10/31/2024 DATE
☑ REQUIRED COURSE
☑ ELECTIVE COURSE

TEC DIVISION
□ NEW COURSE
☑ REVISION

Lake Land College

Course Information Form

COURSE NUMBER:	EET-081	TITLE: *(30 Characters Max)*	Physical Computing

SEM CR HRS:	3	Lecture:	2	Lab:	2		ECH:	4
Course Level:	□ Gen Ed/IAI □ Baccalaureate/Non-IAI	☑ Career/Technical □ Dev Ed/Not in Degree Audit	Clinical Practicum:	0	Work-based Learning:	0	WBL ECH:	0

COURSE PCS #	12 - 15.1201	IAI Code:	N/A	Contact Hours (Minutes/Week)

Repeatable (Y/N):	N	Pass/Fail (Y/N):	N	Variable Credit (Y/N):	N	Min:		Max:		16 Wks	200	8 Wks	400

Prerequisites:	None
Corequisites:	None
Catalog Description: (40 Word Limit)	Handheld computing platforms are ideal for a wide range of interfacing and physical computing projects. This class covers basics hardware, programming, interfacing and control schemes needed for simple or complex interfacing projects.

List the Major Course Segments (Units)	Contact Lecture Hours	Contact Lab Hours	Clinical Practicum	Work-based Learning
Micro computer fundamentals	4	2		
Python	4	4		
SQlite	2	3		
Digital inputs	2	2		
Digital input signal conditioning and interfacing	4	4		
Analog inputs	4	4		
Continuous process control	4	4		
Closed loop control	4	4		
Proportional integral derivative control	4	6		
TOTAL	32	33	0	0

EVALUATION

QUIZZES	☑	EXAMS	☑	ORAL PRES	□	PAPERS	□
LAB WORK	☑	PROJECTS	□	COMP FINAL	☑	OTHER	□

COURSE MATERIALS

TITLE:	Instructor supplied	
AUTHOR:		
PUBLISHER:		
VOLUME/EDITION/URL:		
COPYRIGHT DATE:		

MAJOR COURSE SEGMENT	HOURS	LEARNING OUTCOMES
		The student will be able to:
Micro computer fundamentals	6	Performance Indicators 1. Connect power and peripherals. 2. Operate the device in headless mode. 3. Install the operating system. Knowledge Indicators 1. Describe GPIO pinout and functions. 2. Compare and contrast different communication protocols. 3. Describe what is meant by voltage level compatibility. 4. Describe Raspberry PI power requirements and limitations.

Python	8	Performance Indicators 1. Write functional program to demonstrate loops. 2. Write functional program to demonstrate if, else. 3. Write functional program to demonstrate arrays. 4. Write functional program to demonstrate event detection and interrupt handling. 5. Connect and read a simple sensor. 6. Create a flow chart for a program. Knowledge Indicators 1. Define loops. 2. Describe the use of if, else. 3. Describe the operation of arrays. 4. Describe the potential consequences when interfacing.
SQlite	5	Performance Indicators 1. Install SQlite. 2. Use SQLite to store and retrieve data. Knowledge Indicators 1. Define how to create and manage tables. 2. Describe inserting data into SQLite. 3. Describe querying data from SQLite. 4. Describe database optimization.
Digital inputs	4	Performance Indicators 1. Demonstrate pull up. 2. Demonstrate pull down. 3. Demonstrate floating grounds. Knowledge Indicators 1. Explain when you might use pull up or pull down resistors. 2. Explain how to calculate resistor values for pull up or pull down.
Digital input signal conditioning and interfacing	8	Performance Indicators 1. Debounce mechanical switches with software. 2. Debounce a mechanical switch with hardware. 3. Use digital protocols to interface to input devices. Knowledge Indicators 1. Explain I2C communication in Python. 2. Explain SPI communication in Python. 3. Explain switch bounce. 4. Explain how to use hardware to debounce a switch. 5. Explain how to use software to debounce a switch.
Analog inputs	8	Performance Indicators 1. Interface to and ADC using the LM35. Knowledge Indicators 1. Explain ADC . 2. Describe MISO, MOSI, CLK, CS for SPI-based ADCs . 3. Explain the use of HF and LP filters in ADC . 4. Explain resolution. 5. Explain sampling rate and data accuracy.
Continuous process control	8	Performance Indicators 1. Create a program to control a simple process using open loop control. Knowledge Indicators 1. Summarize open loop control. 2. Explain the advantages and disadvantages of open loop control.

Closed loop control	8	Performance Indicators 1. Create a program to control a simple process using on/off closed loop control. 2. Create a program to control a simple process using differential gap closed loop control. Knowledge Indicators 1. Compare open loop control with closed loop control. 2. Describe the some limitations of closed loop control. 3. Describe the some limitations of on/off closed loop control. 2. Describe the some limitations of differential gap closed loop control.
Proportional integral derivative control	10	Performance Indicators 1. Create a program to control a simple process using PID control. 2. Correctly tune the PID loop for this process. Knowledge Indicators 1. Explain the terms proportional, integral and derivative. 2. Explain the advantages of disadvantages of PID over other forms of closed loop control.
	65	

Outcomes*	At the successful completion of this course, students will be able to:
Course Outcome	Demonstrate proper program documentation techniques.
Course Outcome	Describe basic microcontroller hardware current, voltage, and frequency limits.
Course Outcome	Demonstrate proper programming and interfacing for input/output devices.
Primary Laker Learning Competency	Creative Thinking & Problem Solving: Students think creatively and solve problems by successfully combining knowledge in new ways.
Secondary Laker Learning Competency	Communication: Students communicate effectively and appropriately through the exchange of information.

**Course and program outcomes will be used in the software for outcomes assessment and should include at least 1 primary and 1 secondary Laker Learning Competency. Limit to 3-5.*