Bow High School - Course Map

Course Title: Engineering Principles I
Department: Engineering

Unit Name: Topic 1.0- Engineering Overview
Topics: ● Engineering career disciplines ● Derived units ● Factor Label Method
School Competencies: ● Professional Environment Skills (Communication - Advanced) ● Multi-Disciplinary Technological & Scientific Understanding (Problem Solving & Analysis - Advanced) ● Technical Design (Problem Solving & Analysis - Advanced)
Course Competencies: ● Energy and Power: Students use the fundamental principles of thermodynamics to construct and analyze quantitative models and apply these models to design effective, efficient, and responsible mechanical solutions to real world problems. ● Professional Practices and Communication: In order to arrive at an effective solution to a given problem, students practice professionalism guided by professional ethics and standards, effective communication, and collaboration.
Formative Assessments: ● Engineering Notes Topic 1.0 ● Gravity Generator - Energy System Modeling
Summative Assessments: ● Topic 1.0 Summative

Bow High School - Course Map

Unit Name: Topic 2.6- Mechanical Energy Systems

Topics:
- Simple Machines
- Force vs Work vs Power
- Factor Label Method
- Law of Conservation of Energy

School Competencies:
- Professional Environment Skills (Communication - Advanced)
- Multi-Disciplinary Technological & Scientific Understanding (Problem Solving & Analysis - Advanced)
- Technical Design (Problem Solving & Analysis - Advanced)

Course Competencies:
- Energy and Power: Students use the fundamental principles of thermodynamics to construct and analyze quantitative models and apply these models to design effective, efficient, and responsible mechanical solutions to real world problems.
- Professional Practices and Communication: In order to arrive at an effective solution to a given problem, students practice professionalism guided by professional ethics and standards, effective communication, and collaboration.
- Problem Solving and Process Thinking: Provided with a problem, students utilize strategic and systematic design and inquiry processes to guide the development of an effective solution.

Formative Assessments:
- Engineering Notes Topic 2.6
- Simple Machines at Home
- SMaH: Measurements & Calculations

Summative Assessments:
- Water Pump Design Challenge

Unit Name: Topic 2.1- Energy Resources

Topics:
- Qualitative energy conversions and transfers
- Quantitative definitions of work, stored energy, and power
- Societal energy needs
- Emergent career fields

School Competencies:

Bow High School - Course Map

- Multi-Disciplinary Technological & Scientific Understanding (Problem Solving & Analysis - Advanced)
- Technical Design (Problem Solving & Analysis - Advanced)

Course Competencies:

- Energy and Power: Students use the fundamental principles of thermodynamics to construct and analyze quantitative models and apply these models to design effective, efficient, and responsible mechanical solutions to real world problems.
- Problem Solving and Process Thinking: Provided with a problem, students utilize strategic and systematic design and inquiry processes to guide the development of an effective solution.
- Ethical Design: Students consider knowledge of physical and biological systems, the energy demands of human technology, and the energy resources of the Earth to create sustainable solutions to real world problems and identify the career opportunities associated with such solutions.

Formative Assessments:

- Engineering Notes Topic 2.1
- Personal Energy Requirement Tracker
- Personal Energy Requirement Spreadsheet
- Show Me a Joule project

Summative Assessments:

- ~~Saltstraumen Maelstrom Analysis Part 1 + Part 2~~
- Personal Energy Requirement Value in Joules + Hourly Chart

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Unit Name: Topic 2.2- Energy Conversion

Topics:

- 2nd Law of Thermodynamics
- Efficiency of Energy Conversion Devices
- Quantitative Models of Mechanical Energy Systems

School Competencies:

- Professional Environment Skills (Communication - Advanced)
- Multi-Disciplinary Technological & Scientific Understanding (Problem Solving & Analysis - Advanced)
- Technical Design (Problem Solving & Analysis - Advanced)

Course Competencies:

- Energy and Power: Students use the fundamental principles of thermodynamics to construct and analyze quantitative models and apply these models to design effective, efficient, and responsible mechanical solutions to real world problems.
- Professional Practices and Communication: In order to arrive at an effective solution to a given problem, students practice professionalism guided by professional ethics and standards, effective communication, and collaboration.
- Problem Solving and Process Thinking: Provided with a problem, students utilize strategic and systematic design and inquiry processes to guide the development of an effective solution.
- Ethical Design: Students consider knowledge of physical and biological systems, the energy demands of human technology, and the energy resources of the Earth to create sustainable solutions to real world problems and identify the career opportunities associated with such solutions.

Formative Assessments:

- Engineering Notes Topic 2.2

Summative Assessments:

- Topic 2.2 Summative
- Wind-Powered Generator Project

Bow High School - Course Map

Unit Name: Topic 2.4- Electrical Energy Systems

Topics:

- Ohm's Law
- Kirchhoff's Law
- Quantitative Models of Direct Current Systems
- Quantitative Models of Alternating Current Distribution Systems

School Competencies:

- Professional Environment Skills (Communication - Advanced)
- Multi-Disciplinary Technological & Scientific Understanding (Problem Solving & Analysis - Advanced)
- Technical Design (Problem Solving & Analysis - Advanced)

Course Competencies:

- Energy and Power: Students use the fundamental principles of thermodynamics to construct and analyze quantitative models and apply these models to design effective, efficient, and responsible mechanical solutions to real world problems.
- Professional Practices and Communication: In order to arrive at an effective solution to a given problem, students practice professionalism guided by professional ethics and standards, effective communication, and collaboration.
- Problem Solving and Process Thinking: Provided with a problem, students utilize strategic and systematic design and inquiry processes to guide the development of an effective solution.

Formative Assessments:

- Engineering Notes Topic 2.4 First Half + Second Half
- DC Motor Carnival Ride Project

Summative Assessments:

- Topic 2.4 Summative

Bow High School - Course Map

Unit Name: Topic 2.5- Thermal Energy Systems

Topics:

- Quantitative Models of Thermal Energy Systems

School Competencies:

- Professional Environment Skills (Communication - Advanced)
- Multi-Disciplinary Technological & Scientific Understanding (Problem Solving & Analysis - Advanced)
- Technical Design (Problem Solving & Analysis - Advanced)

Course Competencies:

- Energy and Power: Students use the fundamental principles of thermodynamics to construct and analyze quantitative models and apply these models to design effective, efficient, and responsible mechanical solutions to real world problems.
- Professional Practices and Communication: In order to arrive at an effective solution to a given problem, students practice professionalism guided by professional ethics and standards, effective communication, and collaboration.
- Problem Solving and Process Thinking: Provided with a problem, students utilize strategic and systematic design and inquiry processes to guide the development of an effective solution.

Formative Assessments:

- ~~Ice Cube Project~~ **(2022-2023… NOT 2023-2024)**
- Engineering Notes Topic 2.5

Summative Assessments:

- Topic 2.5 Quiz #1
- Topic 2.5 Quiz #2
- Topic 2.5 Quiz #3
- Topic 2.5 Quiz #4
- ~~Thermal Energy Choice Build Project~~ **(2022-2023… NOT 2023-2024)**
- Ice Cube Design Challenge **(2023-2034)**

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Unit Name: Topic 2.3 - Energy Storage (not covered 2023-2024)
Topics: ● Contemporary Energy Storage Techniques
School Competencies: ● Multi-Disciplinary Technological & Scientific Understanding (Problem Solving & Analysis - Advanced) ● Technical Design (Problem Solving & Analysis - Advanced)
Course Competencies: ● Energy and Power: Students use the fundamental principles of thermodynamics to construct and analyze quantitative models and apply these models to design effective, efficient, and responsible mechanical solutions to real world problems. ● Ethical Design: Students consider knowledge of physical and biological systems, the energy demands of human technology, and the energy resources of the Earth to create sustainable solutions to real world problems and identify the career opportunities associated with such solutions.
Formative Assessments: ● Engineering Notes Topic 2.3
Summative Assessments: ● "Bow and Arrow" (Vertical Elastic Projectile Launch) Performance Assessment