

ITT Technical Institute
IE1210
Manufacturing Processes
Onsite and Online Course

SYLLABUS

Credit hours: 4.5


Contact/Instructional hours: 56 (34 Theory Hours, 22 Lab Hours)

Prerequisite(s) and/or Corequisite(s):

Prerequisites: IE1110 Introduction to Industrial Engineering Technology or equivalent

Course Description:

This course is an overview of manufacturing technology and its basic working principles. Topics include basic modern manufacturing processes and quality control measures,



COURSE SUMMARY

COURSE DESCRIPTION

This course is an overview of manufacturing technology and its basic working principles. Topics include basic modern manufacturing processes and quality control measures.

MAJOR INSTRUCTIONAL AREAS

- Manufacturing Processes
- Engineering Materials
- Rapid Prototyping
- Additive and Subtractive Processes

COURSE LEARNING OBJECTIVES

By the end of this course, you should be able to:

1. Explain basic materials properties, behaviors, and failure modes, and their relevance to manufacturing processes.
2. Explain basic physical and mechanical properties of metals, polymers, ceramics, and composites, focusing on their behaviors, failure modes, and relevance to manufacturing processes.
3. Compare thermal, elastic, and strength properties and their influence on manufacturing costs, efficiency, and quality.
4. Describe atomic structure and the elements, bonding between atoms and molecules, and crystalline and non-crystalline structures.
5. Describe glass and plastic fabrication methods and their resulting products.
6. Describe the basic heat-treating methods for metals and their purposes.
7. Compute the associated force and energy requirements from selected metal forming operations.
8. Describe permanent and non-permanent manufacturing assembly operations that include welding and fastening.
9. Explain different machining operations such as turning, grinding, electrical discharge machining (EDM), and electrochemical machining (ECM).

COURSE OUTLINE

MODULE 1: INTRODUCTION TO MANUFACTURING PROCESSES

COURSE LEARNING OBJECTIVES COVERED

- Explain basic materials properties, behaviors, and failure modes, and their relevance to manufacturing processes.

TOPICS COVERED

- Manufacturing Processes

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
Reading: Groover, Chapter 1.	No	1.5 Hours
Lesson: Study the lesson for this module.	No	1 Hour
Discussion: Participate in the discussion titled “Processes Involved in Manufacturing.”	Yes	1.5 Hours
Lab: Complete the lab titled “Classification of Manufacturing Processes.”	Yes	1.5 Hours
Project: Read and begin the project.	No	1 Hour

Total Out-Of-Class Activities: 6.5 Hours

MODULE 2: ENGINEERING MATERIALS

COURSE LEARNING OBJECTIVES COVERED

- Explain basic materials properties, behaviors, and failure modes, and their relevance to manufacturing processes.
- Explain basic physical and mechanical properties of metals, polymers, ceramics, and composites, focusing on their behaviors, failure modes, and relevance to manufacturing processes.
- Compare thermal, elastic, and strength properties and their influence on manufacturing costs, efficiency, and quality.

TOPICS COVERED

- Types of Engineering Materials
- Properties of Engineering Materials

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF-CLASS TIME
Reading: Groover, Chapters 2 and 3.	No	7 Hours
Lesson: Study the lesson for this module.	No	1.5 Hours
Discussion: Participate in the discussion titled “The Economics of Materials.”	Yes	N/A
Exercise 1: Submit the exercise titled “Basics of Engineering Materials.”	Yes	2 Hours
Exercise 2: Submit the exercise titled “Properties of Engineering Materials.”	Yes	2 Hours
Lab: Complete the lab titled “Assessing the Properties of Engineering Materials.”	Yes	N/A
Project: Continue work on Project Part 1.	No	3 Hours

Total Out-Of-Class Activities: 15.5 Hours

MODULE 3: PROCESSING OF GLASS AND PLASTIC

COURSE LEARNING OBJECTIVES COVERED

- Describe atomic structure and the elements, bonding between atoms and molecules, and crystalline and non-crystalline structures.
- Describe glass and plastic fabrication methods and their resulting products.

TOPICS COVERED

- Stages in the Glassworking Process
- Stages and Methods of Plastic Processing
- Product Design Considerations for Glasswork and Plastic

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
Reading: Groover, Chapters 7 and 8.	No	6 Hours
Lesson: Study the lesson for this module.	No	1.5 Hours
Discussion: Participate in the discussion titled “Polymers versus Glass.”	Yes	N/A
Exercise 1: Submit the exercise titled “Glassworking Process.”	Yes	2.5 Hours
Exercise 2: Submit the exercise titled “Plastic Processing.”	Yes	2.5 Hours
Lab: Complete the lab titled “Assessing Glass and Plastic Processing.”	Yes	N/A
Project: Continue work on Project Part 1.	No	4 Hours

Total Out-Of-Class Activities: 16.5 Hours

MODULE 4: PROCESSING OF METAL

COURSE LEARNING OBJECTIVES COVERED

- Describe atomic structure and the elements, bonding between atoms and molecules, and crystalline and non-crystalline structures.
- Describe the basic heat-treating methods for metals and their purposes.
- Compute the associated force and energy requirements from selected metal forming operations.

TOPICS COVERED

- Fundamentals of Metal Casting
- Metal Casting Processes
- Powder Metallurgy
- Fundamentals of Metal Forming

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
Reading: Groover, Chapters 5, 6, 10, 12, and 20.	No	9.5 Hours
Lesson: Study the lesson for this module.	No	2 Hours
Exercise: Submit the exercise titled “Metal Casting Processes.”	Yes	2.5 Hours
Lab 1: Complete the lab titled “Understanding Metal Solidification.”	Yes	N/A
Lab 2: Complete the lab titled “Inferring Powder Metallurgy and Metal Forming Processes.”	Yes	N/A
Project: Submit Project Part 1.	Yes	2 Hours

Total Out-Of-Class Activities: 16 Hours

MODULE 5: JOINING AND ASSEMBLY PROCESSES

COURSE LEARNING OBJECTIVES COVERED

- Describe atomic structure and the elements, bonding between atoms and molecules, and crystalline and non-crystalline structures.
- Describe the basic heat-treating methods for metals and their purposes.
- Describe permanent and non-permanent manufacturing assembly operations that include welding and fastening.

TOPICS COVERED

- Fundamentals of Welding
- Welding Processes
- Mechanical Assembly
- Rapid Prototyping

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF- CLASS TIME
Reading: Groover, Chapters 22, 23, 25, and 26.	No	7 Hours
Lesson: Study the lesson for this module.	No	1.5 Hours
Discussion: Participate in the discussion titled “Welding versus Other Assembly Processes.”	Yes	N/A
Exercise: Submit exercise titled “Welding and Mechanical Assembly.”	Yes	2 Hours
Lab: Complete the lab titled “Examining Assembly Processes.”	Yes	N/A
Project: Submit Project Part 2.	Yes	3 Hours
Final Exam: Prepare for the final exam.	No	5 Hours

Total Out-Of-Class Activities: 18.5 Hours

MODULE 6: MATERIAL REMOVAL PROCESSES

COURSE LEARNING OBJECTIVES COVERED

- Explain basic materials properties, behaviors, and failure modes, and their relevance to manufacturing processes.
- Explain basic physical and mechanical properties of metals, polymers, ceramics, and composites, focusing on their behaviors, failure modes, and relevance to manufacturing processes.
- Compare thermal, elastic, and strength properties and their influence on manufacturing costs, efficiency, and quality.
- Describe atomic structure and the elements, bonding between atoms and molecules, and crystalline and non-crystalline structures.
- Describe glass and plastic fabrication methods and their resulting products.
- Describe the basic heat-treating methods for metals and their purposes.
- Compute the associated force and energy requirements from selected metal forming operations.
- Describe permanent and non-permanent manufacturing assembly operations that include welding and fastening.
- Explain different machining operations such as turning, grinding, electrical discharge machining (EDM), and electrochemical machining (ECM).

TOPICS COVERED

- Cutting Tools and Fluids
- Grinding Processes

MODULE LEARNING ACTIVITIES	GRADE D	OUT-OF-CLASS TIME
Reading: Groover, Chapters 17 and 18.	No	6.5 Hours
Lesson: Study the lesson for this module.	No	1.5 Hours
Lab: Complete the lab titled “Understanding Cutting and Grinding Processes.”	Yes	N/A
Final Exam: Take the final exam.	Yes	N/A

Total Out-Of-Class Activities: 8 Hours

EVALUATION AND GRADING

EVALUATION CRITERIA

The graded assignments will be evaluated using the following weighted categories:

CATEGORY	WEIGHT
Exercise	20%
Lab	30%
Project	20%
Discussion	10%
Final Exam	20%
TOTAL	100%

GRADE CONVERSION

The final grades will be calculated from the percentages earned in the course, as follows:

GRADE	PERCENTAGE
A (4.0)	90–100%
B+ (3.5)	85–89%
B (3.0)	80–84%
C+ (2.5)	75–79%
C (2.0)	70–74%
D+ (1.5)	65–69%
D (1.0)	60–64%
F (0.0)	<60%

)	
---	--

LEARNING MATERIALS AND REFERENCES

REQUIRED RESOURCES

COMPLETE TEXTBOOK PACKAGE

- Groover, M. P. (2012). *Introduction to manufacturing processes (1st ed.)*. Hoboken, NJ: Wiley.

RECOMMENDED RESOURCES

- Professional Associations
 - American Productivity & Quality Center
 - Institute of Industrial Engineers
 - Society for the Advancement of Material and Processes Engineering
 - Society of Manufacturing Engineers
- ITT Tech Virtual Library (accessed via Student Portal | <https://studentportal.itt-tech.edu>)
 - School of Study> School of Drafting and Design> Research Guides> Industrial Engineering Technology>
 - Finding Articles
 - ❖ Advanced Materials and Processes
 - ❖ Design News
 - ❖ Industrial Engineer
 - ❖ Industrial Robot
 - ❖ Industry Week
 - ❖ Journal of Industrial Engineering & Management
 - ❖ Manufacturing Engineering
 - ❖ Material Handling & Logistics
 - ❖ Production & Operations Management
 - Recommended Reference Books
 - Badiru, A.B. (2011). *Handbook of industrial engineering equations, formulas, and calculations*. Boca Raton: Taylor & Francis
 - *Handbook of industrial and systems engineering*. (2006). Boca Raton: CRC/Taylor & Francis
- Other References

- Government Sites
 - National Technical Information Service
 - Occupational Safety & Health Administration: Regulations
 - Office of Scientific & Technical Information
 - U.S. Patent & Trademark Office
- Standards
 - ASTM International
 - IEEE Standards
 - International Standards Organization
 - National Institute of Standards & Technology

INSTRUCTIONAL METHODS AND TEACHING STRATEGIES

The curriculum employs a variety of instructional methods that support the course objectives while fostering higher cognitive skills. These methods are designed to encourage and engage you in the learning process in order to maximize learning opportunities. The instructional methods include but are not limited to lectures, collaborative learning options, use of technology, and hands-on activities.

To implement the above-mentioned instructional methods, this course uses several teaching strategies, such as guided practice and case problems. Your progress will be regularly assessed through a variety of assessment tools including exercises, labs, discussions, project, and a final exam.

OUT-OF-CLASS WORK

For purposes of defining an academic credit hour for Title IV funding purposes, ITT Technical Institute considers a quarter credit hour to be the equivalent of: (a) at least 10 clock hours of classroom activities and at least 20 clock hours of outside preparation; (b) at least 20 clock hours of laboratory activities; or (c) at least 30 clock hours of externship, practicum or clinical activities. ITT Technical Institute utilizes a “time-based option” for establishing out-of-class activities which would equate to two hours of out-of-class activities for every one hour of classroom time. The procedure for determining credit hours for Title IV funding purposes is to divide the total number of classroom, laboratory, externship, practicum and clinical hours by the conversion ratios specified above. A clock hour is 50 minutes.

A credit hour is an artificial measurement of the amount of learning that can occur in a program course based on a specified amount of time spent on class activities and student preparation during the program course. In conformity with commonly accepted practice in higher education, ITT Technical Institute has institutionally established and determined that credit hours awarded for coursework in this program course (including out-of-class assignments and learning activities described in the “Course Outline” section of this syllabus) are in accordance with the time-based option for awarding academic credit described in the immediately preceding paragraph.

ACADEMIC INTEGRITY

All students must comply with the policies that regulate all forms of academic dishonesty or academic misconduct. For more information on the academic honesty policies, refer to the Student Handbook and the School Catalog.

INSTRUCTOR DETAILS

Instructor Name	
Office Hours	
Contact Details	

(End of Syllabus)