

ELEC 180 Course Outline as of Fall 2013**CATALOG INFORMATION**

Dept and Nbr: ELEC 180 Title: DIGITAL TOOLS FOR ELEC

Full Title: Digital Tools for Electronics

Last Reviewed: 4/22/2019

| 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 or P/NP

Repeatability: 00 - Two Repeats if Grade was D, F, NC, or NP

Also Listed As:

Formerly:

Catalog Description:

Fundamentals of computerized data acquisition and programmable instrument control using National Instruments LabVIEW graphical programming software. Topics include building virtual instruments (VIs), using control structures, using analog and digital signal generators, performing signal processing and analysis, creating charts and graphs, implementing instrument control and data acquisition. Includes an introduction to spice circuit simulation using National Instruments Multisim.

Prerequisites/Corequisites:**Recommended Preparation:**

Course Completion of CS 101B

Limits on Enrollment:**Schedule of Classes Information:**

Description: Fundamentals of computerized data acquisition and programmable instrument control using National Instruments LabVIEW graphical programming software. Topics include building virtual instruments (VIs), using control structures, using analog and digital signal

generators, performing signal processing and analysis, creating charts and graphs, implementing instrument control and data acquisition. Includes an introduction to spice circuit simulation using National Instruments Multisim. (Grade or P/NP)

Prerequisites/Corequisites:

Recommended: Course Completion of CS 101B

Limits on Enrollment:

Transfer Credit:

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: | | Effective: | 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. Design and build VIs.
2. Perform signal generation and measurement using LabVIEW data acquisition tools.
3. Identify and correct VI program errors.

Objectives:

Upon completion of this course, students will be able to:

1. View pre-existing virtual instruments in LabVIEW.
2. Design and build virtual instruments using the LabVIEW environment.
3. Identify and correct virtual instrument program errors.
4. Design and build sub-virtual Instruments.
5. Design and build virtual instruments that employ conditional and repetitive control structures.
6. Create array controls and indicators.
7. Create and customize waveform charts and graphs.
8. Generate and measure analog and digital signals by using the data acquisition tools in LabVIEW.
9. Create string manipulation functions.
10. Write to and read data from a file.
11. Design and build virtual instrumentation for signal generation and processing.
12. Detect, configure, and control an external instrument using LabVIEW.
13. Simulate electronic circuitry using Multisim.

Topics and Scope:

- I. LabVIEW Basics
 - A. The LabVIEW Environment
 - B. Opening, Loading, and Saving Virtual Instruments
- II. Virtual Instruments(VI)
 - A. The Front Panel
 - B. The Block Diagram
 - C. Building a VI
 - D. Data Flow Programming
- III. Editing and Debugging Virtual Instruments
 - A. Editing Techniques
 - 1. Creating Controls and Indicators on the Block Diagram
 - 2. Selecting, Moving and Resizing Objects
 - 3. Selecting and Deleting Wires
 - B. Debugging Techniques
 - 1. Finding Errors
 - 2. Single Stepping Through a VI and its SubVIs
 - 3. Breakpoint and Probes
- IV. SubVIs
 - A. Editing the Icon and Connector
 - B. Using a VI as a SubVI
 - C. Creating a SubVI
- V. Structures
 - A. The For Loop
 - B. The While Loop
 - C. Shift Registers and Feedback Nodes
 - D. Case Structures
 - E. Common Problems in Wiring Structures
- VI. Arrays and Clusters
 - A. Arrays
 - B. Creating Arrays with Loops
 - C. Array Functions
 - D. Clusters
- VII. Charts and Graphs
 - A. Waveform Charts and Graphs
 - B. XY Graphs
 - C. Customizing Charts and Graphs
- VIII.Data Acquisition (DAQ)
 - A. Components of a DAQ System
 - B. Types of Signals
 - C. Analog to Digital Conversions
 - D. DAQ Hardware Configuration
 - E. Analog Input/Output
 - F. Digital Input/Output
- IX. String and File Input/Output (I/O)
 - A. String Conversions
 - B. File I/O
 - C. Analysis
 - D. Signal Generation
 - E. Signal Processing
- X. Instrument Control
 - A. Components of an Instrument Control System

- B. Detecting and Configuring Instruments
- C. Instrument Drivers
- XI. Multisim Basics
 - A. Open and run existing multisim files.
 - B. Using the Multisim tools
 - C. Design and troubleshoot simulated circuits.
 - D. Use virtual instruments to measure simulated circuit properties.
- XII. Laboratory Exercises
 - A. Using the LabVIEW environment
 - B. Programming a Simple VI
 - C. Editing and Debugging Techniques
 - D. Using a SubVI
 - E. Programming Control Structures
 - F. Using Arrays and Clusters
 - G. Using a DAQ system
 - H. File input and output
 - I. Controlling an Instrument
 - J. Use a VI in a Multisim circuit

Assignment:

1. Reading from textbook(s) (approximately 35 pages per week).
2. Laboratory exercises (6-10)
3. Quizzes (2-4)
4. Final project: Design VI computer program.

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.

None, This is a degree applicable course but assessment tools based on writing are not included because problem solving assessments are more appropriate for this course.

Writing
0 - 0%

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

Computer programs and documentation; final project

Problem solving
20 - 30%

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

Laboratory assignments

Skill Demonstrations
20 - 30%

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

Multiple choice, true/false, matching items, completion,
short answer and problem solving

Exams
30 - 60%

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

Participation

Other Category
0 - 10%

Representative Textbooks and Materials:

LabVIEW 2009 Student Edition, by Robert Bishop. Prentice Hall, 2010.

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