**I.** **COURSE** **TITLE**: Tool Design and Manufacturing

**COURSE** **NUMBER**: 2219  **CATALOG** **PREFIX**: ENDS

**II.** **PREREQUISITES**: ENDS 1142 and MATH 1120

**III.** **CREDIT** **HOURS**: 3 **LECTURE** **HOURS**: 3

**LABORATORY** **HOURS**: 0  **OBSERVATION** **HOURS**: 0

**TOTAL CONTACT HOURS**: 3

**IV.** **COURSE** **DESCRIPTION**:

An introductory course in designing of manufacturing tooling including broaches, lathe

and mill tools; piercing, blanking, bending, and drawing dies; the economics of tool

design; cutting and forming; and the design of jigs and fixture devices used to locate and

secure the work-piece in manufacturing. Principles of manufacturing and properties of

materials are utilized. The selection of cutting tools, calculating horsepower

requirements, and cutting feeds and speeds are introduced.

**V.** **ADOPTED** **TEXT(S)**:

Tool Design

Third edition

Donaldson, Lecain, Goold,

McGraw-Hill

ISBN: 07-017531-4

**VI.** **COURSE** **OBJECTIVES**:

At the completion of this course the student will:

1. Understand tool design methods.

2. Know tool making processes.

3. Know heat treating processes.

4. Understand design of cutting tools.

5. Know the principles of gage design.

6. Understand principles of jig and fixture design.

7. Understand the use of plastics in tooling.

8. Know the principles of die making.

9. Understand the principles of numerical control.

10. Analyze a product and design a jig or fixture.

11. Draft working drawings of jigs and fixtures.

12. Relate the manufacturing process to the jig or fixture design.

13. Reference product catalogs to call‑out and specify necessary purchased items.

**VII.** **COURSE METHODLOGY:**

Course is a combination of in-class lecture and hands-on activities.

Videos are utilized demonstrating manufacturing processes at several large companies.

**VIII.** **GRADING**:

Grading follows the policy in the college catalog:

90 – 100 = A

80 – 89 = B

70 – 79 = C

60 – 69 = D

0 – 59 = F

**IX**. **COURSE** **OUTLINE**:

WEEK: MATERIAL:

1 Introduction, tool design methods, the design procedure.

Drafting and design techniques in tooling drawing, drafting practice,

and drawing layout.

2 Tool-making practices, the tools of the toolmaker, hand finishing and

Polishing, screws and dowels, hole location, jig-boring practice.

3 Installation of drill bushings, punch and die manufacture,

Electro-discharge machining, low melting tooling materials.

Test one.

4 Tooling materials and heat treatments, properties of materials, ferrous

Tooling materials, tool steels, cast iron, mild or low carbon, steel

5 Nonmetallic tooling materials, nonferrous tooling materials.

Test two.

6 Heat treating, appearance in carbon in steel, factors affecting heat

treating.

7 Design of cutting tools, a brief history of metal cutting, the metal-

cutting process, the basic requirements of a cutting tool.

8 Test three.

Mechanics and geometry of chip formation.

9 General considerations for metal cutting speeds & feeds.

10 Single-point cutting tools, milling cutters, drills and drilling, reamers,

taps, carbide tools.

11 Gage tolerances. Selection of material for gages.

Gages and gage design, fixed gages

12 Indication gages. Automatic gaging.

Test Four.

13 Principles of locating, methods and devices.

Principles of clamping, methods and devices.

14 Drill jigs, types, construction, bushings.

Principles of chip formation and control.

15 Fixtures, types, construction, activation.

Fixtures and economics in manufacturing.

16 Final Examination.

**X**. **OTHER** **REQUIRED** **BOOKS, SOFTWARE** **AND** **MATERIALS**:

Student will furnish drafting instruments, paper, and three-ring binder for assigned exercises and labs, requiring both mathematical and graphical solutions. Scientific

calculator.

**XI.** **EVALUATION**:

Assignments and Attendance = 20% of final grade

Four tests = 60% of final grade

Comprehensive Final Examination = 20% of final grade

(Also see section XII.)

**XII.** **SPECIFIC** **MANAGEMENT** **REQUIREMENTS**:

All assignments and tests must be turned in on time. Students may work on their own time to complete the assignments. In-class exercises are assigned for the student to complete during class hours.

Examinations will include written and graphical components.

**XIII.** **OTHER INFORMATION:**

**FERPA:** Students need to understand that your work may be seen by others. Others may see your work when being distributed, during group project work, or if it is chosen for demonstration purposes.

Students also need to know that there is a strong possibility that your work may be submitted to other entities for the purpose of plagiarism checks.

**DISABILITIES:** Students with disabilities may contact the Disabilities Service Office, Central Campus, at 800-628-7722 or 937-393-3431