**I. COURSE TITLE:**  Computer Aided Manufacturing

 **COURSE NUMBER:**  2233 **CATALOG PREFIX:** ENDS

**II. PREREQUISITE(S):** MATH 1120 and ENDS 2230

**III. CREDIT HOURS:** 3 **LECTURE HOURS:** 2

 **LABORATORY HOURS:** 1 (2 contact) **OBSERVATION HOURS:** 0

 **TOTAL CONTACT HOURS:**  4

**IV. COURSE DESCRIPTION:**

This course introduces automation and computer-integrated manufacturing with manual part programming for numerical control

machines. History of CNC, coding, punch tape, BCD, word address

programming, and computer numerical control following the recommendations of the Electronic Industries Association (EIA) and Aerospace Industries Association (AIA) with hands-on experience.

The process and requirements for Rapid-Prototyping and Direct Material Deposition are introduced and reinforced with hands-on experience.

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

CNC PROGRAMMING HANDBOOK

3rd Edition

Smid, Peter

Industrial Press, Inc.

ISBN: 978-0-8311-3347-4

**VI. COURSE OBJECTIVES:**

The student will:

1. Learn the growing influence that computers have in the field of engineering and manufacturing today, including automation.

2. Learn the history of the development of numerical control, and the CNC

 procedure and observe a part being machined.

Learn and apply safety procedures for the machining environment.

3. Learn and apply programming techniques to create several numerical

 control programs with an engineering and machining application using straight-line milling, circular interpolation, pockets and islands.

4. Verify programs and machine parts using CNC.

 5. Learn the operation of computer aided design and draw a part using

 a personal computer and prepare that CAD model for rapid-prototyping.

6. Learn how computers may build and test a prototype part and observe a part being made of ABS plastic without a mold by using the computer and equipment for direct material deposition.

**VII. COURSE METHODOLOGY:**

 May include but not limited to lecture and problem solving, independent and group projects, in-class and home assignments, quizzes, and tests. Problem solving will use both graphical and mathematical methods. Hands-on experience.

 Attendance is required.

**VIII. GRADING**

Grading will follow guidelines in the college catalog. Typically:

A = 90-100

 B = 80-89

 C = 70-79

 D = 60-69

 F = 0-59

 See catalog for description of other possible grades.

**IX. COURSE OUTLINE:**

Suggested course outline by the week.

WEEK: MATERIAL:

 1. INTRODUCTION TO CAM, CAD, and NC

 PROGRAMMING NC MACHINES, SAFETY

 2. THE NC CODING AND HISTORICAL METHODS

 THE NC TAPE AND CODING

 3. SAFETY PROCEDURES

 TEST ONE

 4. THE BASIS FOR NC DIMENSIONING

 ZERO POINT LOCATION

 5. DIMENSIONING

 TEST TWO

 6. TAB SEQUENTIAL PROGRAMMING

 REVIEW & PRACTICE

 7. WORD ADDRESS PROGRAMMING

 M-CODE AND G-CODE PROGRAMMING

 8. WRITING THE MANUSCRIPT

 ENCODING AND VERIFYING THE NC PROGRAM

 9. USE OF THE COMPUTER IN NUMERICAL CONTROL

 TEST THREE

 10. LINEAR INTERPOLATION

 LABORATORY – MILLING 1

 11. CIRCULAR INTERPOLATION

 LABORATORY – MILLING 2

 12. PROGRAMMING POCKETS AND ISLANDS

 LABORATORY – MILLING 3

 13. ADVANCED PROGRAMMING ASSIGNMENT

 LABORATORY – MILLING 4

 14. 3-D MODELING AND RAPID PROTOTYPING

 BST MACHINE REQUIREMENTS AND OPERATION

 15. DIRECT MATERIAL DEPOSITION, 3-D CAD FILES

 OPERATING WITH A SAMPLE PROGRAM

 16. FINAL EXAMINATION

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

Scientific calculator

 Scale and Protractor

 Graphing paper (1/4” squares)

 Student will need an auxiliary storage device, flash drive or network home-drive.

**XI. EVALUATION:**

Assignments count 40% of Final Grade

 Attendance counts 10% of Final Grade

 (3) Tests count 30% of Final Grade

 Final examination counts 20% of Final Grade

**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. Some group work is encouraged on exercises and assignments.

For credit, all assignments will be completed as scheduled.

No test may be taken late without prior approval of instructor.

No make-up tests. Read the student handbook.

**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.