge of mathematics, science and engineering.	A1, B2
2.	Introduce students to common sensors and how they work and how they connect to modular acquisition decks of analog and counter channels	- An ability to apply knowledge of mathematics, science and engineering. - An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. - A knowledge of contemporary issues.	A1, B1, C
3.	Enable the students to carry out calibration of measurement systems and design datalogging and control systems.	- An ability to design and conduct experiments, as well as to analyze and interpret data. - An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.	A1, B3
4.	Enable the students to use a control application program which triggers a relay connected to an actuator (light, solenoid, electrical motor, and pump).	- An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. - An ability to identify, formulate, and solve engineering problems. - An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	A1, A2, A3
5.	Encourage students to work in teams to perform the lab and project work sessions.	- An ability to function on multidisciplinary teams. - A recognition of the need for, and an ability to engage in life-long learning.	B1, B4, C

6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			

16. Student Responsibilities

It is the student's responsibility to know and comply with all University Academic Regulations relevant to participation in this course. These regulations specifically include attendance requirement and students` academic code of conduct.

For attendance, it is the student's responsibility to be punctual and to attend all classes.

Students are expected to perform their work with honesty and avoid any academic misconduct, which is defined as the use of any dishonest or deceitful means to gain some academic advantage or benefit. This can take many forms, including but not limited to, the following: copying, plagiarism, collusion and forging documents. For full details, please refer to the Undergraduate Academic Regulations and to the Student Academic Misconduct Policy.

Additionally, this course requires that you:

COURSE INFORMATION			
Course Code	SWAE3308	**Course Title**	Instrumentation and Control Systems
Semester/ Year	Fall 2018	**Section(s)**	10
Day, Time, and Place	SUN (12:00 - 2:00, A13), MON (12:00 - 2:00, AGR0016), TUE (12:00 - 2:00, AGR0016)		

Course Coordinator	Talal Al-Shikaili		
Office Location	Office #234, 2nd floor	**Office Hours**	SUN & TUE 11:00 - 12:00
Office Tel. Ext.	1212	**Email**	talals@squ.edu.om

Tentative Schedule

Week	Lecture #	Topic/Material to be covered	Assessment
1		Introduction to SWAE3308	
2	Lec. 1 Chap. 1	Introduction Definition of instrumentation & Control Systems Process control loop Elements of a control loop Accuracy of devices (instruments)	
3	Lec. 2 Chap. 2	Electrical Components Resistance Capacitance Inductance	HW1 Quiz 1
4	Lec. 3 Chap. 4	Electronics Analog Circuits Digital Circuits	
5	Lec. 4 Chap. 8	Temperature and Heat Concepts, formulas, measuring devices and applications	HW2
6	Lect. 5 Chap. 8	Temperature and Heat: Continue…	Quiz 2
7	Lect. 6 Chap. 7	Flow: Concept, measurements, instruments, and applications	
8	Lec. 7	Review & Midterm	Mid-Term Exam
9	Lec. 8	Microcontrollers NI hardware & LabView Software Arduino	
10	Lec. 9 Chap. 5	Pressure: Concept, measurements, instruments, and applications	HW3
11	Lec. 10 Chap. 9	Humidity : Concept, measurements, instruments, and applications	
12	Lec. 11 Chap. 9	Humidity: Continue…	
13	Lec. 12 Chap. 9	Measurement of PH, Density, Viscosity, & other variables	HW4
14	Lec. 13	Project demonstration & presentation	Quiz 3
15	Lec. 14	Course Revision	