Engineering Course List

Transcript credit from Rochester Institute of Technology (NY) can be earned by passing the course with an 85% or higher and earning a passing score on the college portion of the final exam. The transcript must be paid for by November of the following academic year and the proper paper work sent to RIT. AE and CSE have a slightly different process than the rest of the courses to pay for transcript credit – they are obtained from the University of Iowa.
If your son or daughter has earned this credit, Mr. Velegol will inform you and your student by email as the scores are processed during the exam weeks.

FOUNDATION COURSES

Introduction to Engineering Design (IED - 5 GPA points)

Introduction to Engineering Design™ (IED) is a high school level course that is appropriate for 9th or 10th grade students who are interested in design and engineering. The major focus of the IED course is to expose students to design process, research and analysis, teamwork, communication methods, global and human impacts, engineering standards, and technical documentation. IED gives students the opportunity to develop skills and understanding of course concepts through activity-, project-, and problem-based (APPB) learning. Used in combination with a teaming approach, APPB-learning challenges students to continually hone their interpersonal skills, creative abilities and understanding of the design process. It also allows students to develop strategies to enable and direct their own learning, which is the ultimate goal of education.

The course assumes no previous knowledge, but students should be concurrently enrolled in college preparatory mathematics and science. Students will employ engineering and scientific concepts in the solution of engineering design problems. In addition, students use a state of the art 3D solid modeling design software package to help them design solutions to solve proposed problems. Students will develop problem-solving skills and apply their knowledge of research and design to create solutions to various challenges that increase in difficulty throughout the course. Students will also learn how to document their work, and communicate their solutions to their peers and members of the professional community.

Introduction to Engineering Design™ is the first of three foundation courses in Riverside's Project Lead The Way® high school engineering program. The course applies and concurrently develops secondary level knowledge and skills in mathematics, science, and technology.

The course of study includes:

Design Process
Modeling
Sketching
Measurement, Statistics, and Applied Geometry
Presentation Design and Delivery
Engineering Drawing Standards
CAD Solid Modeling
Reverse Engineering
Consumer Product Design Innovation
Marketing
Graphic Design
Engineering Ethics
Virtual Design Teams

Principles of Engineering (POE - 5 GPA points)

Principles of Engineering (POE) is a high school-level survey course of engineering. The course exposes students to some of the major concepts that they will encounter in a postsecondary engineering course of study. Students have an opportunity to investigate engineering and high tech career POE gives students the opportunity to develop skills and understanding of course concepts through activity-, project-, and problem-based (APPB) learning. Used in combination with a teaming approach, APPB learning challenges students to continually hone their interpersonal skills, creative abilities, and problem solving skills based upon engineering concepts. It also allows students to develop strategies to enable and direct their own learning, which is the ultimate goal of education.

To be successful in POE, students should be concurrently enrolled in college preparatory mathematics and science. Students will employ engineering and scientific concepts in the solution of engineering design problems. Students will develop problem-solving skills and apply their knowledge of research and design to create solutions to various challenges. Students will also learn how to document their work and communicate their solutions to their peers and members of the professional community.

Principles Of Engineering is the second of three foundation courses in Riverside's Project Lead The Way high school engineering program. The course applies and concurrently develops secondary level knowledge and skills in mathematics, science, and technology.

The course of study includes:

Mechanisms
Energy Sources
Energy Applications
Machine Control
Fluid Power
Statics
Material Properties
Material Testing
Statistics
Kinematics

Digital Electronics (DE - 5 GPA points)

Digital Electronics ™ is the study of electronic circuits that are used to process and control digital signals. In contrast to analog electronics, where information is represented by a continuously varying voltage, digital signals are represented by two discreet voltages or logic levels. This distinction allows for greater signal speed and storage capabilities and has revolutionized the world electronics. Digital electronics is the foundation of all modern electronic devices such as cellular phones, MP3 players, laptop computers, digital cameras, high definition televisions, etc.

The major focus of the DE course is to expose students to the design process of combinational and sequential logic design, teamwork, communication methods, engineering standards, and technical documentation.

Utilizing the activity-project-problem-based (APPB) teaching and learning pedagogy, students will

analyze, design and build digital electronic circuits. While implementing these designs students will continually hone their interpersonal skills, creative abilities and understanding of the design process.

Digital Electronics ™ (DE) is a high school level course that is appropriate for 10th or 11th grade students interested in electronics. Other than their concurrent enrollment in college preparatory mathematics and science courses, this course assumes no previous knowledge.

Digital Electronics ™ is the third of three foundation courses in Riverside's Project Lead The Way® high school engineering program. The course applies and concurrently develops secondary level knowledge and skills in mathematics, science, and technology.

The course of study includes:

Foundations of Digital Electronics

Scientific and Engineering Notations
Electronic Component Identification
Basic Soldering and PCB Construction
Electron Theory & Circuit Theory Laws
Circuit Simulation
Breadboard Prototyping
Component Datasheets & Troubleshooting

Combinational Logic Analysis and Design

Binary, Octal and Hexadecimal Number Systems
Boolean Algebra and DeMorgan's Theorems
AND-OR-INVERTER, NAND Only, and NOR Only Logic Design.
Binary Adders and Two's Complement Arithmetic
Combinational Logic Design with Field Programmable Gate Arrays

Sequential Logic Analysis and Design

Flip-Flops, Latches and Their Applications.
Asynchronous Counter Design with Small and Medium Scale Integrated Circuits.
Synchronous Counter Design with Small and Medium Scale Integrated Circuits.
Sequential Logic Design with Field Programmable Gate Arrays
Introduction to State Machines.

Introduction to Microcontrollers

Software Development for an Introductory Microcontroller
Real-World Interface: Introduction to Hardware Controls
Process Control with a Microcontroller

Aerospace Engineering (AE - 5 GPA points)

Aerospace Engineering (AE) is the study of the engineering discipline which develops new technologies for use in aviation, defense systems, and space exploration.

The course explores the evolution of flight, flight fundamentals, navigation and control, aerospace materials, propulsion, space travel, orbital mechanics, ergonomics, remotely operated systems and related careers. In addition the course presents alternative applications for aerospace engineering concepts.

Utilizing the activity-project-problem-based (APPB) teaching and learning pedagogy, students will analyze, design, and build aerospace systems. While implementing these designs, students will continually hone their interpersonal skills, creativity, and application of the design process. Students apply knowledge gained throughout the course in a final multi-media project to envision their future professional accomplishments.

Aerospace Engineering is a high school level course that is appropriate for 10th, 11th, or 12thgrade students interested in Aerospace. It is recommended that students are concurrently enrolled in college preparatory mathematics and science courses and have successfully completed the Principles of Engineering (POE) course.

AE is one of four specialization courses in Riverside's Project Lead The Way high school engineering program. The course applies and concurrently develops secondary-level knowledge and skills in mathematics, science, and technology.

The course of study includes:

Introduction of Aerospace Engineering
Evolution of flight
Physics of flight
Airfoils
Air navigation
Air traffic control
Global positioning system, GPS

Aerospace Design
Aerospace materials
Turbine, rocket and space propulsion
Flight Physiology

Space
Space law
Space junk
Orbital mechanics

Alternative Applications
Alternative applications
Remote systems
Rover design and building
Aerospace careers

Civil Engineering and Architecture (CEA - 5 GPA points)

Civil Engineering and Architecture is the study of the design and construction of residential and commercial building projects. The course includes an introduction to many of the varied factors involved in building design and construction including building components and systems, structural design, storm water management, site design, utilities and services, cost estimation, energy efficiency, and careers in the design and construction industry.

The major focus of the CEA course is to expose students to the design and construction of residential and commercial building projects, design teams and teamwork, communication methods, engineering standards, and technical documentation.

Utilizing the activity-project-problem-based (APPB) teaching and learning pedagogy, students will analyze, design and build electronic and physical models of residential and commercial facilities. While implementing these designs students will continually hone their interpersonal skills, creative abilities and understanding of the design process.

Civil Engineering and Architecture is a high school level course that is appropriate for 10th or 11th grade students interested in careers related to civil engineering and architecture. Other than their concurrent enrollment in college preparatory mathematics and science courses, this course assumes no previous knowledge.

Civil Engineering and Architecture is one of four specialization courses in Riverside's Project Lead The Way® high school engineering program. The course applies and concurrently develops secondary level knowledge and skills in mathematics, science, and technology.

The course of study includes:

Overview of Civil Engineering and Architecture

History of Civil Engineering and Architecture
-Past Civil Engineering and Architecture
-Principles and Elements of Design
-Architectural Styles

Careers in Civil Engineering and Architecture

Residential Design

Building Design and Construction practices
-Building codes
-Building components
-Green technology
-Universal Design
-3D architectural software
-Design and construction documentation

Cost Analysis

Energy Efficiency

Storm water analysis

Water supply

Plumbing

Electrical Systems

Wastewater management

Affordable housing design

Universal design

Commercial Applications

Commercial Buildings
-Building codes
-Land Use and Development
-Commercial building components

Structural design
-Steel deck
-Precast concrete floors
-Steel joints
-Structural steel beams
-Spread footings

Services and Utilities
-Energy Codes
-Plumbing (Optional)
-Electrical systems (Optional)
-Heating, Ventilating and Air-Conditioning systems
-Wastewater management

Site Considerations
-Land surveying
-Soil analysis
-Road design (Optional)
-Parking lot design
-Storm water management
-Site grading (Optional)
-Low impact development

Commercial Building Design

Commercial Building Design Project
-Property description
-Site discovery
-Commercial project viability
-Project management

Commercial Building Design Presentation

Computer Integrated Manufacturing (CIM - 5 GPA points)

Computer Integrated Manufacturing (CIM) is the study of manufacturing planning, integration, and implementation of automation.

The course explores manufacturing history, individual processes, systems, and careers. In addition to technical concepts, the course incorporates finance, ethics, and engineering design. This reflects an integrated approach that leading manufacturers have adopted to improve safety, quality, and efficiency.

Utilizing the activity-project-problem-based (APPB) teaching and learning pedagogy, students will analyze, design, and build manufacturing systems. While implementing these designs, students will continually hone their interpersonal skills, creative abilities, and understanding of the design process. Students apply knowledge gained throughout the course in a final open-ended problem to build a factory system.

Computer Integrated Manufacturing is a high school level course that is appropriate for 10th, 11th, or 12th grade students interested in manufacturing and automation. It is recommended that students are concurrently enrolled in grade level mathematics and science courses and have successfully completed the Introduction to Engineering Design (IED) course.

CIM is one of four specialization courses in Riverside's Project Lead The Way high school engineering program. The course applies and concurrently develops secondary-level knowledge and skills in mathematics, science, and technology.

The course of study includes:

Principles of Manufacturing

History of manufacturing

Manufacturing as an enterprise

System process flow

Automated control

Cost of manufacturing

Manufacturing Processes

Design considerations for manufacturability

Property analysis

Ethics and safety

Creating a prototype

Manufacturing processes and machines

CNC mill programming and usage

Elements of Automation

Robotic simulation and physical testing

Power systems

Pneumatic system design and construction

Integration of Manufacturing Elements

Computer Integrated Manufacturing system types

Manufacturing and automation career research

Manufacturing system design and construction

Computer Science Principles (CSP – 5 GPA Points)

Computer Science and Software Engineering (CSP) is the PLTW course that covers the College Board's CS Principles framework. Students work in teams to develop computational thinking and problem solving skills. The course does not aim to teach mastery of a single programming language but aims instead to develop computational thinking, to generate excitement about the field of computing, and to introduce computational tools that foster creativity. The course also aims to build students' awareness of the tremendous demand for computer specialists and for professionals in all fields who have computational skills. Each unit focuses on one or more computationally intensive career paths. The course also aims to engage students to consider issues raised by the present and future societal impact of computing.

Students practice problem solving with structured activities and progress to open-ended projects and problems that require them to develop planning, documentation, communication, and other professional skills. Problems aim for ground-level entry with no ceiling so that all students can successfully engage the problems. Students with greater motivation, ability, or background knowledge will be challenged to work further

The course of study includes:

Algorithms, Graphics, and Graphical User Interfaces

Algorithms and Agile Development

Mobile App Design

Algorithms in Python

Images and Object Oriented Libraries

GUIs in Python

The Internet

The Internet and the Web – protocols and hierarchy

Shopping and Social on the Web

Client and server side development

Security and Cryptography

Raining Reigning Data

Visualizing Data

Discovering Knowledge from Data

Collection, Persistence, and Societal Concerns of "Big Data"

Intelligent Behavior

Moore's Law and Modeling

Intelligent Agents