

Pre-Engineering

The goal of this course is to introduce students to a variety of engineering disciplines, and to the concepts of design, analysis, and the engineering design process.

- Prepare scale models and dimensioned sketches and develop full-scale projects from sketches or scale models.
- Prepare technical drawings using both drafting techniques and AutoCAD.
- Identify structural members in stress while determining the type and amount of stress, and whether or not the use of the material is appropriate.
- Understand vectors, vector forces, and static equilibrium. Perform a structural analysis using the method of joints.
- Identify open and closed fluid systems, components and controls, and locate and apply flow resistance factors that apply to closed system components.
- Explain the difference between hydraulic and pneumatic systems.
- Using models of home and automotive engine systems, trace the generation (source), dispersal (sink) of heat energy while identifying useful and waste energy, energy transmission methods, and heat cycles.
- Understand concepts of light spectrum, additive and subtractive color, reflection and refraction. Understand the laser, and the application of light properties and the laser to fiber optic technology.
- Diagram an electromagnetic wave. Describe conduction in a wire; describe EM propagation in space. Observe the effects of ionospheric refraction using AM radio.
- Complete an independent engineering design project.

WESTFORD PUBLIC SCHOOLS



CURRICULUM BENCHMARKS

GRADES 9-12

TECHNOLOGY ENGINEERING

Westford Academy

Compiled by the
Science Technology and Engineering
Curriculum Task Committee
under the direction of
Director of Curriculum and Instruction
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“Shaping the future one child at a time”

<http://westford.mec.edu/schools>

Technology and Engineering

The goal of these courses is to provide students a practical and theoretical background in the field, leading to skills that will prepare them to contribute to the advancement of technology and the improvement of living standards by solving tomorrow's problems.

Technology 1: Mechanics

- Understand the engineering design process and its application
- Develop scale models and drawings
- Demonstrate correct and safe use of tools
- Identify structural members in stress and determine the type of stress
- Understand Bernoulli's principle, fluid drag, static, dynamic, and gyroscopic stability, and apply these in designing and optimizing the flight performance of a rocket
- Understand weight and buoyancy and apply these in designing a hot air balloon
- Understand the dynamics of controlled flight. Apply this knowledge to optimizing the flight of a glider and a rubber powered airplane model
- Construct a project and demonstrate for each unit covered
- Practice the design-test-redesign-retest methodology in product development

Technology 2 : Electricity and Electronics

This course expands on the skills learned in Technology 1, however Technology 1 is not a pre-requisite.

- Demonstrate correct and safe use of tools
- Correctly use a multimeter, signal generator, and oscilloscope
- Understand magnetism and electromagnetism, and how these apply to motors and generators
- Understand AC and DC systems, transformers, and electric power distribution. Understand voltage, current, resistance, and power
- Complete computer-based learning modules in DC fundamentals and digital circuit fundamentals
- Understand basic electronic circuit schematic diagrams and construct a power supply to observe waveforms in the different parts of the circuit
- Understand basic switching technology
- Complete an independent engineering design project