



Mechatronics Program

Mechatronics Capstone

Suggested Syllabus

Part 1: Course Information

Course Overview

Basic Information

College:

Department:

Semester:

Instructor:

Office:

Office Hours:

Office Telephone:

Email:

Description

The Mechatronics Capstone is a hands-on study of the control, maintenance, and simulation of automated processes. This course consists of four lessons along with corresponding labs and/or class activities. The physical systems substations include processes such as pick and place feeding, automatic gauging, part indexing, part sorting and queuing, and robotic pick and place assembly; software simulation of each substation also are presented. The final project consists of the complete software and hardware integration of all subsystems into a fully functional mechatronics system. The course also embeds preparation for an industry-recognized mechatronics certification.

Prerequisites

Prerequisite or co-requisite courses are Electrical Systems, Mechanical Systems, Pneumatics and Hydraulics, Programmable Logic Controllers 1 and 2, Engineering CAD and Drafting, Autonomous Robots, Introduction to High-Tech Manufacturing, Introduction to Manufacturing Processes, Industrial Robots, and Welding.

Course Materials

Recommended Textbooks

Braga, N. (2002). *Mechatronics Sourcebook* (1st ed.). Independence, KS: Cengage Learning.
ISBN-13: 978-1401814328.

Course Structure

This course is designed to provide a hybrid experience, including both face-to-face and online activities. Activities to be completed online and face-to-face will be updated weekly and provided as a supplement to the course syllabus.

Contact time will be divided in the following way:

80% face-to-face

20% online

Face-to-face sessions

Laboratory exercises and in-class work will emphasize skill attainment and content mastery.

Online Sessions

Online sessions will include content and activities from Platform +, Wisc-Online, Tooling U, simulated lab activities, and other resources. To access online activities, students will need access to the Internet and a supported Web browser. Technical assistance can be obtained from local technical support.

Technical Requirements

- Internet connection.
- Access to college learning management system and Platform+.
- Access to college email account.
- Microsoft PowerPoint.
- Microsoft Word.

Part 2: Learning Outcomes

Following successful completion of the Mechatronics Capstone course, the student will be able to:

Applied Mathematics

- Solve mathematical problems related to machine control operations.

Critical Thinking/Problem Solving

- Interconnect computer-controlled machines to develop work cells or systems.
- Analyze and select appropriate sensing control and safety requirements for automated machinery.
- Develop machine order of operations.
- Develop detailed material listings for manufacturing processes.
- Create process plans and routings for multiple machining operations.
- Install and program PLC programs at an advanced level.

Equipment

- Adjust machines for accuracy and repeatability.

Safety

- Describe the hazards associated with automated machines and determine appropriate safety methods for working around computer-controlled machinery.

Technical Literacy

- Read, analyze, and use technical documents, such as prints, schematics, and data obtained from engineering drawings, for components within a mechatronic system.

Troubleshooting

- Diagnose, repair, test, and return to service failed components.
- Troubleshoot PLC programs at an advanced level.

Part 3: Course Calendar

This course calendar provides a schedule of lessons and an outline of topics covered. Activities, assignments, and assessments will be explained in detail throughout the course. Please contact the instructor with questions.

Lesson 1: Orientation, Safety, Teams, and Production

Date

1. Lab Safety Rules

2. Production-Operations-Management Teams and Teamwork
3. Lean Manufacturing Techniques and Suggested Approach to Project
4. Sequence and Step Mapping
5. Lab Activities: Safety Rules, Demonstration of System, Team Plan for Assembly of Assigned Project Station, Identifying Components/Connections, Production Flow Chart

Lesson 2: Applying Operational and Diagnostic Skills to Station

Date

1. Connecting Stations to Form a Complete Production Line
2. “Handshaking” Principles with Multiple PLC Program Controls
3. Robotic Synchronization with PLC Programming and Analog Interface Wiring
4. System Check and Single Part Run
5. Lab Activities: Function/Sequence Chart, Mechanical Assembly of Station, Pneumatic/Hydraulic Assembly, Power Supply, Line Layout/Wiring Harness, Electrical Components Mounted, Sensors Mounted

Lesson 3: Maintenance, Troubleshooting, and Diagnostics

Date

1. Maintenance of Operations
2. Troubleshooting a Multi-Station System
3. Diagnostic Techniques and Approach
4. Lab Activities: Diagnostic Techniques, Using Diagrams and Constructed I/O Maps, Troubleshooting and Correcting Faults within Multi-Station Unit or System

Lesson 4: Assessment and Certification

Date

1. Final Assessment Testing
2. Certifications Attached to Course or Program
3. Certification Preparation

Part 4: Grading Information

Graded Activities

Final Exam

There will be a comprehensive final exam worth 30% of the final grade.

Laboratory Exercises

Laboratory exercises measure skills and abilities relating to knowledge learned in class and will be worth 20% of the final grade.

Final Laboratory Projects

There will be two final laboratory projects, each worth 10% of the final grade.

Quizzes

Quizzes on assumed material will be designed for review and evaluation of learning and will be worth 10% of the final grade.

Homework

Doing work outside of class is critical to success. Homework is graded and will be worth 5% of the final grade.

Class Participation

Class participation is important and will be worth 5% of the final grade.

Grading Breakdown

Final Exam = 30%

Final Laboratory Project = 30%

Laboratory Exercises = 20%

Quizzes = 10%

Homework = 5%

Class Participation = 5%

Grading Scale

A = 90-100

B = 80-89

C = 70-79

D = 60-69

F = 59 and below

Late Work

Late work will not be accepted unless it is pre-approved by the instructor. All graded work will be posted in the college learning management system with 48 hours of due date.

Part 5: College Policies and Resources

Policies

Attendance

Academic Integrity

Campus Civility

Resources

Counseling

Veterans

Students with Disabilities

About These Materials

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http://www.ada.gov/2010ADASTandards_index.htm.

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