



Walker Career Center

Principles of Engineering

DOE# 4814



Course Description and Outline

Principles of Engineering is a course that focuses on the process of applying engineering, technological, scientific and mathematical principles in the design, production, and operation of products, structures, and systems. This is a hands-on course designed to provide students interested in engineering careers to explore experiences related to specialized fields such as civil, mechanical, and materials engineering. Students will engage in research, development, planning, design, production, and project management to simulate a career in engineering. The topics of ethics and the impacts of engineering decisions are also addressed. Classroom activities are organized to allow students to work in teams and use modern technological processes, computers, CAD software, and production systems in developing and presenting solutions to engineering problems.

Teacher Information and Student Supports

Name: Jim Hanson
Email: jhanson2@warren.k12.in.us
Phone: 317-532-6165

Course Supplies

- Black or Blue Pen
- Pencil (Mechanical)
- Highlighter
- Engineering Notebook (Provided)
- Calculator

Suggested Course Supplies

- USB Mouse for Chromebook
- Colored Pencils
- Large Eraser
- Second Color Pen

Additional Supports

- Tutoring is available on Tuesdays and after school until 3pm

Journey of a Graduate Skills

Critical Thinking

- Analyze energy source processes.
- Determine systems efficiency and energy use
- Assess energy sources that can be combined to convert energy to useful forms.
- Compare the advantages and disadvantages of parallel and series circuit design.
- Analyze the relationships between voltage, current, and resistance
- Analyze forces acting upon an object in a given situation.
- Employ appropriate scalar and vector calculation to problems.
- Analyze material properties used to create products
- Analyze the forces acting on a object while in motion
- Distinguish between hydrodynamic and hydrostatic systems.
- Distinguish between pressure and absolute pressure.
- Distinguish between temperature and absolute temperature
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- Differentiate between the characteristics of pneumatic and hydraulic systems
- Differentiate between the characteristics of digital and analog devices.
- Judge between open and closed loop systems in order to choose the most appropriate system for a given technological problem.
- Apply design concepts to problems in process control and automations systems
- Brainstorm and sketch possible solutions to an existing design problem.

Communication

- Illustrate the moment of inertia of structural members.
- Demonstrate calculation of product mass properties as used for properties and testing documentation.
- Demonstrate the calculation of projectile motion given parameters
- Explain how gravity effects motion
- Describe the relationships among force, mass, and changes in motion
- Illustrate the use of statistics in the engineering design process.
- Identify and explain basic components and functions of fluid power devices.
- Describe applications of process control and automation systems.
- Select an approach that meets or satisfies the constraints provided in a design brief.

Resilience

- Explore ways to produce mechanical power using alternative energy.

Collaboration

- As a team, present a workable solution to the design problem.

Content Knowledge

- Identify and describe the possible types of power conversion.
- Calculate circuit resistance, current, and voltage using Ohm's law.
- Classify different structural elements of a system.
- Categorize energy sources.
- Differentiate between scalar and vector
- Use equations of equilibrium to calculate unknown forces.
- Use the method of joints strategy to determine forces acting on an object
- Verify non-destructive material property tests on selected common products
- Identify and describe the manufacturing processes used to create common products.
- Examine propulsion of an object.
- Apply the laws of motion to solutions
- Adapt and apply six simple machines, their attributes, and components.
- Calculate mechanical advantage of different mechanisms.
- Design, create, and test gear, pulley, and sprocket systems.
- Calculate work and power in mechanical systems
- Determine efficiency in a mechanical system.
- Measure forces and distances related to mechanisms.
- Compare theoretical and experimental data.
- Use statistics to determine theoretical outcomes.
- Utilize data collection to graphically present findings.
- Calculate values in a fluid power system.
- Calculate values in a pneumatic system.
- Create control system operating programs that utilize computer software.
- Create system control programs that utilize flowchart logic.
- Choose appropriate input and output devices based on the need of a technological system.
- Create a decision making matrix for design problems.
- Create a detailed pictorial sketch and use 3D modeling software to document the best choice.
- Document daily work and progress toward a solution in an engineering notebook.
- Conduct research on the current and future outlook for engineering and engineering technology careers.
- Research college/technical schools for class requirements for entering engineering and engineering technology career majors
- Identify and describe different engineering disciplines

Citizenship

- XX

Grade Calculation

MSD Warren Township Scale

Grade	Percentage
A	92.5 - 100
A-	89.5 - 92.4
B+	86.5 - 89.4
B	82.5 - 86.4
B-	79.5 - 82.4
C+	76.5 - 79.4
C	72.5 - 76.4
C-	69.5 - 72.4
D+	66.5 - 69.4
D	62.5 - 66.4
D-	59.5 - 62.4
F	Below 59.5

Grading Policies

Semester Grade

Your semester grade will be calculated in the following way:

90% Assignments and Challenges, Assessments (Tests, Quizzes, Projects)
10% Final Project/Exam

Warren Central Grading Policy

The high school grading policies will be explained here

Warren Central Homework Policy

The high school homework policies will be explained here.

Synergy Grades

Grades posted in Synergy reflect the students' academic performance in the course.

Credits/Pathways

CORE 40 Diploma

Course fulfills two credits of the elective requirement for the Core 40 diploma.

Academic/Technical Honors Diploma

Has potential to fulfill academic/technical honors diploma. - see counselor

CTE Graduation Pathway

Principles – Introduction to Engineering Design (IED)

Course A – Principles of Engineering (POE)

Course B – Civil Engineering and Architecture (CEA)

Or

Course B – Computer Integrated Manufacturing (CIM)

Or

Course B – Digital Electronics (DE)

Capstone – Engineering Design & Development (EDD)

Types of Assignments and Assessments

Assignments

Assignments will include classwork, and homework. These items are opportunities for students to practice the concepts learned in class.

Labs and Challenges

Each unit will have one or more larger activities. These activities are designed to demonstrate “real world” applications of the class concepts and help students develop a deeper understanding of the learning objectives.

Assessments

Tests/projects cover Indiana State Standards.

Quizzes may be given throughout a unit. There may or may not be a quiz for each unit.