Glendale Unified School District

High School

February 7, 2023

Department: Career Technical Education

Course Title: Advanced Manufacturing Honors (formerly Computer Aided Manufacturing 7-8)

Course Code: 5468V/5439V

Grade Level: 10-12

School(s)
Course Offered: Clark Magnet High School

UC/CSU Approved
(Y/N, Subject) Yes, "G" elective credit

Course Credits: 10

Recommended
Prerequisite: Intermediate Manufacturing

Recommended
Textbook: Lathe – Programming Workbook, Haas Automation, 2015
Mill – Programming Workbook, Haas Automation, 2015

Course Overview: Students will gain advanced knowledge in both mill and lathe setup and operation and proficiency in the use and application of Mastercam software programming for computer numerical controlled (CNC) Mill, Lathe, routers, and plasma cutters. Students will learn how to program machine-cutting strategies, run simulations, and manufacture components to precise specifications from raw materials using Engineering drawings and CAD files. This class expands upon Intermediate Manufacturing by offering certification in advance set up/operation and programming.

Course Content

Unit 1: Intermediate Mill Setup (5 weeks)

STANDARDS
4.0 Technology, 5.0 Problem Solving and Critical Thinking, 6.0 Health and Safety
7.0 Responsibility and Flexibility, 9.0 Leadership and Teamwork
Machining and Forming Technologies Pathway Standard 5.0, 6.0, 7.0, 8.0, 9.0, 11.0

A. In this unit students will learn more complex setup and operation of Mill machines, including the use of a CNC mill probe system. Students will also learn how to better navigate the machine offsets and the understanding of length and diameter compensations on milling machines. Students will have projects on these topics and will learn the components in a hands-on way. Students will be accessed on topics via demonstration both on software and hardware, quizzes, and exams. The standards for assessments will be based on industry standards.

B. Each unit will have respective classroom and lab projects that will test students' knowledge on the topics and each student will demonstrate/produce reports to identify and improve. Each unit will also have a quiz and exam that will assess student's retention on the topics. Students will research regarding the best practices of the Mill Setup. Students will write a research paper on the various Mill Setup best practices including citing sources as evidence, explain how materials are used, explain how ideas and processes are used, and use guiding questions to help in the creation of their manufactured parts. Students will create a PowerPoint presentation and deliver an oral presentation based on their research paper that will be scored with a rubric. Opportunities for peer feedback will be built into each assessment.

Unit 2: Intermediate Lathe Setup (5 weeks)

STANDARDS
4.0 Technology, 5.0 Problem Solving and Critical Thinking, 6.0 Health and Safety
7.0 Responsibility and Flexibility, 9.0 Leadership and Teamwork
Machining and Forming Technologies Pathway Standard 5.0, 6.0, 7.0, 8.0, 9.0, 11.0

A. In this unit students will learn more complex setup and operation of Lathe machines, including the use of CNC Lathe pre-setter system. Students will also learn how to better navigate the machine offsets and the understanding and proper usage of tool nose radius. Students will also learn how to manually program and use tail stock. Students will have projects on these topics and will learn the components in a hands-on way. Students will

be accessed on topics via demonstration both on software and hardware, quizzes, and exams. The standards for assessments will be based on industry standards.

B. Each unit will have respective classroom and lab projects that will test students' knowledge on the topics and each student will demonstrate/produce reports to identify and improve. Each unit will also have a quiz and exam that will assess student's retention on the topics. Students will research regarding the best practices of the Lathe Setup. Students will write a research paper on the various Lathe Setup best practices including citing sources as evidence, explain how materials are used, explain how ideas and processes are used, and use guiding questions to help in the creation of their manufactured parts. Students will create a PowerPoint presentation and deliver an oral presentation based on their research paper that will be scored with a rubric. Opportunities for peer feedback will be built into each assessment.

Unit 3: 2D. CAD (5 weeks)

STANDARDS
4.0 Technology, 5.0 Problem Solving and Critical Thinking, 6.0 Health and Safety, 7.0 Responsibility , 9.0 Leadership and Teamwork
Machining and Forming Technologies Pathway Standard 5.0, 6.0, 7.0, 8.0, 9.0, 11.0

A. In this unit students will learn how to navigate and learn BASIC geometry creation for milling projects using Mastercam software while also learning and understanding the interface. Students will also learn how to create 2D geometry on the software using engineered drawings for manufacturing processes. The students will also be introduced to basic tool paths via Mastercam software. Students will have projects on these topics and will learn the components in a hands-on way. Students will be accessed on topics via demonstration both on software and hardware, quizzes, and exams. The standards for assessments will be based on industry standards

B. Each unit will have respective classroom and lab projects that will test students' knowledge on the topics and each student will demonstrate/produce reports to identify and improve. Each unit will also have a quiz and exam that will assess student's retention on the topics. Students will research the best practices of Computer Aided Design (CAD) using Mastercam software. Students will write a research paper on the various CAD best practices including citing sources as evidence, explain how materials are used, explain how ideas and processes are used, and use guiding questions to help in the creation of their CAD Design. Students will create a PowerPoint presentation and deliver an oral presentation based on their research paper that will be scored with a rubric. Opportunities for peer feedback will be built into each assessment.

Unit 4: 2.5D CAD/CAM (5 weeks)

STANDARDS
4.0 Technology, 5.0 Problem Solving and Critical Thinking, 6.0 Health and Safety
7.0 Responsibility and Flexibility, 9.0 Leadership and Teamwork
Machining and Forming Technologies Pathway Standard 5.0, 6.0, 7.0, 8.0, 9.0, 11.0

A. In this unit students will capitalize on their previous unit and learn how to navigate Intermediate geometry creation including complex geometry using more detailed engineering blueprints. Students will also learn how to create basic/intermediate surfaces and solid models for milling using Mastercam software, importing engineered 3D models, and manipulating them for manufacturing processes. In this unit Students will also learn the use of levels, colors, and other attributes to organize files. Students will have projects on these topics and will learn the components in a hands-on way. Students will be accessed on topics via demonstration both on software and hardware, quizzes, and exams. The standards for assessments will be based on industry standards.

B. Each unit will have respective classroom and lab projects that will test students' knowledge on the topics and each student will demonstrate/produce reports to identify and improve. Each unit will also have a quiz and exam that will assess student's retention on the topics. Students will research regarding the best practices of Intermediate geometry creation. Students will write a research paper on the various 2.5D manufacturing processes practices including citing sources as evidence, explain how materials are used, explain how ideas and processes are used, and use guiding questions to help in the creation of their manufactured parts. Students will create a PowerPoint presentation and deliver an oral presentation based on their research paper that will be scored with a rubric. Opportunities for peer feedback will be built into each assessment.

Unit 5: MILL CAM (5 weeks)

STANDARDS
4.0 Technology, 5.0 Problem Solving and Critical Thinking, 6.0 Health and Safety
7.0 Responsibility and Flexibility, 9.0 Leadership and Teamwork
Machining and Forming Technologies Pathway Standard 5.0, 6.0, 7.0, 8.0, 9.0, 11.0

A. In this unit students will learn how to generate basic Milling toolpaths such as Drilling tapping/threading, countersinking, chamfering, basic countering and pocketing, and other basic milling tool paths using Mastercam software. Students will also learn how to generate codes to be used on milling machines. Students will have projects on these topics and will learn the components in a hands-on way. Students will be accessed on topics via

demonstration both on software and hardware, quizzes, and exams. The standards for assessments will be based on industry standards.

B. Each unit will have respective classroom and lab projects that will test students' knowledge on the topics and each student will demonstrate/produce reports to identify and improve. Each unit will also have a quiz and exam that will assess student's retention on the topics. Students will research regarding the best practices of Mill CAM. Students will write a research paper on the various Mill CAM best practices including citing sources as evidence, explain how materials are used, explain how ideas and processes are used, and use guiding questions to help in the creation of their manufactured parts. Students will create a PowerPoint presentation and deliver an oral presentation based on their research paper that will be scored with a rubric. Opportunities for peer feedback will be built into each assessment.

Unit 6: LATHE CAM (5 weeks)

STANDARDS
4.0 Technology, 5.0 Problem Solving and Critical Thinking, 6.0 Health and Safety
7.0 Responsibility and Flexibility, 9.0 Leadership and Teamwork
Machining and Forming Technologies Pathway Standard 5.0, 6.0, 7.0, 8.0, 9.0, 11.0

A. In this unit students will learn how to generate basic Lathe toolpaths such as Drilling tapping/threading, rough turning finish turning, grooving, cutting off, and other basic Lathe tool paths using Mastercam software. Students will also learn how to generate codes to be used on milling machines. Students will have projects on these topics and will learn the components in a hands-on way. Students will be accessed on topics via demonstration both on software and hardware, quizzes, and exams. The standards for assessments will be based on industry standards.

B. Each unit will have respective classroom and lab projects that will test students' knowledge on the topics and each student will demonstrate/produce reports to identify and improve. Each unit will also have a quiz and exam that will assess student's retention on the topics. Students will research regarding the best practices of Lathe CAM. Students will write a research paper on the various Lathe CAM best practices including citing sources as evidence, explain how materials are used, explain how ideas and processes are used, and use guiding questions to help in the creation of their manufactured parts. Students will create a PowerPoint presentation and deliver an oral presentation based on their research paper that will be scored with a rubric. Opportunities for peer feedback will be built into each assessment.

Unit 7: MILL CAD/CAM (5 weeks)

STANDARDS
4.0 Technology, 5.0 Problem Solving and Critical Thinking, 6.0 Health and Safety
7.0 Responsibility and Flexibility, 9.0 Leadership and Teamwork
Machining and Forming Technologies Pathway Standard 5.0, 6.0, 7.0, 8.0, 9.0, 11.0

A. In this unit students will learn how to generate more complex drawings including solids and surfaces and learn more intermediate/advance tool paths such as thread-milling surface/solid machining, advance countering, and pocketing, and other intermediate to advance milling tool paths this unit will also complete students learnings by incorporating CAD, CAM and milling intermediate/advanced set-up techniques. Students will have projects on these topics and will learn the components in a hands-on way. Students will be accessed on topics via demonstration both on software and hardware, quizzes, and exams. The standards for assessments will be based on industry standards.

B. Each unit will have respective classroom and lab projects that will test students' knowledge on the topics and each student will demonstrate/produce reports to identify and improve. Each unit will also have a quiz and exam that will assess student's retention on the topics. Students will research regarding the best practices of the complex Mill CAD. Students will write a research paper on the various complex Mill CAM best practices including citing sources as evidence, explain how materials are used, explain how ideas and processes are used, and use guiding questions to help in the creation of their manufactured parts. Students will create a PowerPoint presentation and deliver an oral presentation based on their research paper that will be scored with a rubric. Opportunities for peer feedback will be built into each assessment.

Unit 8: LATHE CAD/CAM (5 weeks)

STANDARDS
4.0 Technology, 5.0 Problem Solving and Critical Thinking, 6.0 Health and Safety
7.0 Responsibility and Flexibility, 9.0 Leadership and Teamwork
Machining and Forming Technologies Pathway Standard 5.0, 6.0, 7.0, 8.0, 9.0, 11.0

A. In this unit students will learn how to generate more complex drawings including solids and surfaces and learn more intermediate/advance tool paths such as single point threading, ID boring, the use of CANNED cycles, intermediate to advance lathe tool paths this unit will also complete students learnings by incorporating CAD, CAM, and lathe intermediate/advanced set-up techniques. Students will have projects on these topics and

will learn the components in a hands-on way. Students will be accessed on topics via demonstration both on software and hardware, quizzes, and exams. The standards for assessments will be based on industry standards.

B. Each unit will have respective classroom and lab projects that will test students' knowledge on the topics and each student will demonstrate/produce reports to identify and improve. Each unit will also have a quiz and exam that will assess student's retention on the topics. Students will research regarding the best practices of the complex Lathe CAD. Students will write a research paper on the various complex Lathe CAM best practices including citing sources as evidence, explain how materials are used, explain how ideas and processes are used, and use guiding questions to help in the creation of their manufactured parts. Students will create a PowerPoint presentation and deliver an oral presentation based on their research paper that will be scored with a rubric. Opportunities for peer feedback will be built into each assessment.

Final Project: Students will complete a comprehensive complex project in teams working to create a complex part that connects together to form a complex component. This includes a comprehensive report. Each team will create a PowerPoint presentation and deliver an oral presentation based on their Final Project that will be scored with a rubric and peer feedback.

Final comprehensive exam: incorporating the complex application of Manufacturing design and equipment configuration, setup, and use