Course Information

Catalog Description: The course introduces the concepts of subtractive manufacturing and CNC machining. The major processes of CNC turning and CNC milling, will be introduced in an applied setting. Students will also learn the hands-on setup of CNC work holding, CNC tooling, tool offsets and metrology in subtractive manufacturing processes.

Prerequisite(s):

Corequisite(s):

Credits: 3

Hours: 3

Required Text(s): *CNC Machining Handbook: Building, Programming, and Implementation: Building, Programming, and Implementation* 1st edition | ISBN-10: 0071623019

Supplemental Materials:

Instructor Information

Instructor's Name:

Contact Information:

Office Hours:

Program Goals

1. Equip students with a strong theoretical and applied understanding of robotics, mechatronics, automation, and AI, ensuring they are well-prepared for industry and further education.
2. Develop expertise in the structure, design, components, and subassemblies that make up robotic and automated systems, including motion control, sensors, actuators, and AI integration.

3. Provide hands-on experience to ensure proficiency in troubleshooting, diagnosing, and optimizing complex robotic and automation systems.
4. Ensure students acquire an applied understanding of manufacturing automation, including the tools, practices and processes involved in robotic and automated manufacturing.
5. Develop a hands-on understanding of the interrelation between mechatronic, robotic and automation hardware and software; foster technical proficiency in programming and interfacing robotic systems with AI-driven automation tools, ensuring adaptability in a rapidly advancing field.

Class Core Competencies

The following core competencies are embedded in this curriculum:

- Communicate effectively in both speech and writing.
- Apply appropriate mathematical and statistical concepts and operations to interpret data to solve problems.
- Use computer systems or other appropriate forms of technology to achieve educational and personal goals.
- Address an information need by locating, evaluating, and effectively using information.

Class Learning Assessment

Student Learning Outcomes	Suggested Means of Assessment
Understanding the impact of feeds and speeds on CNC machining operations and surface finishes.	Lab exercises and quizzes
A hands-on understanding of the setup of tool and workpiece offsets.	Lab exercises
A hands-on understanding of the setup of CNC work-holding fixtures and vises to ensure optimal operations and cycle times.	Lab exercises
A hands-on understanding of various tooling types for both milling and turning operations	Lab exercises

Student Learning Outcomes	Suggested Means of Assessment
Proficiency in converting CAD drawings into G-Code using a CAM software suite.	Lab exercises and final project

Grading System

Letter Grade	Percentage Range
A	90 to 100 percent
B Plus (B+)	87 to 89.9 percent
B	80 to 86.9 percent
C Plus (C+)	77 to 79.9 percent
C	70 to 76.9 percent
D	60 to 69.9 percent
F	Below 60 percent

College Information

Disability Services
Disability Services Webpage

Statement and Policy on Cheating, Plagiarism, and Academic Conduct
Academic Conduct Policy (Policy 304) [PDF]

Students are required to perform all the work specified by the instructor and are responsible for the content and integrity of all academic work submitted. A violation of academic integrity will occur if a student: (1) knowingly represents work of others as one's own, (2) uses or obtains unauthorized assistance in any academic work, (3) gives fraudulent assistance to another student, or (4) furnishes false information or other misuse of college documents.

Unauthorized use of Artificial Intelligence (AI) is prohibited unless the instructor explicitly permits it in the syllabus or assignments. If tools such as ChatGPT are permitted by an instructor to be used for an assignment, they should be used with caution and with proper citation. In all such cases, you may only use the specific tools identified as acceptable and you must adhere to the College's standards for attribution, validation, and transparency.

In cases of suspected violation of academic integrity, the incident is to be reported to the Office of Academics. A student found guilty of violating the rule of academic integrity by the Vice President of Academics will be considered to have failed in personal

obligation to the College; such failure will be subject to disciplinary action by the College. Unless otherwise notified, the instructor will allow students who are pending disciplinary action to attend class.

Tutoring and Testing at the Instructional Support Center (ISC)

- Instructional Support Center (ISC) Webpage

WCCC Library Services

- WCCC Library Website

Citation Styles and Formatting

Work submitted for any Warren County Community College course must conform to the required formatting and citation style that are specified by the instructor. The Library and Instructional Support Center can assist students with formatting and citations for assignments and papers.

WCCC Attendance Expectations

The College expects students to attend and participate in all classes. This involves sharing discussions and lectures in class, as well as interacting with other students. Grades are based on the quality of work students complete in meeting the requirements for a particular course, as stated in the course syllabus and catalog description. Attendance, among other factors, may be an additional criterion for assigning grades. Students should realize that they are responsible for all class meetings and that work missed because of absences may affect their grades. Attendance in online classes is determined by the completion of assignments/ tests. Students who have not completed any assignments or tests will be considered non-attending and receive an NF grade in online classes.

Class Attendance Expectations

Topical Outline

1. Introduction to CNC Machining and Production
2. Metrology for CNC Manufacturing
3. Using Fusion 360 for Computer Aided Manufacturing (CAM)
4. Generating and modifying G-Code using a CAM software program
5. Operations, Cycle Times and Program Optimization

6. CNC Milling topics:
    - Tooling Setup
    - Work holding setup
    - Running g-code
    - Coolant
    - Tool life management
    - Optimizing operations and cycle time
    - Palletization and workflow management
7. CNC Turning topics:
    - Tooling Setup
    - Work holding setup
    - Running g-code
    - Tool life management
    - Lights-out manufacturing
    - Optimizing operations and cycle time

Grading Methods

Assignment	Points/Percentage

Class Itinerary

Week / Unit	Topic	Readings/Assignments

Week / Unit	Topic	Readings/Assignments