

## COMPUTER SCIENCE AND ENGINEERING DEPARTMENT

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### **Robotics Engineering and Programming – JH Semester**

**6-8**

This junior high technology elective course is designed to introduce students to the world of robotics, engineering, and programming. It allows teachers to teach STEM concepts utilizing the LEGO Mindstorm's EV3 Robots. Students learn how to build robots and program basic robot behaviors using motors and rotation, sound, light, touch and ultrasonic sensors. Labs and projects are designed to encourage independent study, creativity, and cooperative teamwork. Key educational concepts in mathematics, engineering design, tradeoffs, system integration, hypothesis and observation, measurement and analysis, and documentation will be reinforced.

### **Audio Engineering and Production**

**Semester**

**9-12**

This course is designed to introduce students to digital audio production. In this course, students will learn the following methodologies and basics: recording, producing, distinction of music genres, digital audio history, introduction to music theory, and the science of sound. In conjunction with this training, students will be able to learn how to properly use the necessary sound equipment and Logic Pro X for audio production.

### **Audio-Visual Technical Support**

**Semester**

**9-12**

This hands-on course will teach and train students in the understanding and use of professional audio/visual (A/V) equipment for supporting events such as chapels, assemblies, concerts and more. Students who take this course will become "certified users" of the TKA equipment in the W Building, Theater, Gym, and Quad. In this class, students will be required to support weekly Spiritual Life events and a small selection of other non-school-hour events for TKA. (While supporting non-school hour events, students will be paid hourly for their A/V Tech Support.) This course will cover the preparation and use of the TKA soundboards, video systems, presentation software, lighting boards, and pro-audio equipment. This course will also cover event communication, stage design, philosophy of a sound technician, plus basic audio engineering and video production fundamentals.

### **Computer-Aided Design (CAD)**

**Semester**

**9-12**

In this course, computer-aided design (CAD) and drafting are taught using AutoCAD software. Students will learn basic drafting techniques, geometric constructions, and how to read and create two-dimensional and three-dimensional working drawings. This course will emphasize the use of AutoCAD in an architectural context, but it is also recommended for students interested in engineering and technical fields.

**Prerequisite:** Completion of or concurrent enrollment in Geometry.

### **Comp. Programming for Android Devices**

**Semester**

**9-12**

This course will introduce object-oriented programming tools to create applications for modern computing platforms. Topics include planning and design, algorithms and pseudo-code, logic/conditionals, and debugging techniques. Students will use Android software tools to design and create apps for Android devices. Units will cover the architecture of an app including its components, properties, behaviors, function calls, and parameters. Exercises and labs will demonstrate event-driven programming, graphics and drawing, and animation. For the final project, students will use these skills to design an app or game for Android smartphones.

## COMPUTER SCIENCE AND ENGINEERING DEPARTMENT (CONT'D)

**Introduction to Computer Science 1**                      **Semester**                      **9-12**  
This course provides an overview of computer science and its related disciplines. Students will begin with the language of computers and the binary system and how it is used to represent numbers, text, images, and information theory. Students will be introduced to computer programming by using block-based languages. Topics include algorithms, flowcharts, branching, and loops. Additional units will cover digital circuits, logic, and physical computing using micro-computers. Students will work hands-on in a computer lab, completing projects that demonstrate the skills learned. Group projects will emphasize collaboration, meeting design requirements, and the engineering process.

**Introduction to Computer Science 2**                      **Semester**                      **9-12**  
This course further explores topics in computer science. Units will examine the development and design of operating systems, networking and transmission protocols, internet security, encryption, and personal privacy. Python will be used for programming labs and to develop game apps. Additional units will cover physical computing using discrete components, audio devices, sensors, and data logging.  
**Prerequisites:** Completion of Introduction to Computer Science 1

**PLTW: Introduction to Engineering Design \***                      **Year**                      **10-12**  
This is a foundation course in the Project Lead The Way (PLTW) Engineering Program. In this course, students are introduced to the engineering profession and a common approach to the solution of engineering problems, an engineering design process. Utilizing the activity-project-problem-based (APB) teaching and learning pedagogy, students will progress from completing structured activities to solving open-ended projects and problems that require them to develop planning, documentation, communication, and other professional skills. Through both individual and collaborative team activities, projects, and problems, students will solve problems as they practice common engineering design and development protocols such as project management and peer review. Students will develop skills in technical representation and documentation of design solutions according to accepted technical standards, and they will use current 3D design and modeling software to represent and communicate solutions. In addition, the development of computational methods that are commonly used in engineering problem solving, including statistical analysis and mathematical modeling, are emphasized. Ethical issues related to professional practice and product development are also presented.

**PLTW: Principles of Engineering □**                      **Year**                      **10-12**  
This course is a foundation course of the high school engineering pathway for Project Lead The Way (PLTW). This survey course exposes students to some of the major concepts they will encounter in a postsecondary engineering course of study. Through problems that engage and challenge, students explore a broad range of engineering topics, including mechanisms, the strength of materials and structures, automation, and kinematics. The course applies and concurrently develops secondary level knowledge and skills in mathematics, science, and technology. Students have the opportunity to develop skills and understanding of course activities through activity, project, and problem-based (APB) learning. By solving rigorous and relevant design problems using engineering and science concepts within a collaborative learning environment, APB learning challenges students to continually hone their interpersonal skills, creative abilities, and problem solving skills. Students will also learn how to document their work and communicate solutions to their peers and members of the professional community. It also allows students to develop strategies to enable and direct their own learning.  
**Prerequisite:** Completion of Introduction to Engineering Design

□ Pending UC approval  
\* Course meets UC eligibility

All course offerings are subject to minimum enrollment levels.

## COMPUTER SCIENCE AND ENGINEERING DEPARTMENT (CONT'D)

<b>AP Computer Science Principles * ^</b>	<b>Year</b>	<b>10-12</b>
<p>This course is centered around seven big ideas: creativity, abstraction, data and information, algorithms, programming, the Internet, and global impact. The course will emphasize computational thinking practices. Students will be expected to connect computing to other disciplines, create computational artifacts and communicate their purpose, use abstraction and analysis to develop models for solving complex problems, and work effectively in teams. This course will prepare students for the through-course assessment that asks students to both explore the implications of computing innovations and create a computer application. The course follows the College Board recommended curriculum.</p> <p><b>Prerequisites:</b> Completion of Algebra 2 with an A- or higher, or Algebra 2 Honors with a B- or higher, and AP Committee approval.</p>		

<b>AP Computer Science A * ^</b>	<b>Year</b>	<b>11-12</b>
<p>This <u>online course</u> introduces students to computer science with fundamental topics that include problem-solving, design strategies and methodologies, organization of data (data structures), approaches to processing data (algorithms), analysis of potential solutions, and the ethical and social implications of computing. The course emphasizes both object-oriented and imperative problem-solving and design. Because the discipline of computer science emphasizes problem solving, a study of the discipline requires a mechanism to express potential solutions precisely and concisely. Any natural language such as English allows inconsistencies and ambiguities. <i>Therefore, the AP Computer Science A course requires that potential solutions to problems be written in Java programming language.</i></p> <p><b>Prerequisites:</b> Completion of or concurrent enrollment in Pre-Calculus, completion of AP Computer Science Principles, Introduction to Computer Science, Computer Programming for Android Devices or an approved outside course, and AP Committee approval.</p>		

\* Course meets UC eligibility  
^ Earns an extra grade point

All course offerings are subject to minimum enrollment levels.