INTRO TO ENGINEERING DESIGN
Grades: 9
This course will expose students to the design process, research and analysis, teamwork, communication methods, ethical decision making, engineering standards, and technical documentation. Students have the opportunity to develop these skills through project-based learning and to continually hone their interpersonal skills, creative abilities and understanding of the design process. In addition to hands-on activities from each of the 11 majors engineering disciplines, students will interact with industry professionals through guest presentations. Finally, students will analyze case studies to analyze real-world problems.

INTRO TO COMPUTATIONAL THINKING FOR STEM
Grades: 9
This course will introduce coding as the means to express and communicate STEM ideas and to interact with computing devices. Students will be presented with problems arising from science, engineering and mathematics for which simple computational solutions are easily available. These ideas will be illustrated using games, where the Pythagorean Theorem is the basis of collision detection, and the equations of motion are the basis of realistic behavior. This course will build upon concepts from Algebra I, which will be visualized and put into practice in numerous hands-on projects.

PRINCIPLES OF ENGINEERING
Grades: 10
Through problems that engage and challenge, students explore a broad range of engineering topics, including mechanisms, the strength of structures and materials, and automation. Students continue to enhance their skills in problem solving, research, and design while learning strategies for design process documentation, collaboration, and presentations. The second half of the course will focus on using LearnCNC virtual mills and lathes to teach the students the principles of machining. At the end of the course, students will have a basic foundation for taking several NIMS certifications.

PROGRAMMING FOR ENGINEERS
Grades: 10
The goal of this course is to have students develop a transferrable skill set of computer programming abilities, which they could apply to any future programming task. Topics will include the software development cycle, data representation and processing, variables, functions and expressions, logic and control commands, repetition, implementation of basic algorithms, and physical computing. Projects will cover command-line scripting in Python, graphical interfaces in the JavaScript P5 environment and interaction with electronic components in the Arduino platform.

ROBOTICS
Grades: 11
Students will use robotics to explore the fundamentals of engineering and programming. The course will consist of project based learning including principles of engineering, physics, electronics, mechanics, and computer programming using RobotC. Students will use VEX components to create robots for both competitions and classroom projects. While building the robots, the design process will be emphasized as the robots are tested and their designs are modified to accomplish varying tasks. The second semester projects will have a heavier focus on programming the robot to move autonomously.

DATA MANIPULATION AND ANALYSIS
Grades: 11
This course is an introduction to the emerging field of Data Science, which is a combination of mathematics and statistics on one hand, and computational thinking and programming on the other hand. Students will learn how to collect and clean data from different sources, such as databases, web scraping or measurement devices. They will then use charts and plots to visualize the data, and statistical measures to analyze it. Machine learning techniques such as clustering, regression and Bayesian classification will be introduced as modern approaches to make sense out of large amounts of data. The course will end with an overview of Big Data and the archetypical Map-Reduce algorithm.

ENGINEERING ECONOMY
Grades: 12
Students will learn how to plan engineering projects based on economic studies for decision making, including considerations of rate of return, payback period, cost-benefit calculations, depreciation and tax relationships, and introduction to multivariate alternative studies.

ENGINEERING DESIGN & DEVELOPMENT
Grades: 12
Students work in teams to research, design, test, and construct a solution to an open-ended engineering problem. Students will study visualization and prototyping techniques including freehand sketching and 3D modeling using SolidWorks. The curriculum includes studies in principles of design methodology, product development, human factors, and prototyping with 3D printers. Students will also learn about project management by creating a design portfolio with an emphasis on technical writing and presentation skills.