



COURSE OUTLINE

Course Number AMT 232	Course Title Advanced Computer Numerically Controlled Machines	Credits 3.0
Hours: Lecture/Lab/Other 2/3	Co- or Pre-requisite AMT 231	Implementation Semester & Year Fall 2022

Catalog description:

Investigates advanced theory and practical CAD/CAM (Computer Aided Drafting / Computer Aided Manufacturing) software concepts on computer numerical controlled (CNC) machining equipment used in industry to manufacture extremely precise and complicated machine tool products. Topics include CAD/CAM software (Mastercam) to produce complex machined parts, G and M code post-processing operations and machine tool safety practices. Corresponding labs reinforce lectures with practical hands-on examples which follow NIMS certification requirements.

General Education Category:
[Not GenEd](#)

Course coordinator:
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Required texts & Other materials:

Mastercam 2023 - Mill 2D & 3D & Lathe Training Guide Combo
ISBN #:978-1-988766-96-6

Course Student Learning Outcomes (SLO):

Upon successful completion of this course the student will be able to:

1. Setup working environment in Mastercam (ILG 2,4,10,11 / PLO 3,6)
2. Create 2D and 3D geometry in Mastercam (ILG 4,11 / PLO 3,6,7)
3. Create Mill 2D and 3D toolpaths in Mastercam (ILG 4,11 / PLO 3,6,7)
4. Create lathe toolpaths in Mastercam (ILG 4,11 / PLO 3,6,7)
5. Generate NC code in Mastercam (ILG 4,11 / PLO 3,6,7)

Course-specific Institutional Learning Goals (ILG):

Institutional Learning Goal 2 Mathematics: Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

Institutional Learning Goal 3 Science: Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.

Institutional Learning Goal 4 Technology: Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Institutional Learning Goal 10 Information Literacy: Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.

Institutional Learning Goal 11 Critical Thinking: Students will use critical thinking skills understand, analyze, or apply information or solve problems.

Program Learning Outcomes for (PLO)

1. Maintain a safe and organized workspace.
2. Interpret blueprints to manufacture parts.
3. Apply shop and tool room mathematics as needed.
4. Complete part inspection using appropriate instruments such as micrometers, calipers, and scales.
5. Set up and operate a manual drill press, lathe, milling machine, grinder and press brake.
6. Set up and operate CNC machines (lathe and mill).
7. Use NC programming (G and M codes) to control movement and cutting processes.
8. Understanding of statistical quality control.
9. Understanding of the broad spectrum of manufacturing technologies.
10. Pursue NIMS certification.

Units of study in detail – Unit Student Learning Outcomes:

Unit I Mill 2D operations in Mastercam (SLO 1,2,3,5)

The student will be able to:

1. Setup the environment in Mastercam
2. Create 2D geometry in Mastercam (using lines, circles, rectangles, arcs, Mirror, trim, translate, copy, move, divide, delete commands)
3. Define rough stock and setup in Mastercam.
4. Create spot drilling, drilling, contour, pocket, tap, face and 2D high speed toolpaths in Mastercam.
5. Inspect the toolpath using Mastercam Verify and back plot.
6. Generate NC code.

Unit II Mill 3D operations in Mastercam (SLO 1,2,3,5)

The student will be able to:

1. Setup the environment in Mastercam
2. Create 3D geometry in Mastercam (using lines, circles, rectangles, arcs, Mirror, trim, translate, copy, move, divide, delete commands)
3. Create revolved surface, lofted solid, net surface, silhouette boundary, swept surface, flat boundary surface, filleted surface, ruled surface in Mastercam.
4. Create solid bodies, extruded solid, revolved solid, filleted solid, levels in Mastercam.
5. Define rough stock and setup in Mastercam.
6. Create dynamic OptiRough, Hybrid, rough parallel, surface high speed raster, surface high speed area roughing, finish flowline, waterline, scallop, rough plunge, finish contour, finish shallow, surface rough pocket and surface finish contour 3D toolpaths in Mastercam.
7. Inspect the toolpath using Mastercam Verify and back plot.

8. Generate NC code.

Unit III Lathe operations in Mastercam (SLO 1,2,4,5)

1. Setup the environment in Mastercam
2. Define rough stock and setup in Mastercam.
3. Create lathe face, rough, finish, cutoff, spot drill, drill, thread and groove toolpaths in Mastercam.
4. Inspect the toolpath using Mastercam Verify and back plot.
5. Generate NC code.

Method of Instruction

Learning will take place via classroom instruction, lab demonstrations and student activities, as well as through textbook reading and homework assignments. Lab activities will augment this. Use of equipment and manual skills will be developed in the lab.

Evaluation of student learning:

Students' achievement of the course objectives will be evaluated through the use of the following:

- Three unit tests assessing students' comprehension of terminology, calculations and practices related to the unit objectives.
- Lab grade based on shop projects and lab assignment results.
- In class participation, homework assignments and attendance.

Evaluation Tools	
3 Unit Tests	60%
Lab Assignments / Shop Projects	20%
Homework / In-Class Assignments	20%
Total	100%