



STARK STATE COLLEGE

GENERAL SYLLABUS

Course Information

Course Name: CNC Lathe Operations
Course Number: ARL121

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
1-4 Foundation Skills	<ul style="list-style-type: none"> • Machine safety and workshop orientation: Proper use of personal protective equipment (PPE), emergency procedures, machine-specific safety features (e-stops, interlocks), and general workshop safety rules. • Introduction to CNC: History and principles of CNC machining, the function of a CNC lathe, and an overview of components (spindle, turret, control panel, etc.). • Measurement and metrology: Proper use of precision measuring instruments like micrometers, calipers, and dial indicators to verify part dimensions. • Blueprint reading and shop math: Interpretation of engineering drawings, including orthographic projections, dimensions, and tolerances. Application of shop math for calculations involving speeds, feeds, and coordinate points.
5-8 Basic Programming and Setup	<ul style="list-style-type: none"> • Introduction to G- and M-codes: Fundamental G-codes (preparatory functions) and M-codes (miscellaneous functions) for basic machine movements, spindle control, and coolant control. • Cartesian coordinate system: Understanding the X- and Z-axes for a CNC lathe, including absolute and incremental positioning. • Manual programming: Writing simple programs by hand for basic operations like facing, turning, and drilling. • Tooling and workholding: Identifying different types of turning tools and inserts. Learning how to select and set up workholding devices like chucks and collets. • Machine setup: Performing a basic machine power-up, checking coolant levels, and properly securing raw stock.

Week	Chapter/Topic/Lab
9-12 Intermediate Programming and Operations	<ul style="list-style-type: none"> • Advanced G- and M-codes: Studying more complex codes for threading (G76), grooving (G75), and multiple repetitive cycles (G71, G70). • Tool and work offsets: Learning how to set tool offsets and work offsets to establish the part's zero point, crucial for part accuracy. • Canned cycles: Understanding and implementing canned cycles to simplify programming for repetitive tasks like drilling, tapping, and roughing. • Live tooling (optional): Introduction to live tooling for operations like cross-drilling and milling on a turn-mill center. • CAM software introduction: Initial exposure to Computer-Aided Manufacturing (CAM) software (e.g., Mastercam, Fusion 360) for generating toolpaths.
13-16 Advanced Applications and Project-Based Learning	<ul style="list-style-type: none"> • CAM-driven projects: Generating and simulating toolpaths from CAD models using CAM software and exporting the G-code to the machine. • Part inspection and troubleshooting: Learning to inspect finished parts using precision tools and how to troubleshoot common issues like dimensional errors, tool wear, and program alarms. • Multi-feature programming: Developing complex programs to machine parts requiring multiple operations, including turning, threading, and grooving. • Final project: Applying all learned skills to produce a multi-featured, finished part from a blueprint, covering programming, setup, and operation.