

ENGINEERING & TECHNOLOGY PROGRAM

<u>COURSE</u>	<u>LENGTH</u>	<u>CREDITS</u>	<u>OPEN TO</u>
Construction Technology	Year	5	9-12
Manufacturing Technology I	Semester	2.5	9-12
Manufacturing Technology II	Year	5	10-12
Technical C.A.D.	Semester	2.5	9-12
Architectural Design	Semester	2.5	9-12
Engineering Design	Year	5	10-12
Engineering Design Honors	Year	5	10-12
Robotics	Semester	2.5	9-12
Advanced Robotics Honors	Year	5	10-12
Product Design & Analysis	Semester	2.5	9-12
Energy Systems	Semester	2.5	9-12
Computer Programming	Year	5	9-12
Web Design	Year	5	9-12
Television Production I	Semester	2.5	10, 11, 12
Television Production II	Year	5	10, 11, 12
Television Production III	Year	5	11, 12
Digital Media Applications	Semester	2.5	9-11
Independent Study	Semester	2.5	11, 12
Independent Study	Year	5	11, 12

CONSTRUCTION TECHNOLOGY

Year Course

5 credits

Prerequisite: None

Open to: Fr., So., Jr., Sr.

The construction process is a series of actions taken to build a structure, including preparing a site, setting a foundation, erecting a structure, installing utilities, and finishing a site. Various materials, processes, and systems are used to build structures. Students will demonstrate and apply the concepts of construction technology through building and constructing both full-size structures and scale models using various materials commonly used in construction.

MANUFACTURING TECHNOLOGY I

Semester Course

2.5 credits

Prerequisite: None

Open to: Fr., So., Jr., Sr.

Manufacturing Technology I is an introduction to the basic concepts of manufacturing and safe operation of machine tools. Topics covered include proper use of measuring tools, setup, and operation of machine tools to accurately and efficiently produce a manufactured part. Students will demonstrate mastery of the six manufacturing processes (including molding, forming, separating, conditioning, assembling, and finishing) through the construction of several simple projects. An emphasis is placed on reading technical drawings, craftsmanship, and independent productivity.

MANUFACTURING TECHNOLOGY II

Year Course

5 credits

Prerequisite: Man. Tech. I, Dept. Head Approval

Open to: So., Jr., Sr.

This course continues to develop student knowledge of Manufacturing Technology. The six manufacturing processes are reinforced through advanced projects and mass production techniques. Quality control, assembly line manufacturing, and custom design-build lessons will provide students real world production experience.

TECHNICAL C.A.D

Semester Course

2.5 credits

Prerequisite: None

Open to: Fr., So., Jr., Sr.

Technical C.A.D. is an exploration of modern drafting technology. Students will begin by learning proper pencil and paper sketching techniques, proper drawing layout, and accurate dimensioning skills. Various projects will guide students through aspects of plane geometry, descriptive geometry, transformation geometry, and solids. Student portfolios demonstrate two-dimensional multiple view drawings as well as three dimensional views including isometric, oblique, and perspective drawings. All portfolio work is completed using the latest AutoCAD software available.

ARCHITECTURAL DESIGN

Semester Course

2.5 credits

Prerequisite: None

Open to: Fr., So., Jr., Sr.

Architectural Design surveys many popular styles in modern residential construction. Students complete exercises in the visualization and drafting of structures and construction conditions using orthographic projection, isometric and sectional drawings as an expression of architectural communication. Portfolio work includes plans, elevations, details, schedules, and sections of traditionally framed structures. Students experience a simulation of an actual architectural client-based project. The instructor issues preliminary design ideas (provided by their client) from which students prepare working drawings. The challenges presented have varied architectural styles, materials, and constraints, offering a wide range of experiences in architectural drawing.

ENGINEERING DESIGN

Year Course

5 credits

Prerequisite: None

Open to: So., Jr., Sr.

Engineering Design examines the form and function of structural and mechanical systems. Student projects will follow the engineering design process and cover topics including solids, modeling, rendering, and simple animation. Autodesk Inventor, a state of the art solid modeling software package, will be the primary computer application used by all students. Professional standards and tolerance sensitive manufacturing will be stressed throughout the course to give students real-world experience with the engineering field.

Furthermore, each computer-generated design will be manufactured using a sophisticated CAD-CAM ProtoTRAK system for analysis and redesign.

ENGINEERING DESIGN HONORS

Year Course

5 credits

Prerequisite: None

Open to: So, Jr, Sr.

Engineering Design Honors offers the same content and skill building activities as Engineering Design (unleveled) and adds project management, leadership skills, and Students are required to participate on the Robotics Team after school in design and construction of the FRC robot. Additional time is required out of class between Winter Break and February Vacation including weekly Saturday 'practice' (approx. 10 hours/week). Students will attend no less than 2 overnight competitions in March and April (dates vary). Upon successful completion of this course students will be eligible for a number of summer internships.

ROBOTICS

Semester Course

2.5 credits

Prerequisite: None

Open to: Fr., So., Jr., Sr.

Robotics is an interactive course designed to engage students, promote creativity, and develop fundamental science and math skills. Students work in groups exploring the engineering design process in constructing various projects using the Lego MindStorms NXT kit. Students must also teach their robot to operate autonomously by using a visual programming language called LabVIEW. Projects examine simple principles such as gear ratios, pulleys, levers, torque, and speed. Students are encouraged to use proper robotics vocabulary, standardized programming techniques, and analytical communication skills essential in the engineering field today.

*This course can be repeated for full credit.

ADVANCED ROBOTICS HONORS*

Year Course

5 credits

Prerequisite: Robotics, Teacher Recommendation

Open to: So, Jr, Sr.

Or Department Chairperson Approval

Advanced Robotics builds on the skills and knowledge gained in Robotics with a focus on complex programming techniques, control systems, electrical systems, and mechanical design and fabrication. During the first semester students will participate in the *FIRST* Tech Challenge (FTC) – an annual design competition using the Lego Mindstorms Robotics platform with the Tetrix expansion set. The class will be broken into teams where every student will design, assemble, wire, and program their own solution to various complex challenges. The challenge or 'game' is reinvented every year incorporating new and emerging fields of study in Engineering & Technology. Students then participate in the *FIRST* Robotics Competition (FRC) beginning in early January. A distinctly new design challenge and 6-week timeline put students' knowledge and skills to the test. Teams are

allowed more design flexibility and are responsible for sourcing custom materials and itemizing a tight budget. Effective project management skills and teamwork are stressed throughout the project. Additional time after school and at competition is required.

*This course may be repeated for full credit.

PRODUCT DESIGN & ANALYSIS

Semester Course

2.5 credits

Prerequisite: None

Open to: Fr., So., Jr., Sr.

Product Design and Analysis is a semester course developed by the Boston Museum of Science featuring two of the four units from their “Engineering the Future” curriculum. Students examine the role of engineers and how they create our ever-evolving world by developing products, building structures, critiquing designs, and analyzing failure. Projects will be constructed of simple materials and require no specialized tools or skills and will often be redesigned and rebuilt to more accurately reflect the engineering design process. Students who successfully complete this course *as well as* ENERGY SYSTEMS are encouraged to take the Technology and Engineering exam to fulfill their Science MCAS in June.

ENERGY SYSTEMS

Semester Course

2.5 credits

Prerequisite: None

Open to: Fr., So., Jr., Sr.

Energy Systems is a semester course developed by the Boston Museum of Science featuring two of the four units from their “Engineering the Future” curriculum. Students examine thermal energy, fluid energy, and electrical energy in order to experience the similarities and differences in several energy systems. Students then design and build systems to maximize certain criteria (power, efficiency, materials cost, lifespan, etc.) using simple materials and tools. Communication of design advantages and limitations are emphasized during each project. Students who successfully complete this course *as well as* PRODUCT DESIGN & ANALYSIS are encouraged to take the Technology and Engineering exam to fulfill their Science MCAS in June.

COMPUTER PROGRAMMING

Year Course

5 credits

Prerequisite: None

Open to: Fr., So., Jr., Sr.

This course examines basic computer programming concepts and techniques. Students will learn to design and build their own customized computer programs using both MSW Logo, and Python programming languages. After learning the necessary concepts and keystrokes, students will be asked to complete programming challenge problems. Examples of programming challenges include, designing computer games and creating ticketing programs for sporting events.

WEB DESIGN

Year Course

5 credits

Prerequisite: None

Open to: Fr., So., Jr., Sr.

This course examines website development. Students will learn how to plan and construct professional quality web sites using HTML, CSS, Dreamweaver, Flash, PhotoShop, and Fireworks web publishing software. They will also learn how to create dynamic web pages using PHP and MySQL and how to design and create web-based computer games using Flash ActionScript.

TELEVISION PRODUCTION I

Semester Course

2.5 credits

Prerequisite: None

Open to: Fr., So., Jr., Sr.

Television Production provides theoretical knowledge and hands-on experience in television broadcast and video procedures, including studio and field production. Students operate and direct all components of television studio equipment, including camera, audio, lighting, graphics and editing. In addition, they perform in, produce, and direct productions that include newscasts, commercials, and music videos. Class size is limited.

TELEVISION PRODUCTION II

Year Course

5 credits

Prerequisite: T.V. Prod. I, Dept. Head Approval

Open to: So., Jr., Sr.

This more advanced course involves a theoretical approach to television production and an opportunity for students to create a school-based, student-produced television program. Students shape and define their basic skills and expand those skills by developing and producing projects that are more complex. The end result contains the elements required for planning, writing, and producing advanced programming designed to develop communication and broadcast journalism abilities. In addition, students will be required to tape and edit live school events for broadcast. Class size is limited.

TELEVISION PRODUCTION III

Year Course

5 credits

Prerequisite: T.V. Prod. II, Dept. Head Approval

Open to: Jr., Sr.

Working in conjunction with TV Production II, this course provides hands-on experience to students interested in careers in mass communications. As producers, directors, and editors of student-produced shows, students identify program constraints, troubleshoot problems, organize personnel, describe production tasks, plan and execute television and video programming, and complete and maintain production schedules. They also lead weekly production meetings. TV Production III students are responsible for detailed evaluations, proposals, and a research paper. Class size is limited.

DIGITAL MEDIA APPLICATIONS

Semester Course

2.5 credits

Prerequisite: None

Open to: Fr, So, Jr.

Digital Media Applications is a survey of computer-based software applications used by a variety of media industries. Students learn basic tools and techniques in the Adobe Creative Suite, including units in the following areas: Photoshop, In Design, Flash, Dream Weaver, and Premiere Pro. Students will build skills and exercise their creativity in graphic design, website design, journalism, and digital video editing in creating a number of focused projects. An online portfolio will be created by each student. Students are informed about career opportunities and prepared to pursue their talents or interests in digital media.

INDEPENDENT STUDY

Semester or Full Year

2.5 or 5 credits

Prerequisite: Dept. Head Approval

Open to: So., Jr., Sr.

This course is available to students who desire to further their study in a particular area of Engineering or Technology. Students, with the help of an advisor from the department, develop an area of concentration, a major project, and a research project, according to the student's needs. Students are evaluated based on how well they have achieved their mutually developed goals.