



STARK STATE COLLEGE

GENERAL SYLLABUS

Course Information

Course Name: Master CAM Operations
Course Number: ARL224

Required Materials

Textbook(s): MasterCam Operations Handbook Ariel Corp.
Required Readings: None
Additional Materials: Scientific Calculator, Laptops, Note Pads, Writing Utensils, Web Links, Handouts and related items as provided in class.

Course Outline/Calendar

The date of coverage and order of coverage may be modified based on the faculty member and events beyond the control of faculty members that interfere with class times and teaching.

Week	Chapter/Topic/Lab
1-4: Introduction to Mastercam and CAD/CAM	<ul style="list-style-type: none"> ○ Interface and layout navigation. ○ File management and settings configuration. ○ Fundamentals of G-code and CAM processes.
2: 2D Geometry Creation	<ul style="list-style-type: none"> ○ Creating lines, arcs, and points. ○ Transforming geometry (translating, rotating, mirroring). ○ Using Levels and managing layers.
3: 2D Toolpath Creation	<ul style="list-style-type: none"> ○ Stock setup and machine selection. ○ Chaining geometry and creating 2D contour and pocket toolpaths. ○ Backplotting and verifying toolpaths.
4: Intermediate 2D Toolpaths	<ul style="list-style-type: none"> ○ Dynamic Milling for efficient material removal. ○ Advanced drilling, including peck and custom cycles. ○ Creating engraving and circular mill toolpaths.
5: Solid Modeling Basics	<ul style="list-style-type: none"> ○ Extruding, revolving, and sweeping solid geometry. ○ Using Boolean functions and creating solid fillets and chamfers. ○ Editing solid history and preparing models for machining.
6: 3D Toolpath Creation (Basic)	<ul style="list-style-type: none"> ○ Working with stock models and machine simulation. ○ Creating surface roughing and finishing toolpaths. ○ Using waterline and raster toolpaths.
7: Advanced 3D Toolpaths	<ul style="list-style-type: none"> ○ High-speed surface machining strategies. ○ Implementing rest machining for complex areas. ○ Optimizing toolpaths with filtering and tolerance settings.

Week	Chapter/Topic/Lab
8:Midterm Project	<ul style="list-style-type: none"> ○ Design and program a complex 3D part using wireframe and solid geometry. ○ Generate and verify toolpaths for roughing and finishing operations. ○ Submit the Mastercam file and a final report detailing the manufacturing process.
9: Lathe Basics	<ul style="list-style-type: none"> ○ Lathe machine setup, including stock, jaws, and tools. ○ Creating 2D geometry and profiles for turning. ○ Performing facing, roughing, and finishing toolpaths.
10: Advanced Lathe Techniques	<ul style="list-style-type: none"> ○ Programming groove and thread toolpaths. ○ Introduction to C- and Y-axis toolpaths for live tooling. ○ Simulating and verifying lathe operations.
11: Introduction to Multiaxis	<ul style="list-style-type: none"> ○ Understanding 4- and 5-axis machine types. ○ Creating basic 4-axis toolpaths, such as rotary substitution. ○ Performing indexed multiaxis programming.
12: Miltiaxis Applications	<ul style="list-style-type: none"> ○ Programming advanced multiaxis toolpaths, including unified and flowline. ○ Utilizing specialized toolpaths like deburring and swarfing.
13: Efficiency and Automation	<ul style="list-style-type: none"> ○ Tool library management and custom tool creation. ○ Using Mastercam Add-ons and implementing automation features. ○ Strategies for post-processing and generating setup sheets.
14: Troubleshooting and Optimization	<ul style="list-style-type: none"> ○ Identifying and fixing common programming and geometry issues. ○ Optimizing toolpaths for specific machine, material, and tool combinations. ○ Best practices for shop floor documentation and communication.
15: Final Project Development	<ul style="list-style-type: none"> ○ Students begin working on their final project, integrating all course concepts. ○ Mentoring sessions with the instructor for project guidance and feedback.
16: Final Project Presentation and Evaluation	<ul style="list-style-type: none"> ○ Students present their final project, demonstrating the complete process from design to generated G-code.