ELEC 82 Course Outline as of Fall 2018

CATALOG INFORMATION

Dept and Nbr: ELEC 82 Title: MECHATRONICS FUND
Full Title: Mechatronics Fundamentals
Last Reviewed: 4/10/2023

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	3.00	Lecture Scheduled	2.50	17.5	Lecture Scheduled	43.75
Minimum	3.00	Lab Scheduled	1.50	8	Lab Scheduled	26.25
		Contact DHR	0		Contact DHR	0
		Contact Total	4.00		Contact Total	70.00
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 87.50 Total Student Learning Hours: 157.50

Title 5 Category:	AA Degree Applicable
Grading:	Grade Only
Repeatability:	00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:	
Formerly:	

Catalog Description:
Analysis and control of systems that combine mechanical elements with electronic components as well as computers and/or microcontrollers. Topics include sensors, actuators, servo and stepper motors and motor controllers.

Prerequisites/Corequisites:
Course Completion of ELEC 54C

Recommended Preparation:

Limits on Enrollment:

Schedule of Classes Information:
Description: Analysis and control of systems that combine mechanical elements with electronic components as well as computers and/or microcontrollers. Topics include sensors, actuators, servo and stepper motors and motor controllers. (Grade Only)
Prerequisites/Corequisites: Course Completion of ELEC 54C
Recommended:
Limits on Enrollment:

Transfer Credit: CSU;
Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**	Effective:	Inactive:
CSU GE:	**Transfer Area**	Effective:	Inactive:
IGETC:	**Transfer Area**	Effective:	Inactive:

CSU Transfer:	Transferable	Effective:	Fall 2018	Inactive:
UC Transfer:		Effective:		Inactive:

CID:

Certificate/Major Applicable:
Not Certificate/Major Applicable

COURSE CONTENT

Student Learning Outcomes:
At the conclusion of this course, the student should be able to:
1. Identify the different sensor types and measurands; force, temperature, distance, velocity, acceleration, pressure, flow, optical, and chemical.
2. Test and plot sensor data to obtain sensor characteristics.
3. Demonstrate the operation of servo and stepper motors.

Objectives:
During this course students will:
1. Explain how sensor characteristics and signal conditioning affect a simple system.
2. Compare sensing of a measurand using sensors based on different physical effects.
3. Test and plot sensor data to obtain sensor characteristics
4. Demonstrate the use of sensors to provide feedback to a control system.
5. Design a useful device containing a sensor or actuator and predict its behavior.
6. Interface with microcontrollers using sensors as input and actuators as output.
7. Design a motor control system using servo and stepper motors.

Topics and Scope:

I. Introduction
   A. Classification of sensors and actuators
   B. Sensing and actuating strategies
   C. Sensing
   D. Transduction
   E. Evacuation
II. Performance Characteristics
   A. Input/output characteristics
   B. Accuracy and errors
   C. Frequency response and calibration
   D. Applications

III. Temperature Sensors
   A. Thermistors
   B. Resistance temperature sensors
IV. Optical sensors
   A. Photodiodes
   B. Phototransistors
   C. Photoresistors
   D. Infrared
V. Magnetic Sensors
   A. Proximity sensors
   B. Hall sensors
VI. Mechanical Sensors
   A. Accelerometers
   B. Force sensors
   C. Pressure sensors
VII. Acoustic Sensors
VIII. Chemical Sensors
   A. Humidity
   B. Moisture
IX. Motors as Actuators
   A. Servo motors and controls
   B. Stepper motors and controls
X. Interfacing Methods and Circuits
   A. Bridge circuits
   B. Interfacing to microprocessors
   C. Data transmission
   D. Power requirements
   E. Noise and interference
XI. Interfacing to Microprocessors:
   A. General requirements for sensors and actuators
   B. Input signal conditioning
   C. Output signals (level, power, isolation, etc.)
   D. Driving methods (direct, PWM)

XII. Laboratory Exercises
   A. Temperature and humidity sensors
   B. Optical sensors
   C. Magnetic sensors
   D. Mechanical sensors
   E. Acoustic sensors
   F. Chemical sensors
   G. Servo motors and controls
   H. Stepper motors and controls
   I. Interfacing to Arduino

Assignment:

Lecture-Related Assignments:
1. Reading (10-30 pages per week)
2. Homework assignments (1-4)
3. Quizzes (2-6) and final exam

Lab-Related Assignments:
1. Laboratory assignments (5-12) including demonstrating operation of a sensor controlled motor
2. Lab reports (4-8)

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

Lab reports	Writing 20 - 50%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Homework assignments	Problem solving 20 - 30%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

Laboratory assignments	Skill Demonstrations 10 - 30%

Exams: All forms of formal testing, other than skill performance exams.

Quizzes and final exam	Exams 20 - 40%

Other: Includes any assessment tools that do not logically fit into the above categories.

None	Other Category 0 - 0%

Representative Textbooks and Materials:
Fundamentals of Mechatronics. Jouaneh, Musa. Cengage Learning. 2013 (classic)