Course Description

This course provides an introduction to data acquisition circuits and systems as well as basic feedback control systems. Topics include measurements techniques, computerized data acquisitions, introduction to LabVIEW, Interfacing to microcontrollers and instrumentation, signal processing and communications, and feedback control techniques, mechanical systems and mechanical power transmission. Students will learn the basics of measurements and data acquisition using LabVIEW based exercises.

The lab portion of this course provides students with hands-on experience with analog and digital closed loop automatic control components, circuits, and systems. It familiarizes students with analog and digital simulation techniques. LabVIEW and microcontrollers are used extensively with various sensors and actuators.

Course Detail

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **CRN** | **Cred** | **Title** | **Day** | **Time** | **Room** |
| 33193 | 3 | Data Acquisition and Controls | Thu | 5:00 pm – 6:40 pm | B213 |
| 33194 | 0 | LAB, Data Acq. And Controls | Thu | 6:41 pm – 9:26 pm | B213 |

Text

Modern Control Technology, Kilian, 3rd Edition (ISBN: 978-1-4018-5806-3)

BlackBoard

All students are required to monitor the Blackboard site for announcements, class material postings, and updates to the schedule. Grades will be posted on Blackboard.

Calculator Policy

A scientific or graphing calculator is allowed for all exams and homework. A computer may be used during the examination provided you have sufficient power and sit in such a way that your computer screen is visible by the instructor at all times.

Grading

Course grade will be based on assessment in the following areas:

* Homework (15%) – No late homework assignments will be accepted. Two homework assignments will be dropped. If you are not in class on the due date to record your homework, determine an alternate means of delivery (e.g., email).
* Quizzes (20%) – Quizzes will be completed at the end of each class meeting. If you are going to miss a quiz, you must get permission prior to the quiz unless it is an (instructor’s discretion) emergency. The low two quizzes will not be included.
* Labs/Participation (25%)
* Project (15%)
* Three Tests (25%) – Each test will contain problems to assess your understanding of the basic material (passing material), demonstrate achievement of course outcomes (C level), advanced understanding of material (B level), and application of material to unique situations (A level).

An optional final exam will be administered on the last day of class. This exam will allow you to replace any test scores lower than the final exam score. If your final is lower than all tests, it will not change any of them. The optional final exam will be comprehensive of all the material presented throughout the semester. The option final will be difficult. It will comprise problems to test your advanced understanding of material (B level) and application of material to unique situations (A level).

Attendance

Students with a known conflict will make the instructor aware of such conflict prior to missing a class or lab. Accommodations will be made for students with a reasonable excuse (e.g., religious holidays, extra-curricular activities, and emergencies). If the instructor is not notified in advance, it will be treated as an absence. Please be sure to silence cell phones prior to class.

Expectations

Our expectation is that you are spending 2-3 hours of reading and doing homework for this class for every “academic” hour we meet in class. We meet 5 “academic” hours per week, therefore you should expect to spend at least 10 - 15 hours per week on this class, outside of class meetings, every week!

Meeting once a week for a five-hour period will require discipline on your part to keep course material and course work fresh in your mind. Assigned homework problems will be categorized to help you stagger them. Easy, basic problems will be identified in one group and then more involved problems in a second group. You should be able to do the first group of homework problems quickly to verify your understanding of the material. The second group of problems should be completed over the next several days – one or two each day – and will require application of the material presented in class.

EET Outcomes

1. Students will practice the skills needed to work effectively in teams and as an individual.
2. Students will demonstrate the ability to use appropriate mathematical and computational skills needed for engineering technology applications.
3. Students will combine oral, graphical, and written communication skills to present and exchange information effectively and to direct technical activities.
4. Students will know of a professional code of ethics.
5. Students will describe concepts relating to quality, timeliness, and continuous improvement.
6. Students will describe how the concepts of electric circuits, electrical measurements, digital electronic devices, programmable logic circuits, electromechanical and automated systems, affect the design, maintenance, and operation of electrical systems.
7. Students will illustrate an ability to think critically and identify, evaluate and solve complex technical and non-technical problems; demonstrate creativity in designing problem solutions; and conduct and interpret experimental data and outcomes.
8. Students will recognize actions and acts of professionalism that allows them to become informed and participating citizens cognizant of ethics, civic duty, and social responsibility.
9. Students will recognize the need to be lifelong learners.

Course Outcomes

1. Mastery of Electrical Technology concepts as defined in the course syllabus
2. Identifying and defining data acquisition requirements and specifying data acquisition tasks to be performed.
3. Be familiar with a variety of sensor types of a data acquisition system.
4. Be familiar with the different forms of signal conditioning.
5. Demonstrate an ability to build and test circuits and systems related to closed-loop control systems
6. Demonstrate an ability to analyze and solve problems related to closed-loop control systems
7. Demonstrate an ability to build and test software systems related to LabVIEW data acquisition and control
8. Demonstrate an ability to analyze and solve problems related to LabVIEW systems
9. Demonstrate senior level oral and written communication skills
10. Demonstrate project management skills.

Plagiarism and Academic Honesty

At Three Rivers, we expect the highest standards of academic honesty. The Board of Trustees’ Proscribed Conduct Policy prohibits cheating on examinations, unauthorized collaboration on assignments, unauthorized access to examinations or course materials, and plagiarism.

Academic integrity is essential in all aspects of college coursework and learning. I have zero tolerance for academic dishonesty. Communication or collaboration of ANY sort is ABSOLUTEY PROHIBITED during any exam. Academic Misconduct is punishable in a number of ways, including a score of a zero on the assignment where the cheating took place, a grade of an F in the course and/or possible censure on your permanent record. All cases of academic dishonesty will be referred to the Academic Dean. Do not let yourself come under the suspicion of academic dishonesty.

IF IN DOUBT, ASK.

Professionalism and respect is demonstrated through a clear understanding of what is yours and what you learned from others. Be proud for your accomplishments; respect those of others.

Getting Help

* Tutoring and Academic Support Center
* Peer tutoring
* Extra help from the instructor (see schedule posted outside office C126 and by appointment)

Schedule

| **Week** | **Section** | **Material** | **Lab/Demonstration** |
| --- | --- | --- | --- |
| 27 Aug | 1.1 – 1.3 | * Course Overview – Expectations, Operations, Conduct
* Data Acquisition and Control System Overview
 | * Lab Safety
 |
| 3 Sep | 2.3 – 2.5Additional Handout | * Digital Acquisition
* Sampling theory
* Pre-filtering
 | * Introduction to LabVIEW
 |
| 10 Sep | 2.1, 2.2 | * Intro to Microcontrollers
 | * Arduino Introduction
 |
| 17 Sep | Handout | * Arduino Programming
 | * Arduino ADC/DAC
 |
| 24 Sep | Handout | * Project Management
* 25 Sep last day to choose audit
 | **Test #1** |
| 1 Oct | 4.2Chap. 12 | * Relays
* Programmable Logic Control (PLC)
 | * Timers, Time Delay
* Sequencer
 |
| 8 Oct | 3.1 | * Operational Amplifier Applications
 | * Initial Project Work
 |
| 15 Oct | 3.2, 3.3 | * Signal Conditioning
 | * Operational Amplifiers
 |
| 22 Oct | Chap. 6 | * Sensors
 | **Test #2** |
| 29 Oct | Handout | * Laplace Transforms
 | * Project Design
 |
| 5 Nov | Chap. 11 | * PID Controller
* 6 Nov last day to choose Pass/Fail
 | * Control System
 |
| 12 Nov | Chap. 4Chap. 10 | * Switches, Relays, and Power Control Devices
* Actuators
 | **Test #3** |
| 19 Nov |  | Thanksgiving Break | No Class |
| 26 Nov | Chap. 7Chap. 8Chap. 9 | * DC Motors
* Stepper Motor
* AC Motors
 | * Stepper Motor
 |
| 3 Dec |  | * Project Work
* 9 Dec last day to withdraw
 | * Project Work
 |
| 10 Dec |  | * Project Presentations
 | * (Optional) **Final**
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Sexual misconduct clause:

“The Board of Regents for Higher Education (BOR) in conjunction with the Connecticut State Colleges and Universities (CSCU) is committed to insuring that each member of every BOR governed college and university community has the opportunity to participate fully in the process of education free from acts of sexual misconduct, intimate partner violence and stalking. It is the intent of the BOR and each of its colleges or universities to provide safety, privacy and support to victims of sexual misconduct and intimate partner violence.”

Title IX clause:

“Title IX of the Education Amendments of 1972 (Title IX) prohibits discrimination based on sex in education programs and activities in federally funded schools at all levels. If any part of a school district or college receives any Federal funds for any purpose, all of the operations of the district or college are covered by Title IX.

Title IX protects students, employees, applicants for admission and employment, and other persons from all forms of sex discrimination, including discrimination based on gender identity or failure to conform to stereotypical notions of masculinity or femininity. All students (as well as other persons) at recipient institutions are protected by Title IX – regardless of their sex, sexual orientation, gender identity, part-or full-time status, disability, race, or national origin-in all aspects of a recipient’s educational programs and activities.”

If any student experiences sexual misconduct or harassment, and/or racial or ethnic discrimination on Three Rivers Community College Campus, or fears for their safety from a threat while on campus, please contact Vicki Baker, the Diversity Officer and Title IX Coordinator: 860-215-9208 (vbaker@trcc.commnet.edu)

Accommodations

Students with learning disabilities should contact the Learning Specialist, Matt Liscum, at 860-215-9265 or via email at mliscum@trcc.commnet.edu as soon as possible to ensure timely accommodations. Students with physical disabilities should contact Elizabeth Willcox at 860-215-9289 or via email at ewillcox@trcc.commnet.edu to facilitate accommodations. All testing accommodations MUST be discussed with the instructor in a timely manner, that is, *at least* one to two class meetings **prior** to any scheduled test for which accommodations are needed.

Student Digication Portfolio

As a student you will maintain an online learning portfolio using a college-designed template in Digication. Through this electronic tool you will have the opportunity to monitor your own growth in college-wide learning. It may even help you determine a major that is best suited to you. You will be able to keep and maintain your learning portfolio after graduation. A Three Rivers General Education Assessment Team will select and review random works to improve the college experience for all. If your work is selected and reviewed for assessment purposes, it will remain anonymous and private. Digication provides a “place” where you will connect your learning from the classroom, college, and life in general. Sometimes when you review all of the work you have done and think about it, you end up learning something different and perhaps unexpected. Please review your course outlines to determine what assignments to upload into the TRCC Digication template and please post your own choices, as well. Have fun in learning!

MyCommNet Alert Notification System

MyCommNet is a system that sends text messages and emails to anyone signed up in the event of a campus emergency. The system will also be used to deliver important information to students, faculty, and staff regarding weather-related class cancellations.  The system delivers both email messages, and text messages over cellular phones to those individuals who are registered.  To register, log on to your myCommnet account at <http://my.commnet.edu/> and follow the link to myCommnet Alert.

Class Cancellation

Except under rapidly changing conditions, information on the status of day classes will be available and published by 6:30 AM and by 3:00 PM for evening classes starting at 5:00 PM and later.

The College’s website will also have announcements regarding any delays, cancellations or closings. This information may be obtained by accessing the [www.threerivers.edu](http://www.trcc.commnet.edu/) home page.