Glendale Unified School District

High School

December 9, 2014
(Revised Course Title Board Approved February 20, 2018)

Department:	Career Technical Education
Course Title:	Principles of Engineering & Manufacturing 3-4 (Previously Principles of Engineering) ***Course name change effective: 2017-18 school year***
Course Code:	5455V/5456V
Grade Level:	11
School(s) Course Offered:	Clark Magnet High School
UC/CSU Approved (Y/N, Subject):	Yes, "g" general elective credit
Course Credits:	10
Recommended Prerequisite:	Introduction to Engineering, Integrated II
Recommended Textbook:	Various online reference materials
Course Description:	Principles of Engineering & Manufacturing 3-4 is the concentrator course for the Engineering and Manufacturing Pathway. Students will learn the fundamentals of lab safety and equipment operation as they apply a variety of manufacturing methods to intermediate-level engineering projects. This project-based class features instruction on topics including metalworking techniques, 3D computer-aided design, computer-controlled manufacturing methods, practical engineering problem solving, project documentation, and collaborative project management. After completing Principles of Engineering, students may enroll in Computer-Aided Manufacturing.

I. Standards

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

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

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

3. 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. Teacher-developed authentic projects which demonstrate skill mastery.

B. Project write-ups, which include documentation, photographs, self-reflection, and research questions. Required for every project.

C. Ongoing formative assessment via teacher oversight during lab work time.

D. First semester final exam and second semester final presentation.

III. Topic of Study – Suggested Time Distribution

Semester 1

The first semester curriculum is conducted in a rotational fashion where students work in small groups of 2-4 students to complete each of eight projects each spanning two weeks in duration. The eight projects are listed as items B through I below.

A. Course Overview & Lab safety – 10 hours

B. Computer Aided Design & 3D printing Project – 10 hours

C. Computer-Aided Manufacturing Project – 10 hours

D. CNC Mill Programming & Operation Project – 10 hours

E. Manual Milling Operations Project – 10 hours

F. Manual Lathe Operations Project – 10 hours

G. Welding Technology Project – 10 hours

H. Microcontrollers & Programming Project – 10 hours

I. Sheet Metal Sculpture Project – 10 hours

J. Final Exam – 2 hours

Semester 2

During second semester, students will utilize skills learned in first semester in more depth to produce engineered products that will be entered into in-class competitions. The second semester project and time distribution schedule is shown on the following page.

A. Rubber-band Powered Car Project – 20 hours

B. Project Testing & Iteration – 4 hours

C. Racquet-ball Launcher Project – 20 hours

D. Project Testing & Iteration – 4 hours

E. Formal Project Proposal Writing – 10 hours

F. Student-selected Project Design – 10 hours

G. Student-selected Project Manufacturing – 10 hours

H. Final Documentation and Presentation Preparation – 8 hours

I. Final Presentations – 4 hours

IV. Recommended Materials

A. Computers with 3D CAD software such as Autodesk Inventor
B. TIG Welder
C. CNC Milling Machine
D. CNC Router
E. 3D Printer
F. Arduino Microcontroller
G. Sheet metal forming tools
H. Manual Milling Machine
I. Metalworking Lathe
J. Various hand tools: files, hammers, pliers, etc.
K. Various power tools: saws, drills, sanders, etc.