

MACH-210: MACHINE TECHNOLOGY 3

Effective Term

Fall 2026

CC Approval

10/03/2025

AS Approval

10/09/2025

BOT Approval

10/16/2025

SECTION A - Course Data Elements

Send Workflow to Initiator

No

CB04 Credit Status

Credit - Degree Applicable

Discipline

Minimum Qualifications	And/Or
Machine Tool Technology (Tool and die making) (Any Degree and Professional Experience)	

Subject Code

MACH - Machine Tool Technology

Course Number

210

Department

Machine Tool Technology

Division

Career Education and Workforce Development (CEWD)

Full Course Title

Machine Technology 3

Short Title

Machine Technology 3

CB03 TOP Code

0956.30 - *Machining and Machine Tools

CB08 Basic Skills Status

NBS - Not Basic Skills

CB09 SAM Code

B - Advanced Occupational

Rationale

The SLOs were revised to streamline outcomes, eliminate redundancy, and ensure alignment with current industry standards and measurable skills for student success.

SECTION B - Course Description

Catalog Course Description

An advanced course in the machine tool technology degree program. This course emphasizes skills in the operation of horizontal and vertical milling machines. Advanced milling operations include gear cutting, gear calculations, and the use of rotary tables, index heads and dividing heads and multiple-lead threading.

SECTION C - Conditions on Enrollment

Open Entry/Open Exit

No

Repeatability

Not Repeatable

Grading Options

Letter Grade or Pass/No Pass

Allow Audit

Yes

Requisites

Prerequisite(s)

Completion of MACH-111 with a minimum grade of C.

Requisite Justification

Requisite Description

Course in a Sequence

Subject

MACH

Course

111

Level of Scrutiny

Content Review

Upon entering this course, students should be able to:

- Machine mandrels, gear blanks, threaded parts, and cams using an engine lathe.
- Perform calculations for various thread forms.
- Measure machined parts to determine if parts are to drawing tolerances.
- Design parts using proper steel selection processes.
- Specify proper heat-treating processes for parts.

SECTION D - Course Standards

Is this course variable unit?

No

Units

7.00

Lecture Hours

54.00

Lab Hours

216.00

Outside of Class Hours

108

Total Contact Hours

270

Total Student Hours

378

Distance Education Approval**Is this course offered through Distance Education?**

No

SECTION E - Course Content**Student Learning Outcomes**

Upon satisfactory completion of the course, students will be able to:	
1.	Perform advanced machining operations, including gear cutting and multiple-lead threading, on lathes and vertical and horizontal milling machines.
2.	Apply gear cutting calculations and advanced measurement techniques to ensure precision and quality control of machined components.
3.	Interpret complex engineering drawings and develop complete manufacturing plans, including sequencing of operations, tooling strategy, and workholding methods.
4.	Verify part accuracy using specialized precision instruments, ensuring conformance with blueprint specifications and industry-standard tolerances.

Course Objectives

Upon satisfactory completion of the course, students will be able to:	
1.	Accurately calculate formulas for sizing and cutting spur gears.
2.	Accurately measure gears with specialized precision measurement instruments.
3.	Complete advanced machining operations on the engine lathe and milling machine.
4.	Accurately cut a multiple-lead thread using the engine lathe.

Course Content

- **Safety in Advanced Machining Environments**
 - Hazard analysis for horizontal milling machines and gear cutting setups
 - Advanced PPE use and risk mitigation during multi-axis operations
- **Gear Cutting Theory and Calculations**
 - Diametral pitch, pressure angle, and tooth geometry
 - Gear ratios and compound gear train analysis
 - Indexing calculations for spur, helical, and bevel gears
- **Setup and Operation of Dividing Heads and Rotary Tables**
 - Headstock alignment and tailstock support
 - Mounting and tramping techniques for precise angular cuts
 - Sector arms and differential indexing
- **Advanced Vertical Milling Machine Operations**
 - Use of fly cutters, shell mills, and slitting saws
 - Machining irregular shapes and cam profiles
 - Multi-axis positioning and clamping strategies
- **Advanced Horizontal Milling Machine Operations**
 - Gear train setup for multi-lead threading
 - Use of arbors, spacers, and overarms for rigidity
 - Complex fixture and jig design
- **Multiple-Lead Threading Operations on Engine Lathe**
 - Synchronizing lead screw and spindle for compound threads
 - Use of threading dials and compound rest setups
 - Inspection using thread pitch gauges and micrometers
- **Blueprint Analysis and Machining Process Planning**

- Creating machining sequences for complex parts
- Tool selection and changeout strategy
- Setup sheets and documentation for repeatability
- **Intermediate Metrology and Inspection**
 - Gear inspection using tooth thickness and span measurements
 - Surface finish analysis using comparator plates
 - Use of gauge blocks, dial indicators, and micrometers

Methods of Instruction

Methods of Instruction

Types	Examples of learning activities
Activity	Students complete advanced machining projects, such as machining spur gears and performing multi-step operations using vertical and horizontal milling machines.
Lecture	Demonstrations of advanced milling operations (gear cutting, dividing head use, rotary table setups, and multiple-lead threading). Step-by-step examples of gear cutting calculations and indexing processes.

Methods of Evaluation

Methods of Evaluation

Types	Examples of classroom assessments
Projects	Students are evaluated on the accuracy, tolerances, and surface finishes of advanced machined parts (e.g., precision spur gears or lead screws). Evaluation includes setup efficiency, adherence to safety, and proper tool usage.
Lab Activities	A capstone gear-cutting project graded on accurate calculations, machining, and inspection of gear dimensions. Students will complete weekly lab assignments. Example: lab assignment #1, machining of a diametral pitch spur gear.
Exams/Tests	Written exams with calculation problems, part analysis, and identification of advanced tooling or gear-cutting methods. Students will be given a written midterm exam and a written final exam. Example: A midterm and a final exam consisting of multiple choice and identification questions.
Quizzes	Students will be given written weekly quizzes covering assigned reading and weekly lectures. Example: Quizzes consisting of identification and multiple-choice questions.

Assignments

Reading Assignments

1. Students will be required to read their notes from lab lectures in order to perform their lab assignments.
Example: Notes on lecture regarding lab assignment #1, machining of a diametral pitch spur gear.
2. Students will be required to read weekly assignments from the textbooks in preparation for lectures and for lab assignments.
Example: Section on gear calculations, *Machine Tool Practices*, Kibbe, et al. textbook.
3. Students will be required to read the assigned portions of the textbook to determine the correct procedure for machining a part.
Example: Section on gear cutting, *Machine Tool Practices*, Kibbe, et al. textbook.

Writing Assignments

1. Students will be required to take notes on the procedures for completion of lab assignments.
Example: Notes on lecture regarding lab assignment #1 (machining of a diametral pitch spur gear).

2. Students will analyze the drawings given to them and formulate a strategy for machining the assigned part.

Example: Drawing for machining a diametral pitch spur gear.

SECTION F - Textbooks and Instructional Materials

Material Type

Textbook

Author

Kibbe, Neely, Meyer, & White

Title

Machine Tool Practice

Edition/Version

11th

Publisher

Prentice-Hall

Year

2019

Rationale

updated edition

ISBN #

9780134893501

Material Type

Textbook

Author

Oberg, Jones, Horton, & Ryffel

Title

Machinery's Handbook

Edition/Version

32nd

Publisher

Industrial Press

Year

2024

Rationale

Updated edition

ISBN #

978-0831138325

SECTION G - Diversity, Equity and Inclusivity

How does your course and/or course outline of record reflect strategies for accommodating and engaging diverse student populations, advancing equitable outcomes, and fostering inclusion for all students?

This course addresses diverse learning needs by incorporating project-based instruction, open lab hours, and detailed feedback on technical work. Complex operations, like gear cutting, are broken down into manageable steps to support all learners. Inclusion is prioritized by ensuring students have equal access to advanced equipment and resources.

Course Codes (Admin Only)

CB00 State ID

CCC000276651

CB10 Cooperative Work Experience Status

N - Is Not Part of a Cooperative Work Experience Education Program

CB11 Course Classification Status

Y - Credit Course

CB13 Special Class Status

N - The Course is Not an Approved Special Class

CB23 Funding Agency Category

Y - Not Applicable (Funding Not Used)

CB24 Program Course Status

Program Applicable

Allow Pass/No Pass

Yes

Only Pass/No Pass

No