Introduction to Engineering

Curriculum Map *Course Length: 1 Semester (approximately 17 weeks)*

Unit and Topics	Duration	Month (Fall)	Month (Spring)
"Big Idea" Concepts Emphasized Throughout the Course • Answering the fundamental question: What is engineering? • Learning the fundamentals of computer spreadsheets for both engineering and non-engineering applications • Experiencing the steps of the engineering design process • Applying engineering tools to create engineering models and solutions • Connecting engineering to mathematics, science, history, and economic/cost considerations • Understanding the use of the engineering design process in the solution of problems and the advancement of society			
Unit 1: Computer-Aided Design Fundamentals • What is Computer-Aided Design? • Computer-Aided Design Concepts: 3D Modeling, 2D Diagrams, Rendering, Isometric View, Orthographic Projection, Dimensions, Units and Unit Conversion • Computer-Aided Design Tools: Orbit, Pan, Zoom, Sketch, Revolve, Line, Circle, Rectangle, Extrude, Fillet, Rectangular and Circular Patterns, Constraints, Text, Spline, Insert Decal/Canvas, Press Pull, Extrude, Cut/Emboss • Reading Knowledge Topics: How Engineers Use CAD, Engineering Sketching and Drawing, Fusion 360 For Makers Definitions, Dimensioning Guidelines • Language and Communication Skills: Creating Models and Diagrams	5 weeks	Aug-Sept	Jan-Feb
Unit 2: 3D Printing and 3D CAD Tools • What is 3D printing? • 3D Printer Concepts: STL and G-Code, Printer Limitations, Overhangs, Supports, Warping, Skirt, Brim, Raft, Print Cost Estimation • Advanced Computer-Aided Design Tools: Fully-Constrained Sketches, Revolve, Tangent Constraint, Offset Planes, Loft, Shell, Sweep, Import Spline CSV, Create and Import Graphs of Mathematical Functions (e.g. Parabola) • Reading Knowledge and Application Topics: How 3D Printers Work, 3D Printer Best Practices, 3D Printed Windpipe, 3D Printed Cells, Mass/Volume/Density, 3D Printing Hairy Structures, Dimensional Analysis with Squares and Cubes • Design Projects: Keychain, Project with a Purpose	7 weeks	Sept-Oct	Feb-Apr
Unit 3: Interactive Book Design and the History of Engineering • Engineering Design Process Concepts: Criteria and Constraints, Teamwork, Prototype, Model, Brainstorming, Iterative Design • Engineering History Packet Topics: Egypt and Mesopotamia, Engineering the Temples of Greece, The Roman Roads and Aqueducts, The Great Wall of China, Leonardo da Vinci, Gutenberg and His Printing Press, Engineering Developments 1500-1900 • "Top 20" Twentieth Century Engineering Accomplishments • Modern Branches of Engineering • Engineering Design Concepts: Mechanical Design, Reliability and Durability, Troubleshooting, Electrical Circuits, Light Emitting Diodes, Series and Parallel Circuits, Soldering, Open Circuit, Short Circuit • Reading Knowledge Topics: Preparing for an Engineering Degree, Engineering Design Process • Language and Communication Skills: Teamwork, Creating a Pop-Up Book Page, Creating a Light-Up Book Page, Citing Sources of Information	5 weeks	Nov-Dec	Apr-May

Note: Specific topics and units are subject to modification at teacher's discretion based on availability of equipment, space, enrollment, and class pacing. All students will experience engineering design through multiple units and projects.