



STARK STATE COLLEGE

GENERAL SYLLABUS

Course Information

Course Name: CNC MACHNG Center Programming In Coventional Format
Course Number: ARL133

Required Materials

Textbook(s): None
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 – Introduction to CNC and Mazatrol	<ul style="list-style-type: none"> CNC fundamentals: Review of industrial safety, standard G-code vs. conversational programming, and basic machine components. Mazatrol conversational programming: Overview of the user interface, basic control navigation, and the core concept of Mazatrol units. Hands-on: Powering up and navigating a Mazak control.
2 – Program Creation Basics	<ul style="list-style-type: none"> Program structure: Understanding the "Common Unit," "Workpiece Unit" (WPC), and "End Unit". Part setup: Defining raw stock and coordinate systems (e.g., origin, offsets, theta angle). Tool data: Entering tool geometry, offset data, and selecting tool sequences.
3 – Basic Point Machining (Hole Cycles)	<ul style="list-style-type: none"> Point units: Introduction to creating drilling, tapping, and reaming operations. Cutting conditions: Entering speeds, feeds, and material types in the conversational interface. Hands-on: Programming and simulating simple point machining on a Mazak simulator.
4- Basic Line and Face Milling	<ul style="list-style-type: none"> Line units: Programming linear milling operations such as pocketing and contouring. Face units: Creating facing operations to machine the top of a workpiece. Hands-on: Simulating a workpiece with basic face milling, pocketing, and a hole pattern.
5- Contouring and Islands	<ul style="list-style-type: none"> Contouring: Programming complex external and internal profiles using line and shape sequences. Islands: Creating programs that include cutouts and un-machined sections (islands). Hands-on: Machining a part with a stepped profile and an island.
6 – Tool Path Verification and Simulation	<ul style="list-style-type: none"> Built-in simulation: Using the control's graphical simulation to verify tool paths, identify collisions, and check for errors. Dry runs: Performing a dry run on the physical machine to confirm program safety.

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	<ul style="list-style-type: none"> Hands-on: Simulating and dry-running more complex parts before cutting.
7 – Tool Selection and Advanced Cutting Conditions	<ul style="list-style-type: none"> Optimizing tools: Choosing the right tools and tool sequences for different materials and finishing requirements. Advanced cutting: Overriding automatic speeds and feeds for specific situations or to improve surface finish. Hands-on: Fine-tuning a program by adjusting tool parameters and cutting conditions.
8 – Machine Setup and First Part Run	<ul style="list-style-type: none"> Workholding: Proper installation and tramping of vises and fixtures. Tool setting: Setting tool length and diameter offsets in the machine control. First part: Running a pre-written program to machine a part, including minor offset adjustments.
9 – Manual Units and G-Code Integration	<ul style="list-style-type: none"> Manual units: Integrating manual G-code sections into a Mazatrol program for greater flexibility. Applications: Using manual units for custom movements, programming stops, and other operations not available conversationally. Hands-on: Programming a manual unit to perform a non-standard task.
10 – 4 th Axis and Slant Surface Machining	<ul style="list-style-type: none"> 4th-axis programming: Understanding rotary axis movements and indexing. Slant surface machining: Programming tool paths for machining angled surfaces. Hands-on: Programming and machining a simple 4th-axis workpiece.
11 – Probing Cycles	<ul style="list-style-type: none"> Introduction to probing: Using Renishaw or other probing tools to set work offsets. In-process measurement: Probing features during a machining cycle to verify accuracy and trigger offset adjustments. Hands-on: Creating a program that uses a probing cycle to find a part's origin.
12 – Complex Geometry and Multi-Part Production	<ul style="list-style-type: none"> Complex geometry: Programming parts with more intricate curves, intersecting features, and 3D paths. Multi-part mode: Programming the simultaneous production of multiple identical parts using offset patterns. Hands-on: Programming a part with complex geometry and then creating a multi-part production run.
13 – Machining Different Materials	<ul style="list-style-type: none"> Material properties: Discussing how different materials (e.g., steel, aluminum, exotic alloys) affect cutting conditions and tool selection. Strategy adjustments: Modifying Mazatrol cutting parameters for optimal chip evacuation and surface finish. Hands-on: Machining a part using a material different from previous projects.
14 – Program Transfer and Data Management	<ul style="list-style-type: none"> Data transfer: Moving programs and data from a PC to the Mazak control via network, USB, or other methods. Program storage: Understanding file management on the control and backing up programs. Hands-on: Transferring a program to the machine and saving existing programs.
15 – Troubleshooting and Optimization	<ul style="list-style-type: none"> Error handling: Deciphering and addressing common Mazatrol alarm codes and program errors. Cycle time optimization: Reviewing and modifying programs to reduce machining time without compromising quality. Hands-on: Troubleshooting and optimizing existing programs.
16 – Final Project	<ul style="list-style-type: none"> Project assignment: Students receive a complex part print and are responsible for all aspects of the job. Project execution: Students program the part in Mazatrol, set up the machine, and complete the machining operation.