



NAPA VALLEY
UNIFIED SCHOOL DISTRICT

High School Course of Study Approval Request Form

High School Site	Signature - Principal or Academic AP Designee	Signature - Teacher Leader (enter N/A if no Teacher Leader)	Comments:
American Canyon HS	Andrew Goff	NA	
Napa HS	Ean Ainsworth	Ron Solomon	
Napa Valley Independent Studies	Susan Wilson	NA	
New Tech HS	Riley Johnson	NA	
Valley Oak HS	Maria Cisneros	NA	
Vintage HS	Katelyn Estudillo	Brady Mitchell	

Course submitted by:	Gillie Miller	School Site:	Napa High School
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Executive Director, Secondary Education: _____

Review resources:

[Rubric for Evaluating Digital Content & Technology Tools in Relation to CCSS for ELA \(Grades 6-12\)](#)

[State Math criteria](#)

[Technology in Teaching Math](#)

[Other criteria and decision making tools](#)

Please review following high school course outline and sign above if you approve or write reason in comment area if you do not.

☐ New ☒ **Revised outline - new course number to be issued due to change in Vocational Ed level**

COMPUTER (Short) TITLE: CTE MMPD 1
COURSE (Long) TITLE: CTE Machining, Manufacturing & Product Development 1
AERIES TITLE: CTE Mach, Mfg & Prod Dev 1
COURSE NUMBER: CTE908
GRADE LEVEL: 9 - 12
LENGTH OF COURSE: 1 year/10 credits (5 credits/semester)
GRAD REQUIREMENT: Elective (Z)
CSU/UC REQUIREMENT: no
COLLEGE PREP: no
VOCATIONAL ED: Introductory **[New: Concentrator]**
CALPADS CODE: 8220
PATHWAY CODE: 212
NCLB : No

COURSE OVERVIEW

DESCRIPTION OF COURSE

This course is an introduction to traditional and contemporary metalworking and manufacturing techniques including precision measurement, design and layout, hand tools, drilling, sawing, turning, milling, and fabrication through a series of projects. Students will also be introduced to advanced design and manufacturing techniques such as computer aided design (CAD), computer aided manufacturing (CAM), computer numerical control machining (CNC), and 3-D printing.

Students fabricate projects based on following prescribed and precise directions and they design and create their own projects. Students become proficient at reading and writing technical industry-based manuals and tutorials. Students explore careers related to engineering, machining and manufacturing, and gain entrepreneurial and project management skills. Math, physics, and other core academics are integrated into the curriculum adding relevance and rigour. Students apply math through hands on learning: precision measurements, adding and subtracting fractions and decimals, algebra and geometry.

Safety is a must; students are expected to follow all safety rules and will be dismissed if they choose not to comply.

GOALS OF THE COURSE

Upon completion of Machining, Manufacturing, and Product Development 1, the following competencies can be demonstrated:

Machine Shop Safety and Personal Protective Equipment

Machining Mathematics Concepts and Operation

Technical reading and writing

Semi-Precision and Precision Measurements and Care of Instruments

Job Planning, Basic Drafting, Layout and Bench Work

Identification and Proper Use and Care of Hand Tools

Identification and Operation of Traditional Machine Tools (Drill Press, Saws, Milling Machines, Lathes)

Identification of Machining, Manufacturing, Product Development and Engineering careers

Career and College Readiness (Cover Letter, Resume, References, Portfolio, Presentation, Interviewing)

Communication: oral, written, and listening skills

COURSE CONTENT

Unit 1: Safety Rules and General Maintenance

Learning Objectives: Students demonstrate shop safety and good housekeeping practices:

Material Safety Data Sheets

Tool safety

Personal Protective Equipment (safety glasses, earplugs, etc)

Shop behavior

Potential hazards

Lifting

OSHA requirements

Shop and Equipment Cleanliness

Inspection and assessment of tool and equipment condition

Noises and Vibrations

Daily, weekly and/or monthly routine maintenance

Non-routine maintenance strategies

Tooling Maintenance

Operating Manuals

Sample Assignments

Students will examine specific safety and use policies, procedures, and practices. Students will examine work spaces for safety and/or health concerns. They will be expected to demonstrate a variety of safety practices through various classroom assignments and activities and will demonstrate their understanding through completion of a required safety test. Students and parents sign and return a contract. Students demonstrate safe practices at all times.

Anchor Standards 2.1, 2.2, 5.1, 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, 7.7, 8.4, 10.2 11.1, 11.4

Pathway Standards B2.1, B6.1, B7.1, B8.2, B9.1, B10.1

Unit 2: Measurements and Math

Learning Objectives: Students will demonstrate knowledge of:

Fractions and Decimals (Addition / subtraction, conversion)

Reading measuring tools (Rulers, Calipers and Micrometers)

Linear, Square and Cubic measurements

Weights and Measures Standards

Precision measuring practices

Manual Precision Measurement

Metrology Inspection – machines and software

Statistical Process Control

Sample Assignments

Given a set of objects and measuring devices, students collaborate to measure and record various aspects of weight, length, diameter, angle, square and cubic measurements, then compare for consistency.

Measurements are recorded in fractions, decimals, inches and metric units. Students will then add subtract and convert from one system to the other.

Students will complete a series of measurement tests designed to assess their understanding and mastery of basic measurements utilized throughout the course. This may be either a hands on and/or paper demonstration of understanding (fraction, inch, decimal inch, dial caliper, micrometer, etc.).

Anchor Standards 2.4, 5.1, 9.2, 10.1, 10.2, 10.3

Pathway Standards B1.1, B1.2, B1.3

Unit 3: Tool Identification and Manual Operations

Learning Objectives: Students will demonstrate knowledge of:

Hand Tools (wrenches, screwdrivers, pliers, files, scribes etc)

Power Hand Tools

Traditional Machine Tools

Advanced Manufacturing Tools

Layout, benchwork and assembly

Layout materials

Bench vises & hand tools

Threading and tapping

Sample Assignments

Logo Project: Students will design, layout and manufacture their own logo using sheet metal. Students demonstrate basic drawing techniques and apply measurement skills to create their own logo. They then apply shop safety practices, learn how to transfer information from their drawings and create their logo using saws, drills, grinders, sanders, files and other hand tools. Students present their work to the class. Students give and receive constructive criticism utilizing technical terminology. Students refine their skills on their next project.

Anchor Standards 5.1, 5.2, 6.3

Pathway Standards B1.1, B5.1, B5.2, B5.3, B5.8, B5.9, B7.1

Unit 4: Print Reading and Product Design

Learning Objectives: Students will demonstrate knowledge of:

Understanding Drawings (Blueprints)

Drawing and modeling techniques, manual, digital, and 3D

Identify specifications & tolerances

Material Specifications

Tolerances

Drawing Symbols

CAD, Inventor, Solidworks, other industry software

Sample Assignments

Students start by drawing plans on graph paper (orthographic), then students read and manufacture projects based on a CAD design. Students advance to using the computer to create plans utilizing industry-based software, and making 3D printed prototypes increasing in complexity.

Anchor Standards 2.6, 3.8, 4.1, 4.3, 4.5, 4.6, 5.3, 5.4, 8.1, 8.6, 8.7, 10.1, 10.2, 10.3, 10.4, 11.2, 11.4, 11.5

Pathway Standards B1.4, B11.1, B11.2, B11.3, B11.4, B11.5, B11.6

Unit 5: Power Tools and Operation of Machine Tools

Learning Objectives: Students will demonstrate knowledge and safe operation of:

Drill Press

Drilling tools

Sharpening drills

Drill Press Operations & Safety

Speeds and feeds

Lathe:

Work holding /Tool holding

Cutting Tools

Speed and Feeds

Setup

Facing, Turning, Boring, Threading

Milling:

Cutting Tools

Speed and Feeds

Climb vs. Conventional Milling

Setup

Work holding / Tool holding

Facing, slotting, boring, and squaring

Sample Assignments

Lathe Project: Students produce an aluminum product on the lathe that meets precise specifications. Students read prints or design projects, measure with rulers, dial caliper, micrometers, and other tools. They learn the basics of cutting metal on a lathe: turning, facing, drilling, and tapping on aluminum. Students calculate spindle speeds and feed rates for the vertical mill and lathe.

Hammer Project: Students produce a hammer from prints.

1. Develop Materials List
2. Calculate materials costs
3. Project sketching
4. Select machining processes to create project
5. Select machines and tooling needed
6. Produce prototype models

The Hammer Project integrates 3D printing into the curriculum.

Students reflect on their learning by critiquing their finished hammer with the teacher analyzing the manufacturing processes used and the areas (if any) needed for improvement. Students extrapolate more advanced applications of the machining skills and processes.

Anchor Standards 4.1, 6.3, 6.4, 6.5, 6.7, 7.2, 7.5, 7.6, 8.1, 10.3

Pathway Standards B1.1, B1.2, B1.3, B2.5, B4.1, B5.3, B7.2, B7.3, B7.4, B7.5, B7.6, B8.1, B8.2, B8.3, B9.1

Unit 6: Introduction to New Product Introduction (NPI) Planning Process

Learning Objectives: Students will demonstrate knowledge of:

Product Concept Generation and Refinement (Sketching, Drafting, CAD)

Develop Materials List (B.O.M.)

Calculate Product Costs (Material, Labor, Burden)

Select machining processes to create project

Select machines and tooling needed

Produce prototype models

Manufacture Product

Take Product to Market

Sample Assignments

Students develop an entrepreneurial mindset while they design, plan, manufacture, and market products to be sold through the student-run enterprise. Students interact with local industries and businesses to produce real products. Students identify target markets and business strategies to make a profit. Sample products are trailer hitches, bottle holders, fidget spinners, coasters, chess sets, lazy susans, logos, etc.

Anchor Standards 2.4, 2.5, 4.1, 4.2, 5.2, 5.4, 6.3, 6.4, 6.5, 7.2, 7.3, 7.4, 7.5, 7.6, 8.1, 8.3, 8.5, 8.6, 8.7, 9.3, 9.6, 9.7, 10.2, 10.3, 10.4, 11.3, 11.4, 11.5

Pathway Standards B2.1, B2.2, B2.3, B2.4, B2.5, B5.1, B5.9, B6.3, B9.2, B9.3, B9.4, B10.5, B11.1, B11.3, B11.4, B11.5, B11.6

Unit 7: Introduction to Project Management

Learning Objectives: Students will understand basic fundamentals of project management using the PMlef badging course materials:

Project Management Foundational Knowledge

Process Groups

Project Integration Management

Project Scope Management

Project Time Management
Project Quality Management
Project Human Resource Management
Project Communications Management
Project Risk Management
Project Stakeholder Management

Sample Assignments

PMlef learning modules with sample tests.

Students will incorporate and demonstrate this knowledge into their projects. Students will be eligible to take the PMI badging exam through NOCTI in the spring.

Anchor Standards 2.3, 2.4, 2.5, 2.6, 4.4, 5.1, 5.2, 5.3, 5.4, 6.7, 6.8, 7.1, 7.2, 7.3, 7.4, 7.6, 7.7, 8.1, 8.2, 8.3, 8.4, 9.1, 9.2, 9.3, 9.5, 9.6, 9.7, 10.1, 10.2, 10.3, 10.4, 11.1, 11.2, 11.3, 11.4, 11.5

Pathway Standards B11.5, B11.6

Unit 8: Career and College Readiness

Learning Objectives: Students gain career awareness and career exploration related to careers in manufacturing, engineering, machining, welding, fabrication, robotics, etc., and will participate in work-based learning.

Sample Assignments

Students identify their areas of interest and research careers in the Manufacturing/Engineering Industry.

Students research post secondary options and tour programs at the local college.

Students write a resume, cover letter and start a digital portfolio of their work.

Students participate in mock job interviews with industry professionals

Students interact with industry partners through career fairs, guest speakers and worksite tours.

Anchor Standards 2.4, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.9, 4.1, 7.2, 7.7, 7.8, 8.4, 10.4, 11.1

Pathway Standards (none)

Common Core Standards LS 9-10, 11-12.6, SLS 9-10, 11-12.1, 11-12.2, WS 11-12.6

INSTRUCTIONAL STRATEGIES

Lecture and Demonstrations

Multimedia Sources

Project-Based Learning

Work-Based Learning

INSTRUCTIONAL MATERIALS / TEXTBOOKS

TEXTBOOK 1:

Title: Precision Machining Technologies

Edition: 1st Edition

Date: 2011

Publisher: Delmar Centgage

Author(s): Hoffman, Hopewell, Janes, Sharp

SUPPLEMENTAL INSTRUCTIONAL MATERIALS

Solid Works Tutorials

Master CAM Tutorials

Machine Lab

PMlef curriculum

STANDARDS SUMMARY

Manufacturing and Product Development Knowledge and Performance Anchor Standards All (1-11) anchor standards addressed.

Machining and Forming Technologies Pathway Standards B1.1-1.4, B2.1-2.5, B4.1, B5.1-5.3, B5.8, B5.9, B6.1, B6.3, B7.1-7.6, B8.1-8.3, B9.1-9.4, B10.1, B10.5, B11.1-11.6

Common Core and Academic Standards LS 9-10, 11-12.6, SLS 9-10, 11-12.1, 11-12.2, WS 11-12.6, 11-12.7, RSTS 9-10, 11-12.4, RSIT 11-12.7, RLST 11-12.3, 11-12.4, 11-12.6, 11-12.7, 11-12.10. A-CED 2,4, A-REI 6, 7, G-C 2, G-CO 1, 2, 5, 12, N-Q 1, 2, 3, S-IC 6, S-ID 1, C 14.0, 15.0, 16.0, 17.0, 18.0, 19.0, 20.0, SEP 1, 2, 3, 4, 5, 6, 8, CC 1, 3, 6, 7, ETS 1,2, WH 10.11,