

# STEM CURRICULUM PILOT

## UTAH'S STEM ACTION CENTER

*2013-14 Academic Year*

Utah's STEM Action Center invites you to apply for participation in a pilot of STEM 101 programming for the 2013-14 academic school year. Selected schools will receive comprehensive STEM curriculum and software, and physical materials designed to improve STEM literacy for all students. Each selected school will also receive STEM instructor orientation and training at the Salt Lake Center for Science Education on August 9th.

STEM101 is a flexible, project-based curriculum designed to inspire all students with the excitement of technology and engineering. STEM101 curriculum is based on research by the National Academies Foundation and targets the development of the skills required for the technically oriented jobs of the 21st century. STEM careers are among the fastest growing and most rewarding segments of our economy. STEM101 program has resulted in better performance on standardized tests, higher rates of college admission, and a higher rate of students selecting STEM as their college majors.

STEM101 is an instructor-led, project-based, digital curriculum. Selected schools will implement a full-year elective course that may be led by a math, science, or CTE instructor. Project-based curricular units will also be available for use in core science courses as outlined by the Next Generation Science Standards (NGSS). Units may also be used in core math, science, English, and social studies courses to show application for learning and enhance remediation plans.

### PROFESSIONAL DEVELOPMENT

All instructors, career counselors and administrators from the proposed school site will have the opportunity to attend a STEM Orientation Training Session. Participants will learn the STEM pedagogy, best practices for curriculum delivery, course sequencing, career pathways, and management of student outcome data. Schools will receive an onsite visit from a member of our STEM Academic Leadership Team to analyze instructor curriculum delivery practices and provide practical recommendations for improvement based upon extensive experience.

Participating faculty will earn (3) graduate school credits. This is a great opportunity to advance the STEM qualifications of the faculty at your school.

### ABOUT

The practices, strategies, and programming utilized within The STEM Academy (K-16 Program) were developed from identified national best practices by the National Academy of Engineering and National Science Foundation. The Curriculum correlates to NGSS and Common Core standards and features dual-credit agreements with over 180+ post-secondary institutions. Instructors may earn up to 12 graduate school credits through the STEM 101 professional development program.

STEM  
education  
enhanced  
process



# THE STEM ACADEMY®

A National Non-Profit Status K-16 Education Program [WWW.STEM101.ORG](http://WWW.STEM101.ORG)

# Dedicated *to* improving STEM LITERACY for all students

*A National Non-Profit Status K-16 Education Program*



## HIGH SCHOOL COURSE DESCRIPTIONS

### INTRODUCTION TO ENGINEERING

This STEM course is a basic introduction to engineering for all students. Students who complete this course will learn the concepts necessary in order to develop their ideas into solutions that will improve our lives. The course includes exciting hands-on learning activities like comparison of heart rates, rating consumer products, destructive testing, and 3D solid modeling. Apply math, science, history and English content from other courses in a STEM experience.

**UNITS:** The Secret to Success (Failure), What is Engineering, Engineering Communications, Success in the Classroom, Systems and Optimization, History of Engineering, Kick out the Ladder, Teamwork and Concurrent Engineering, Measurement, Introduction to 3D Solid Modeling, Materials, Basic Electricity, Problems Solving, Design and Modeling, Traditional Engineering Disciplines, FastTrack RC Culminating Project

### 3D SOLID MODELING

Students learn best when they can explore the practical applications of the concepts they learn. This STEM course has many activities and exercises that enable students to put design concepts into practice. Students develop real-world solutions such as artificial heart components, extreme sports equipment, hip replacement parts, robotic arm components, musical instruments and many others. Ideas become reality in this course.

**UNITS:** Understanding a Graphical User Interface (GUI), Basic Functionality, Sketched Features, Basic Operations in 3D Solid Modeling, Applied Features, Loft Features, Pattern Features, Fillets, Design Tables, Assembly Basics, Toolbox Basics, Drafting Basics, Visualization, Basic Sheet Metal Design Theory, Surfacing Features, Weldment Features, Predictive Analysis and Simulation, SolidWorks CSWA Certification

### DESIGN FOR MANUFACTURING

Design for Manufacturing teaches general manufacturing techniques. Calculation and analysis tools are used to design and redesign student's concepts. This course applies the ideas and projects developed in the previous two courses to produce life size models and prototypes. Industry standard software and machinery are used to manufacture student's ideas including verification programs to ensure that plans can be mass-produced. Students can complete industry certifications to enhance career opportunities in the fields of engineering, design, and machine operation.

### UNITS:

Introduction to Manufacturing, Reading Technical Drawings, Introduction to Machining, Mills and Milling Operations, Math in Manufacturing, Conversion Measurements and Tools, Simple Metallurgy, Cutting Tools, Cutting Feeds, Speeds and RPM, Chip Formation, Load and MRR, Cutting Tools Geometry, The Science and Skill of Measuring, Introduction to Computer Numerical Control, Coordinates, Axis and Motion, Introduction to Geometrics, Before and After the Machine, Advanced Technology Section, Beyond Chip Making (Laser, Water Jet EDM)

### PRINCIPLES OF ENGINEERING

This course teaches students to link Science, Technology, Engineering, and Math, as well as writing and teamwork skills to solve open-ended problems. More and more jobs require that people be able to learn, reason, think creatively, and make decisions to solve problems. Principles of Engineering is a team-based advanced course designed for all students. Students who complete this course will engage in real world case studies and learning activities that focus on the engineering process and making the world a better place to live and work in.

### UNITS:

Teamwork and Concurrent Engineering, Systems and Optimization, Gantt and Flow Charts, Ethics, Gears Trebuchet, Technical Communications, Project Management, Rube Goldberg Machines, Failure Modes and Effect Analysis, Introduction to Finite Element Analysis, Problem Solving, Design and Modeling, Engineering Work Experience, Industry Design Challenge



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# Representing *the* national **NEXT-GENERATION** high impact academic model

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## MIDDLE SCHOOL COURSE DESCRIPTIONS

### DISCOVERING STEM (*Grade 6*)

Discovering STEM curriculum students will be introduced to basic STEM concepts. Students will take part in an activity from each STEM area with two culminating activities that put their STEM skills to the test. Students will enjoy a hands-on, minds-on approach to learning about science, technology, engineering, and math. Each activity is designed to give the teacher flexibility of delivery and material choice.

### UNITS:

Manufacturing by Design, Design Drafting, Long Distance Flyer, Electronics, Floating Above the Rest, Robotics Orientation, Presentation

### DESIGNING WITH STEM (*Grade 7*)

The Designing with STEM curriculum is packed with tools to excite students and instructors alike! Designing with STEM introduces educators and students to the fun and powerful tools of designing and problem solving. The activities and academic applications engage the learner to embrace Science, Math, Engineering, and Technology while they examine each of the integral steps of critical design and problem solving.

### UNITS:

Problem Solving Techniques and Applications, Defining the Problem, Determining and Defining the Criteria, Developing Ideas, Creating Solutions, Testing and Evaluating, SEA Perch Challenge, Presentation

## INVESTIGATING STEM SKILLS (*Grade 8*)

The Investigating STEM Skills curriculum integrates the design skills and introductory STEM ideas from the Discovering (*Grade 6*) and Designing (*Grade 7*) courses. Investigating STEM Skills was designed with an 18 week semester instructional schedule in mind. The activities are intended to highlight the three primary elements of manufacturing: tools, materials, and processes. As always, this guide is intended to be used and customized by educators to meet the specific needs of students within specific instructional settings.

### UNITS:

Introduction to Robotics, Introduction to Material Science, Packaging Design, Robotics Design, Underwater SEA Perch Challenges, Environmental Engineering, Sustainable Energy, Mechanical Engineering, Presentation

STEM  
Middle  
School  
Courses



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