ITT Technical Institute

AM340
Manufacturing Processes and Materials

Onsite Course

SYLLABUS

Credit hours: 4

Contact/Instructional hours: 50 (40 Theory Hours, 10 Lab Hours)

Prerequisite(s) and/or Corequisite(s):
None

Course Description:
This course offers a survey of various manufacturing processes and materials found in the industry. Areas of instruction include various manufacturing materials, machine tools and tooling used in a variety of processes in manufacturing. Emphasis is placed on terminology and function.

Outside 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.

Syllabus: Manufacturing Processes and Materials

Instructor:	_____
Office hours:	_____
Class hours:	_____

Major Instructional Areas

1. Fundamentals of materials: their behavior and manufacturing properties.
2. Metal-casting processes and equipment.
3. Forming and shaping processes and equipment.
4. Material-removal processes and machines.
5. Joining processes and equipment.
6. Surface technology.

Course Objectives

1. Identify the basic properties of materials along with their measurement method.
2. Interpret and report specific material type, relative hardness, and machinability for materials on a phase diagram.
3. Recognize the properties and machinability for the basic types of plastics.
4. Name and describe various methods of cutting different materials.
5. Identify types of plastics and composites.
6. Analyze the basic structure of materials.
7. Identify by name the various forming methods and processes.
8. Demonstrate an understanding of the terminology, application and methodology of casting processes.
9. Identify methods and terminology for forging and related processes.

10. Define various methods of metal rolling and extrusion.
11. Identify methods and terminology for fastening materials, plus evaluate advantages, automation and reliability of such methods.
12. Describe methods of welding, brazing, and soldering.
13. Identify or describe methods for simplifying manufacturing processes and reducing costs.
14. Demonstrate techniques of metrology (measurement) of manufactured goods and the uses of such measurements in quality control.

SCANS Objectives

SCANS is an acronym for Secretary's Commission on Achieving Necessary Skills. The committee, created by the National Secretary of Labor in the early 1990s, created a list of skills and competencies that the committee feels are necessary for employees to function in a high-tech job market.

1. Apply new knowledge and skills in both familiar and changing situations.
2. Explain trends in technological change and deduce how the change will impact the status quo.
3. Demonstrate critical thinking skills through a detailed analysis of a situation and use sound logic to resolve the situation.
4. Demonstrate competence in configuring, installing, and integrating various hardware and software systems.
5. Identify how technological systems operate effectively.
6. Demonstrate competence in selecting appropriate technology, which includes determining desired outcomes and applicable constraints.

Course Outline

Note: All graded activities, except the Final Exam, are listed below in the pattern of <Unit number>.<Assignment Number>. For example, Lab 2.1 refers to the 1st lab activity in Unit 2.

Unit	Activities
1–Properties of Materials	• Content Covered: *Manufacturing Engineering and Technology:* o Chapter 1, "The Structure of Metals" o Chapter 2, "Mechanical Behavior, Testing, and Manufacturing Properties of Materials" o Chapter 3, "Physical Properties of Materials" • Homework: 1.1 • Labs: 1.1
2–Metals and Alloys	• Read from *Manufacturing Engineering and Technology:* o Chapter 4, "Metal Alloys: Structure and Strengthening by Heat Treatment" o Chapter 5, "Ferrous Metals and Alloys: Production, General Properties, and Applications" • Homework: 2.1 • Labs: 2.1
3–Nonferrous Metals, Polymers, and Composites	• Read from *Manufacturing Engineering and Technology:* o Chapter 6, "Nonferrous Metals and Alloys: Production, General Properties, and Applications" o Chapter 7, "Polymers: Structure, General Properties, and Applications" o Chapter 9, "Composite Materials: Structure, General Properties, and Applications"

Unit	Activities
	• Exam: 3.1 • Homework: 3.1 • Labs: 3.1
4–Metal-Casting Processes	• Read from *Manufacturing Engineering and Technology:* o Chapter 10, “Fundamentals of Metal Casting” o Chapter 11, “Metal-Casting Processes” • Labs: 4.1
5–Metal Shaping	• Read from *Manufacturing Engineering and Technology:* o Chapter 13, “Rolling of Metals” o Chapter 14, “Forging of Metals” o Chapter 15, “Extrusion and Drawing of Metals” • Homework: 5.1 • Labs: 5.1-5.2
6–Plastics and Composites	• Read from *Manufacturing Engineering and Technology:* o Chapter 19, “Forming and Shaping Plastics and Composite Materials” • Homework: 6.1 • Labs: 6.1-6.2
7–Machining	• Read from *Manufacturing Engineering and Technology:* o Chapter 22, “Cutting-Tool Materials and Cutting Fluids” o Chapter 23, “Machining Processes Used to Produce Round Shapes: Turning and Hole Making” o Chapter 24, “Machining Processes Used to Produce Various Shapes: Milling, Broaching, Sawing, and Filing; Gear Manufacturing”

Unit	Activities
	○ Chapter 25, “Machining Centers, Advanced Machining Concepts and Structures, and Machining Economics” • Exam: 7.1 • Homework: 7.1 • Labs: 7.1
8–Joining	• Read from *Manufacturing Engineering and Technology:* ○ Chapter 30, “Fusion-Welding Processes” ○ Chapter 32 “Brazing, Soldering, Adhesive-Bonding, and Mechanical-Fastening Processes” • Homework: 8.1 • Labs: 8.1
9–Engineering Metrology	• Read from *Manufacturing Engineering and Technology:* ○ Chapter 35, “Engineering Metrology and Instrumentation” ○ Chapter 36, “Quality Assurance, Testing, and Inspection” • Exam: 9.1 • Homework: 9.1 • Labs: 9.1
10–Automation	• Read from *Manufacturing Engineering and Technology:* ○ Chapter 37, “Automation of Manufacturing Processes” • Labs:10.1
11–Course Review and Final Exam	• Course Review • Final Exam

Instructional Methods

The course Manufacturing Processes and Materials is designed to promote various teaching strategies that support the outcomes described in the course objectives and that foster higher cognitive skills. It explains the aspects of various manufacturing processes and materials used in the industry.

The course incorporates the strategies of lectures, collaborative learning options, hands-on laboratory activities, and Internet-based communications. Lesson plans, course materials, notes, or other information resources will be customized for you, as required. Unit exams will help you test your understanding of the concepts covered in the previous units. There is a final exam in Unit 11. The overall assessment strategy for this course includes labs, unit exams, and the final exam.

Instructional Materials and References

Student Textbook Package

Kalpakjian, Serope, and Steven R. Schmid. *Manufacturing Engineering and Technology. 5th ed. Upper Saddle River, NJ: Pearson Education, Inc., 2006.*

References

ITT Tech Virtual Library

Log on to the ITT Tech Virtual Library at http://www.library.itt-tech.edu/ to access online books, journals, and other reference resources selected to support ITT Tech curricula.

Books

You may click “Books” or use the “Search” function on the home page to find the following books.

- EngNetBase> Click Manufacturing & Processing> Search for>

  - Boothroyd, Geoffrey, Peter Dewhurst, and Winston Knight. *Product Design for Manufacture and Assembly. 2nd ed. New York: Taylor & Francis Group, LLC, 2002.*

  - Campbell, Robert. *Integrated Product Design and Manufacturing Using Geometric Dimensioning and Tolerancing. New York: Marcel Dekker, Inc., 2003.*

  - Mazumdar, Sanjay K. *Composites Manufacturing: Materials, Product, and Process Engineering. Boca Raton, FL: CRC Press LLC, 2002.*

Periodicals

You may click “Periodicals” or use the “Search” function on the home page to find the following periodicals.

- Ebscohost> EBSCOhost Databases

  - “ILLUSTRATION AND LANGUAGE IN TECHNICAL COMMUNICATION.” By: DONNELL, JEFFREY. *Journal of Technical Writing & Communication, 2005, Vol. 35 Issue 3, p239-271, 33p; (AN 17395117)*

- "Showing clear results." By: Fireman, Jerry. *Tech Directions, Feb2000, Vol. 59 Issue 7, p40, 2p, 1 graph; (AN 2781877)*

- "Preparing for a career in technical graphics." By: Kapur, Arjun; Childress, Vincent. *Tech Directions, Jan99, Vol. 58 Issue 6, p26, 2p, 1 chart; (AN 1540281)*

- "Let's get technical." By: S. M.. *Communication Arts, Jul2005, Vol. 47 Issue 3, p206-206, 0p; (AN 17557084)*

- "Software Speeds Crystal Analysis." *Lasers & Optronics, Aug2000, Vol. 19 Issue 8, p11, 2p; (AN 3517215)*

- "TECHNICAL GRAPHICS." *Mechanical Engineering, Apr2003, Vol. 125 Issue 4, p19, 0p; (AN 9443048)*

Reference Resources

You may click "Reference Resources" or use the "Search" function on the home page to find the following reference resources.

- 4specs.com: Internet Directory for Specified Construction Products

The Internet directory for specified construction products. It is a link to a list of manufacturers of construction products.

- American Gear Manufacturers Association

A Web site that provides the history, mission, membership, and publications of the American Gear Manufacturers Association.

- Associations on the Net

A guide to Web sites of prominent organizations and associations from the Internet Public Library.

- Marvin Windows and Doors
  A manufacturer Web site that provides information on interiors and architecture solutions to customers.

- McGraw-Hill Construction Network for Products
  A Web site that offers building products information and includes Sweet's Catalog and other types of catalogs.

- ReferenceUSA
  A directory of 12 million U.S. business companies. It helps users search business companies by using the company name, location, standard industrial classification (SIC) code, industry type, industry size, and other criteria.

- Simpson Strong-Tie
  A manufacturer Web site of Simpson Strong-Tie Company. The site provides information on steel connectors for wood and concrete.

- Southern Pine Council
  A manufacturer Web site of the Southern Pine Council. The site provides information on interiors and construction.

- The Blue Book of Building and Construction
  A regionalized directory of commercial construction professionals, listing general contractors, subcontractors, architects, engineers, and regional and national manufacturers.

- Tyco Valves & Controls
  A manufacturer Web site that provides high-tech valve and actuator products used widely throughout demanding markets, including power generation, oil production and refining, chemical and petrochemical, and nuclear and allied industries.

Program Links

You may click “Program Links” or use the “Search” function on the home page to find the following program links.

Industrial Automation Engineering Technology (IAET)>

- Professional Organizations> American Society for Testing and Materials
- Professional Organizations> The Instrumentation, Systems, and Automation Society
- Recommended Links> GlobalSpec

Learning Guides

You may click “Learning Guides” or use the “Search” function on the home page to find the following learning guides.

Online Tutorials>

- ARCHIdigm
- Avatech Online Workshops
- CADTutor
- CAT Online
- Computer Training Tutorials
- Finding Information on the Internet: A Tutorial
- Fundamentals of Communications
- GeoCommunity Tutorials
- Tailoring AutoCAD
- Touch Typing

Other References

The following resources may be found **outside** of the ITT Tech Virtual Library, whether online or in hard copy.

Books

- Bruce, R. G., W. K. Dalton, J. E. Neely, and R. R. Kibbe. *Modern Materials and Manufacturing Processes. 3rd ed. Upper Saddle River, NJ: Prentice Hall, 2004.*
- Fellers, W. O., and W. W. Hunt. *Manufacturing Processes for Technology.* Upper Saddle River, NJ: Prentice Hall, 1995.

Web sites

- **Autodesk**
  http://usa.autodesk.com/adsk/servlet/home?siteID=123112&id=129446 (accessed July 02, 2008)

This Web site has an excellent resource called the Student Engineering & Design Community, which is designed for students and the faculty.

- **MIT OpenCourseWare**
  http://ocw.mit.edu/OcwWeb/web/home/home/index.htm (accessed July 02, 2008)

This is a Web-based publication of the course content of the Massachusetts Institute of Technology (MIT). OpenCourseWare (OCW) can be accessed by anyone in the world and is a permanent MIT activity.

- **eFunda**
  http://www.efunda.com/home.cfm (accessed July 02, 2008)

eFunda stands for engineering fundamentals. This Web site is an online reference for the engineering community, where working professionals can quickly find concise and reliable information.

All links to Web references outside of the ITT Tech Virtual Library are always subject to change without prior notice.

Course Evaluation and Grading

Evaluation Criteria Table

The final grades will be based on the following categories:

CATEGORY	WEIGHT
Homework	25%
Labs	25%
Exams	25%
Final Exam	25%
Total	**100%**

Note: Students are responsible for abiding by the Plagiarism Policy.

Grade Conversion Table

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

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

(End of Syllabus)

