



STARK STATE COLLEGE

GENERAL SYLLABUS

Course Information

Course Name: Precision Grinding
Course Number: ARL128

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
1-2 Introduction to Grinding and Safety	<ul style="list-style-type: none"> • Fundamental concepts: History, importance, and applications of precision grinding. • Workshop safety: Personal protective equipment (PPE), machine safety features, and emergency procedures. • Measurement and inspection: Basic shop math, measuring tools (micrometers, calipers, dial indicators), and an introduction to GD&T (Geometric Dimensioning and Tolerancing).
3-5 Abrasives and Grinding Wheels	<ul style="list-style-type: none"> • Grinding wheel technology: Understanding abrasive types (aluminum oxide, diamond, CBN), grit size, and bond materials. • Wheel characteristics: Interpreting wheel markings and selecting the correct wheel for different materials and applications. • Wheel preparation: Proper mounting, balancing, and ringing of grinding wheels. • Wheel truing and dressing: Techniques for truing (restoring concentricity) and dressing (sharpening) the grinding wheel.
6-8 Surface Grinding	<ul style="list-style-type: none"> • Surface grinding machines: Operation, components, and maintenance of horizontal and vertical spindle surface grinders. • Workholding: Using magnetic chucks, vises, and other fixtures to secure workpieces. • Basic techniques: Grinding flat, square, and parallel surfaces. • Advanced techniques: Plunge grinding and grinding angles using sine vises and tables.
9-11 Cylindrical Grinding	<ul style="list-style-type: none"> • Cylindrical grinding machines: Operation and components of center-type and chucking-type cylindrical grinders. • Workholding: Methods for holding workpieces between centers and in chucks.

Week	Chapter/Topic/Lab
	<ul style="list-style-type: none"> • External diameter (OD) grinding: Techniques for grinding external diameters to precise tolerances. • Internal diameter (ID) grinding: Introduction to grinding internal holes and bores. • Centerless grinding: Overview of throughfeed and infeed centerless grinding.
12-14 Advanced Grinding and Special Applications	<ul style="list-style-type: none"> • Creep-feed grinding: Understanding the principles and applications of this high-efficiency grinding process. • Form grinding: Creating complex profiles and contours on a workpiece. • Tool and cutter grinding: Sharpening cutting tools like end mills, drills, and reamers. • Jig grinding: Introduction to the principles of jig grinding for extremely accurate hole and contour finishing.
15- CNC Grinding and Process Optimization	<ul style="list-style-type: none"> • CNC grinding fundamentals: Overview of CNC controls, machine setup, and programming. • Process control and optimization: Using calculations to determine material removal rates (Q'), specific energy, and other parameters to improve quality and efficiency. • Troubleshooting: Identifying and correcting common grinding issues like burn, chatter, and poor surface finish. • Coolants and fluids: Selection and management of grinding fluids.
16	<ul style="list-style-type: none"> • Review: Comprehensive review of all course topics to prepare for final assessments. • Final projects: Hands-on projects to demonstrate mastery of skills, including grinding a specific set of blocks or tools to very tight tolerances.