

Course Syllabus

Department: Science & Technology

Date: Spring 2013

I. Course Prefix and Number: TECH 231

Course Name: Automation of Data Acquisition

Credit Hours and Contact Hours: 3 Credit Hours – 4 Contact Hours

Catalog Description including pre- and co-requisites:

The automation of data acquisition is essential for measurements in R&D as well as industrial environments where massive amounts of data are collected, especially when the data are to be collected much more rapidly than what is possible manually. The main topics covered are sources of signals, selection of appropriate transducers, and signal conditioning needed before signal is converted to digital format for computer controlled data acquisition and analysis. Students will complete a team-based case study project in which they will define and develop an innovative data acquisition solution using appropriate hardware and software tools. Prerequisites: ESC 174, MAT 152 or placement into Math Level 4, TECH 122, TECH 123.

Relationship to Academic Programs and Curriculum including SUNY Gen Ed designation if applicable:

The course relies on successful completion of prerequisite courses: TECH 122 Electronic Theory I, TECH 123 Digital Electronics, ESC 174 Computing for Engineers II, and MAT 152 Pre-Calculus. TECH 123 is required for AAS Mechanical Design and Drafting program. TECH 231 will be corequisite for TECH 232 Automation Control I. It will be prerequisite for TECH 234 Automation Control II.

II. Course Student Learning Outcomes: *State the student learning outcome(s) for the course (e.g. Student will be able to identify...)*

The culminating synthesis of student learning in the course will be a team-based case study project in which they will define and develop an innovative data acquisition solution using appropriate hardware and software tools. The student will demonstrate specific learning outcomes:

- * Identifying and defining the data acquisition requirements and specifying data acquisition tasks to be performed
- * Selecting appropriate sensors, signal conditioning, and data acquisition hardware
- * Setting up and testing of sensors, signal conditioning and data acquisition hardware
- * Developing a software solution to implement specified data acquisition tasks, using LabVIEW
- * Documenting and presenting an appropriate solution

College Learning Outcomes Addressed by the Course: *(check each College Learning Outcome addressed by the Student Learning Outcomes)*

- | | |
|---|---|
| <input type="checkbox"/> writing | x <input checked="" type="checkbox"/> computer literacy |
| <input type="checkbox"/> oral communications | <input type="checkbox"/> ethics/values |
| <input type="checkbox"/> reading | <input type="checkbox"/> citizenship |
| x <input checked="" type="checkbox"/> mathematics | <input type="checkbox"/> global concerns |
| x <input checked="" type="checkbox"/> critical thinking | <input type="checkbox"/> information resources |

III. Assessment Measures (Summarize how the college and student learning outcomes will be assessed): *For each identified outcome checked, please provide the specific assessment measure.*

List identified College Learning Outcomes(s)	Specific assessment measure(s)
Mathematics	Student will complete quantitative assignment using mathematical methods to model and analyze data acquisition system.
Critical Thinking	Student will complete complex problem solving assignment using all available resources.
Computer Literacy	Students will complete laboratory work and assignment using LabVIEW software.

IV. Instructional Materials and Methods

Types of Course Materials:

Software: LabVIEW and NI MAX

Hardware: Various types of Sensors, Signal Conditioning, Data Acquisition equipment

Text: Introduction to Data Acquisition with LabVIEW, by Robert H. King, published by McGraw-Hill Higher Education, 2012.

Methods of Instruction (e.g. Lecture, Lab, Seminar ...): Mini-lectures, active learning, hands-on activities, team based case study project

V. General Outline of Topics Covered:

Intermediate LabVIEW (building on the introduction to LabVIEW covered in ESC 172)

Sensors: Position, Acceleration, Strain, Load, Sound, Light, Voltage, Current, Flow, Temperature

Signal Conditioning

Digitization: Analog to Digital conversion

Instrument Control: Digital to Analog Conversion

Hardware configuration using NI MAX

Types of measurements: Single, repeating, and continuous

Data Visualization

Signal Processing & Analysis

Documentation of Data Acquisition

The students will complete a team-based case study project in which they will define and develop an innovative data acquisition solution using appropriate hardware and software tools.

Specific outcomes include:

- * Identifying and defining data acquisition requirements and specifying data acquisition tasks to be performed
- * Selecting appropriate sensors, signal conditioning, and data acquisition hardware
- * Setting up and testing of sensors, signal conditioning and data acquisition hardware
- * Developing a software solution to implement specified data acquisition tasks, using LabVIEW
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