

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)