

Las Positas College  
 3000 Campus Hill Drive  
 Livermore, CA 94551-7650  
 (925) 424-1000  
 (925) 443-0742 (Fax)

## Course Outline for WLDT 79

### MANUFACTURING PROCESSES

Effective: Fall 2011

#### I. CATALOG DESCRIPTION:

WLDT 79 — MANUFACTURING PROCESSES — 2.00 units

This course examines the processes and equipment used in modern manufacturing. This course provides an excellent introduction to today's manufacturing processes, as well as an overview of the processes and equipment used in modern manufacturing. The course concentrates on the five major types of industrial materials; metals, plastics, ceramics, woods, and composites. It provides thorough coverage of the forming, separating, fabricating, conditioning, and finishing processes related to each material. The course also includes the materials and manufacturing processes used in packaging finished goods. The proper and safe use of hand tools, basic shop tools, manufacturing and welding equipment will be covered. Understanding the relationship between manufacturing processes, materials properties, materials processing and design.

1.50 Units Lecture 0.50 Units Lab

#### Grading Methods:

Letter or P/NP

#### Discipline:

	<b>MIN</b>
<b>Lecture Hours:</b>	27.00
<b>Lab Hours:</b>	27.00
<b>Total Hours:</b>	54.00

#### II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

#### III. PREREQUISITE AND/OR ADVISORY SKILLS:

#### IV. MEASURABLE OBJECTIVES:

**Upon completion of this course, the student should be able to:**

- A. Demonstrate basic hand tools safety and usage;
- B. Demonstrate basic shop power tools safety and usage;
- C. Demonstrate basic welding equipment safety and usage;
- D. Explain or demonstrate the modern manufacturing processes and equipment used to process the following material types:
  1. Metals
  2. Plastics
  3. Ceramics
  4. Wood
  5. Composites
- E. Explain or demonstrate the following manufacturing processes and their application:
  1. Welding
  2. Heat Treating
  3. Sawing
  4. Plate Shearing
  5. Punch Press
  6. Sheet Metal Stamping
  7. Press Brake
  8. Roll Forming
  9. Plasma Cutting
  10. Oxy-Fuel Cutting
  11. Laser Cutting and processing
  12. Abrasive Water Jet Cutting
  13. Hole Making Processes
  14. Planers
  15. Broaching
  16. Surface Grinders
  17. Milling Machine
  18. Engine Lathe
  19. CNC Machine Work
  20. Electrical Discharge Machining (EDM)
  21. Industrial Robotics
  22. Forging

23. Powdered/Sintered Metal Processes
24. Hot Isostatic Pressing (HIP)
25. Rapid Prototyping
26. Direct Metal Manufacturing
27. Sheet Metal Coil Processing
28. Sheet Metal Shearing and Blanking
29. Hydroforming
30. Injection Molding
31. Blow Molding
32. Rotational Molding
33. Centrifugal Casting
34. Permanent Mold Casting
35. Die Casting
36. Sand Casting
37. Investment Casting – Lost Wax Process
38. Metal Matrix Composite Processing
39. Carbon Fiber Processing
40. Fiberglass Processing
41. Plastic Machining and assembly
42. Just-In-Time (JIT) Manufacturing
43. Finishing
44. Packaging;

F. Explain the connection between:

1. Materials processing
2. Materials properties
3. Materials properties
4. Manufacturing processes
5. Design

## V. CONTENT:

- A. Basic hand tools safety and usage
- B. Basic shop power tools safety and usage
- C. Basic welding equipment safety and usage
- D. Material Types and Properties
  1. Metals
  2. Plastics
  3. Ceramics
  4. Wood
  5. Composites
- E. Manufacturing processes and methods:
  1. Welding
  2. Heat Treating
  3. Sawing
  4. Plate Shearing
  5. Punch Press
  6. Sheet Metal Stamping
  7. Press Brake
  8. Roll Forming
  9. Plasma Cutting
  10. Oxy-Fuel Cutting
  11. Laser Cutting and processing
  12. Abrasive Water Jet Cutting
  13. Hole Making Processes
  14. Planers
  15. Broaching
  16. Surface Grinders
  17. Milling Machine
  18. Engine Lathe
  19. CNC Machine Work
  20. Electrical Discharge Machining (EDM)
  21. Industrial Robotics
  22. Forging
  23. Powdered/Sintered Metal Processes
  24. Hot Isostatic Pressing (HIP)
  25. Rapid Prototyping
  26. Direct Metal Manufacturing
  27. Sheet Metal Coil Processing
  28. Sheet Metal Shearing and Blanking
  29. Hydroforming
  30. Injection Molding
  31. Blow Molding
  32. Rotational Molding
  33. Centrifugal Casting
  34. Permanent Mold Casting
  35. Die Casting
  36. Sand Casting
  37. Investment Casting – Lost Wax Process
  38. Metal Matrix composite Processing
  39. Carbon Fiber Processing
  40. Fiberglass Processing
  41. Plastic Machining and Assembly
  42. Just-in-time (JIT) Manufacturing
  43. Finishing
  44. Packaging
- F. Connections between:
  1. Materials processing
  2. Materials properties
  3. Manufacturing processes
  4. Design

## VI. METHODS OF INSTRUCTION:

- A. **Lecture** -
- B. Textbook reading assignments; additional Internet and/or assignments
- C. Class and group discussions
- D. **Research** -
- E. **Field Trips** -
- F. **Lab** -
- G. Presentation of audio-visual materials

## VII. TYPICAL ASSIGNMENTS:

A. Lectures: 1. Basic Hole Making 2. Thermal Cutting 3. Welding and Forging 2. Reading: 1. Read the textbook chapter on Abrasive Waterjet Cutting B. Locate and read an article off the internet authored in the last 90 days on the subject of sheet metal processing, write a summary of what you read. C. Homework: 1. Read the textbook chapter on Milling Machines and answer these questions: a. What is a horizontal milling machine? b. What is a shell mill and when might we use it? c. What is the purpose of being able to adjust RPM on the spindle? D. Class and group discussions: 1. What is the purpose of Rapid Prototyping in an industrial environment? What are the costs of rapid prototyping verses conventional manufacturing methods? 2. When would we use CNC manufacturing techniques and processes? What are the advantages of CNC processing? What are the disadvantages? E. Audio-visual materials: 1. Video of forging processes F. Field Trip: 1. Visit a local manufacturing company G. Lab Work: 1. Safely use basic hand and shop tools to make the sheet metal part shown on the attached blueprint 2. Using a drill press, drill and tap, six 0.250-20-UNC threaded holes on a 4" bolt circle 3. Capstone Lab Assignment: Using the technical drawing provided, develop a plan, define what tools or equipment you will need to manufacture the component. Using the material provided, make the part using the manufacturing methods covered in lecture/lab to meet the drawing requirements. H. Research project: 1. You are leader of your own manufacturing company. You just got an order to make 1000 of this item. The drawing gives you the material required. What manufacturing processes and equipment would you select, and explain in detail how you would make the item. Prepare a presentation and describe your method of manufacturing to the class.

## VIII. EVALUATION:

### A. **Methods**

- 1. Exams/Tests
- 2. Quizzes
- 3. Research Projects
- 4. Papers
- 5. Home Work
- 6. Lab Activities
- 7. Other:
  - a. Methods
    - 1. Quizzes
    - 2. Objective examinations (for lecture and text reading assignments)
    - 3. Analysis and evaluation of homework assignments
    - 4. Analysis and evaluation of lab assignments
    - 5. Research project:
      - a. Written proposal
      - b. Outline
      - c. First draft
      - d. Evaluation of final

### B. **Frequency**

- 1. Frequency
  - a. Weekly Quizzes
  - b. Midterm and Final Examinations
  - c. Weekly homework and lab evaluation
  - d. End-of-term evaluation of research project & lab project

## IX. TYPICAL TEXTS:

- 1. Duvall, J. Barry, and David R. Hillis *Manufacturing Processes*. 2nd ed., Goodheart-Wilcox, 2008.
- 2. Lincoln Electric *Procedure Handbook of Arc Welding*. 14th ed., James F Lincoln Foundation, 2008.
- 3. O'Con, Robert J., and Richard H. Carr *Metal Fabrication – A Practical Guide*. 3rd ed., Fabricators & Manufacturers Association, 2010.

## X. OTHER MATERIALS REQUIRED OF STUDENTS:

- A. Safety Glasses
- B. Gloves