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Course Outline for DSNT 54

MANUFACTURING PROCESSES

Effective: Fall 2002

I. CATALOG DESCRIPTION:

DSNT 54 — MANUFACTURING PROCESSES — 2.00 units

Overview of machine shop procedure, welding, and general manufacturing processes, practice in the use of hand tools, basic machine tools, and welding equipment; understanding the relationship between manufacturing processes and design.

1.00 Units Lecture 1.00 Units Lab

Grading Methods:

Letter Grade

Discipline:

	MIN
Lecture Hours:	18.00
Lab Hours:	54.00
Total Hours:	72.00

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. understand how product design influences tooling for manufacturing;
- B. select the most appropriate processes for manufacture from design drawings;
- C. effectively use design techniques to develop product design and the consequent manufacture of the complete product from the design;
- D. develop a dual vocabulary of both shop and technical terminology;
- E. demonstrate machine tool operation and be familiar with the operation of a lathe, milling machine, and related equipment for manufacturing class projects;
- F. demonstrate good safety precautions while gaining laboratory experience;
- G. perform typical machine operations which encourage accuracy and precision;
- H. understand the breathe of the capabilities of each machine, its range of size and power, and its limitations;
 - I. be familiar with the equations and formulas specific to each machine;
 - J. conduct welding equipment setup, completing welds using a minimum of two different types of equipment.

V. CONTENT:

- A. Properties and Basic Metallurgy of Metals
 1. Hardness
 2. Hot and cold working
 3. Machinability versus Microstructure
- B. Measuring equipment
 1. Measuring systems and units
 2. Gage blocks
 3. Hand-held and inspection bench measuring instruments
 4. Production gages and special gaging
 5. Surface roughness measurement
- C. Quality Control, Tolerancing, and Dimensioning
- D. Product design concepts
 1. Design and planning metal products
 2. Production process analysis
 3. Cost estimating
- E. Basic Cutting Process
 1. Accessing machinability
 2. Cutting tool materials
 3. Tool life and maintenance
 4. Power requirements
 5. Effect of Speed, Feed, Depth, and cutting fluids
 6. Safety procedures
- F. Numerical Control

1. Tape and Types of N/C Machines
2. Programming of N/C Machines
3. Advantages and disadvantages
4. Computer-integrated manufacturing
- G. Machine Tools, Types, Function, cutting tools, computations, economics of use
 1. Engine Lathe
 2. Turning Machines
 3. Drill Press
 - a. Reaming
 - b. Specifying and cutting threads
 4. Milling Machines
 5. Abrasives and Grinding wheels
 6. Finishing Methods
 7. Shapers and Planers
 8. Boring and Turning Machines
 9. Broaching
 10. Saws and Files
- H. Welding and related processes
 1. Types of Welds and welding machines
 2. Arc Welding Methods and cutting processes
 3. Oxyacetylene welding, soldering, and cutting processes
 4. Resistance Welding, Brazing
- I. Powdered Metal Processes
 1. Production and preparation of powders
 2. Characteristics of the powder
 3. Sintering, Infiltration, and Impregnation
 4. Limitations of Powder Metallurgy
- J. Casting techniques
 1. Sand casting
 - a. Advantages and disadvantages
 - b. Steps in making a sand casting
 - c. Mold designs
 - d. Design considerations
 2. Permanent-mold casting
 3. Die Casting
 4. Shell molding
 5. Investment casting
 6. Ceramic-mold processes
 7. Plaster-mold casting
- K. Rolling, Bending, Drawing, Extrusion
 1. Rolling Mills
 2. Cold-rolling, cold-drawing, cold-roll forming
 3. Press-Brake bending
 4. Shearing
 5. Hot extrusions
- L. Presswork
 1. Press Dies
 2. Hole Punching
 3. Deep drawing
- M. Forging Processes
 1. Hot forging process
 2. Precision Forging
 3. Roll forging
- N. Gear Making
 1. Terminology and Types
 2. Making, finishing, checking and inspection
- O. Unconventional Machine Processes
 1. Electrical Discharge Machining (EDM)
 2. Electrochemical Machining (ECM)
 3. Electrochemical Deburring and Grinding
 4. Lasers
- P. Plastics
 1. Thermosetting and thermoplastics
 2. Processing plastics
 3. Tolerancing, machining, and fastening

VI. METHODS OF INSTRUCTION:

- A. **Lecture** -
- B. **Demonstration** -
- C. Sample materials and products from industry
- D. **Discussion** -
- E. **Lab** - On-hands laboratory projects

VII. TYPICAL ASSIGNMENTS:

A. Laboratory projects: 1. Select the proper drill bits to create the pattern of holes on pg. 145 of the textbook. 2. Study the clamp assembly. Each student will be responsible for one of the detail drawings, completing dimensioning and tolerancing of the part. Using the appropriate equipment, each part will be created to specification in the machine shop. B. Homework: 1. Name and sketch three other types of cuts or work, which can be done on a lathe? 2. Cutting speeds are often lower for cutoff and grooving tools than for turning tools. Explain why this is so.

VIII. EVALUATION:

- A. **Methods**
- B. **Frequency**
 1. Frequency:
 - a. Weekly laboratory assignments and homework
 - b. Quizzes as needed

c. One midterm and one final examination

IX. TYPICAL TEXTS:

1. Roberts, Arthur D. and Lapidge, Samuel C *Manufacturing Processes.*, McGraw-Hill, Inc, 1977.

X. OTHER MATERIALS REQUIRED OF STUDENTS:

- A. Safety glasses
- B. Shop coat or apron