Syllabus

ARM 226 Programmable Automation Technologies- 3 credits

Second year course for Automation, Robotics, Mechatronics A.A.S. Degree at College of Lake County

Course Description

This course covers manufacturing technologies, including CNC, CAD and CAM; and microcontrollers and programming. The manufacturing technologies coved include Metal Cutting, Modal Analysis, CNC, CAM and CAD. The metal cutting section includes references on material properties, tool geometry and mechanics for manufacturing processes. The section on CNC includes different types of commands, an introduction to CNC design and general algorithms. The CAM section explains the use of NC, APT, parametric definitions as well as tool geometry. The microcontroller programming focuses on its interaction with other electronic elements and its role as part of a whole. The use of component data sheets for reference, calculations and design is also explained. The course culminates with the instruction of Assembly Language programming. A large portion of the course uses an Allen-Bradley Ferris Wheel Trainer for the laboratory activities.

Learning Outcomes

1. Apply knowledge about automation manufacturing to maintain and improve mechatronic systems.
2. Realize the importance of microcontrollers and automated tools as essential components on a mechatronic system.
3. Explain the relationship of these elements as part of a whole and how they interact with others in a way that allows for successful operation and continuous improvement.
4. Operate, assemble and interconnect microcontrollers.
5. Make use of microcontrollers in a mechatronic system taking advantage of its features to expedite automation systems.
6. Program mechatronic modules and systems.
7. Recognize metal cutting methods, tool geometries and general material properties.
8. Use CAD, CAM and CNC general concepts to maintain and improve mechatronic systems.
9. Understand CNC fundamentals and basic notions on CNC programming.
10. Identify general aspects about CAM, its applications and advantages in a automated manufacturing environment.
11. Represent models for mechatronic components by using CAD tools.

Topical Outline

Week 1 Microprocessor and Microcontroller Fundamentals
Processor components
Memory
Busses
Multiplexing
Low level programming languages

Ferris Wheel Trainer – Allen-Bradley Equipment

Week 1	Identifying Common Industries in Industrial Automation
Week 2	Understanding Industrial Automation Careers
Week 3	Identifying Industrial Automation Standards and Regulations
Week 4	Understanding Basic Mechanical Components
Week 5	Understanding Automation Control Systems
Week 6	Understanding Controllers
Week 7	Identifying I/O Devices and Modules
Week 8	Understanding Networks
Week 9	Recognizing Logic
Week 10	Recognizing Basic Programming Concepts
Week 11	Identifying System Documentation
Week 12	HMI Operator Interface
Week 13	AC/DC Motors and Drives
Week 14	Understanding Safety in Automation
Week 15	Understanding Process Control

Week 16 CNC

1. Metal cutting
2. Tool Wear
3. Static deformation
4. Vibrations
5. Modal analysis
6. NC – Computer numerical control (Automated Manufacturing)
7. CAM – Computer aided manufacturing
8. CAD – Computer aided design

Course Prerequisites:

Autonomous Robots I, II, III