Glendale Unified School District

High School

September 15, 2015
(Revised Course Title Board Approved February 20, 2018)

Department:	Career Technical Education
Course Title:	Computer Aided Manufacturing 7-8 (Formerly Computer Aided Manufacturing 3-4)
Course Code:	5581V/5582V
Grade Level:	12
School(s) Course Offered:	Clark Magnet High School
UC/CSU Approved (Y/N, Subject)	Yes, "g" elective credit
Course Credits:	10
Recommended Prerequisite:	Computer Aided Manufacturing 1-2 and Geometry
Recommended Textbook:	CNC Machining for Engineers & Makers by Charles Davis ISBN-13: 978-0-615-99935-7 Copyright 2014 by NexGenCAM, Inc.
Course Overview:	Training and certification on advanced manufacturing software and equipment including computer-numerically-controlled (CNC) milling machines, lathes, routers and plasma cutters. Students learn how to program machine-cutting strategies, run simulations, and manufacture components to precise specifications from raw materials. The CAM 3-4 class expands upon CAM 1-2 by offering certification in CNC lathe operation and programming and the opportunity for students to earn NIMS credentials.

I. California CTE Model Curriculum Standards

A. **Machining and Forming Technologies Pathway Standard B10.0**
Produce parts to specifications or drawings provided on a computer numerical controlled (CNC) mill or lathe. Demonstrate common functions or controls through manual input and through programmed (stored) input. Introduce basic G and M Code Programming focusing on the use of the Cartesian coordinate system and machine axis.

B10.1 Discuss and demonstrate the setup and safe operation of a CNC turning or milling center: the setup of tools in tool holders; referencing the vice or chuck to the machine's control; and referencing the cutting tool to the machine's control.

B10.2 Demonstrate control panel commands to perform basic milling or turning commands for motion of the tool path along the coordinate axis.

B10.3 Convert a provided three-dimensional (3-D) or computer-aided design (CAD) data set to a set of machine instructions (G code) and then run the program producing the part to specifications provided.

B10.4 Demonstrate a tooling change and tool selection to complete a multistep process on a CNC milling or turning center.

B10.5 Produce a part with tight-radius pocket features by demonstrating proper cutting tool selection, proper tool-path, and proper speeds on a CNC milling machine.

B. **Engineering Technology Pathway Standard B7.0**
Understand industrial engineering processes, including the use of tools and equipment, methods of measurement, and quality assurance.

B7.2 Describe the major manufacturing processes.

B7.4 Estimate and measure the size of objects in both Standard International and United States units.

C. **Engineering Technology Pathway Standard B10.0**
Design and construct a culminating project effectively using engineering technology.

B10.1 Use methods and techniques for employing all engineering technology equipment appropriately.

B10.2 Apply conventional engineering technology processes and procedures accurately, appropriately, and safely.

B10.3 Apply the concepts of engineering technology to the tools, equipment, projects, and procedures of the Engineering Technology Pathway.

II. Methods of Assessment

A. Pre-tests and post-tests for each major unit of the Immerse2Learn LearnCNC for HAAS Curriculum. Certification units require scores of 80% or better.

B. Frequent short quizzes during each instructional module to check for understanding.

C. Teacher-developed authentic projects which demonstrate skill mastery

D. Comprehensive semester final exams

III. Topics of Study - Estimated Total Time Distribution

Semester 1

A. 2.5D CAM toolpath programming – 6 Hours

B. 2.5D CAM Project – 10 Hours

C. CNC mill probe system setup and operation – 4 hours

D. 3D CAM toolpath programming – 6 Hours

E. 3D CAM Project – 10 Hours

F. 2-Axis CNC Lathe Programming (Certification Unit) – 20 Hours

G. 2-Axis CNC Lathe Setup & Operation (Certification Unit) – 16 Hours

H. CNC Lathe Manual Programming Project – 12 hours

I. Manufacturing as a career– 4 Hours

J. Semester 1 Final Exam – 2 Hours

Semester 2

A. CNC Lathe Conversational Programming Project – 10 Hours

B. CNC Lathe CAM Project Level I – OD roughing and contours – 10 Hours

C. CNC Lathe CAM Project Level II – ID and OD operations – 12 Hours

D. Short-run Production Practice – 12 Hours

E. National Institute of Metalworking Skills (NIMS) Credential Projects – 20 Hours

F. Artwork in Manufacturing using CNC Plasma Cutting and CNC Routers – 12 Hours

G. Student-selected project – 8 hours

H. Manufacturing as a career– 4 Hours

I. Semester 2 Final Exam – 2 Hours

IV. Recommended Materials (Provided)

A. Immerse2Learn LearnCNC for Haas Digital Curriculum
B. Haas Lathe Programming Workbook
C. Equipment in Advanced Engineering & Manufacturing Lab