Glendale Unified School District

High School

October 21, 2014
(Revised Course Title Board Approved February 20, 2018)

Department:	Career Technical Education
Course Title:	Computer Aided Manufacturing 5-6 (Formerly Computer Aided Manufacturing 1-2)
Course Code:	5405V/5406V
Grade Level:	11, 12
School(s) Course Offered:	Clark Magnet High School
UC/CSU Approved (Y/N, Subject):	Yes, "g" elective credit
Course Credits:	10
Recommended Prerequisite:	Introduction to Engineering, Principles of Engineering (aka Engineering 100), 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, and routers. Students learn how to program machine-cutting strategies, run simulations, and manufacture components to precise specifications from raw materials.

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. Semester final exams.

III. Topic of Study - Suggested Time Distribution

Semester 1

A. Virtual Course System Introduction – 2 Hours

B. Safety for Machining – 4 Hours

C. Shop Mathematics Level 1 (Arithmetic, Fractions, Decimals, Units) – 4 Hours

D. Shop Mathematics Level 2 (Geometry and Trigonometry) – 4 Hours

E. Reading Manufacturing Blueprints – 8 Hours

F. Precision Measurements – 4 Hours

G. Speeds and Feeds Calculations – 4 Hours

H. 3-Axis CNC Milling Machine Setup & Operation (Certification Unit) – 20 Hours

I. 3-Axis CNC Milling Machine Programming (Certification Unit) – 26 Hours

J. CNC Mill Project Level I – 8 Hours

K. Manufacturing as a Career – 4 Hours

L. Semester 1 Final Exam – 2 Hours

Semester 2

A. 2.5D Toolpath Programming in OneCNC XR5 – 12 Hours

B. 2.5D Toolpath Programming in Inventor HSM Express – 8 Hours

C. 3D Toolpath Programming in OneCNCXR5 – 6 Hours

D. CNC Router Project – 6 Hours

E. CNC Mill Project Level II (2.5 D strategies)– 6 Hours

F. CNC Mill Project Level III (3D contouring strategies)– 6 Hours

G. CNC Lathe Programming (Certification Unit) – 24 Hours

H. CNC Lathe Setup and Operation – 4 Hours

I. CNC Lathe Project - 6 Hours

J. Student-selected project – 10 hours

K. Semester 2 Final Exam – 2 Hours

IV. Recommended Materials

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