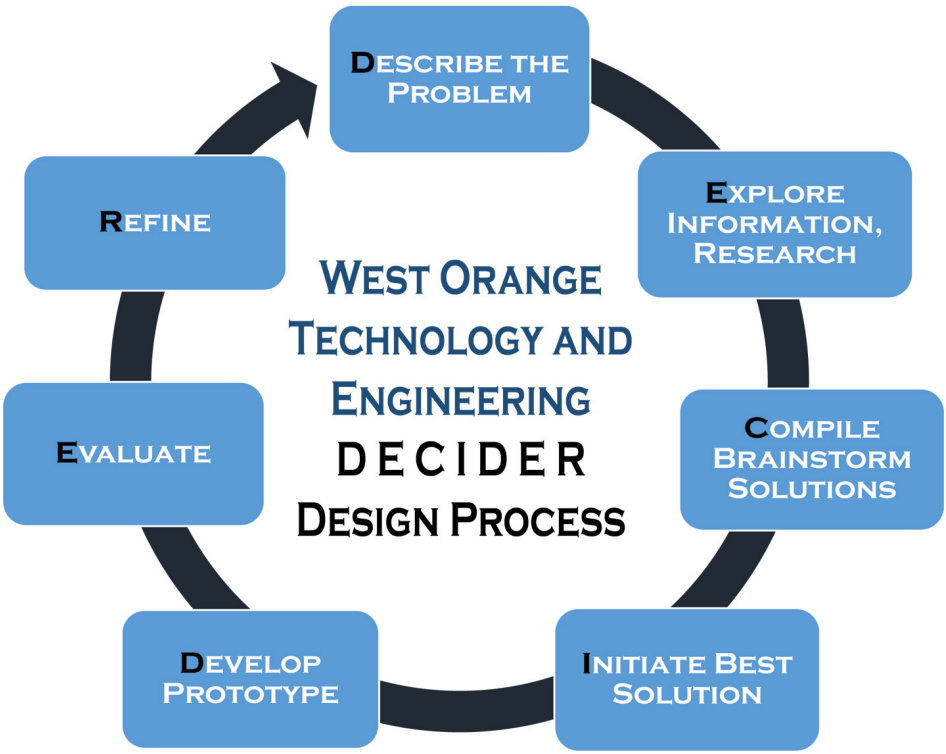
WEST ORANGE HIGH SCHOOL

TECHNOLOGY AND ENGINEERING DEPARTMENT

2022-2023 COURSE SELECTION GUIDE


Describe the Problem
Explore Information, Research
Compile Brainstorm Solutions
Initiate Best Solution
Develop Prototype
Evaluate
Refine
West Orange Technology and Engineering
DECIDER
Design Process

Problem Solving Through Design

About the WOHS Technology and Engineering Department

The West Orange Technology and Engineering Department received the prestigious "2021 Program Excellence Award," sponsored by the International Technology and Engineering Educators Association (ITEAA).

The department offers a variety of courses that challenge students to solve real world problems. Students apply our original "DECIDER" (describe, explore, compile, initiate, evaluate, and refine) design process to arrive at solutions and engineer project prototypes. Students study the evolution of inventions and innovations, evaluate the impact technologies have on society, analyze emerging technologies, and prototype their own innovations. Performance based technology learning activities throughout all our courses give students the opportunity to study technology and engineering content through hands-on experiences. The Technology and Engineering Department comprehensive curriculum includes programs such as Graphic Communications, Engineering, Electronics, Automotive Technology, Woodworking Technology and Architectural and Engineering Design.

Our state of the art classrooms, shops, and labs feature:Boss Laser Machine for laser cutting and engraving utilized throughout all our programs, Vinyl Cutters in Graphic Design and Communications, Wheel alignment diagnostic and tire rotation machines in the Mountaineer Auto Shop AutoCAD Design Suite software , Samsung Gear VR, and 7 new 3D printers in the Architectural and Engineering Design Studio Creative Cloud Adobe Photoshop and InDesign software in the Graphics Communications classroom Rhino Software for design and modeling Roomba robots, Lego Mindstorms robotics kits and Quadcopter Drones in Electronics 360 Cameras in Photography

West Orange is the home of Thomas Edison and where the modern world was invented. There is no better place than West Orange High School to discover, design, create, and fabricate. Our innovative teachers provide effective instruction that integrates craftsmanship, modern technology, and design activities that are constantly changing to adapt to the latest technological improvements in our global society.

TECHNOLOGY AND ENGINEERING RECOMMENDED COURSE SEQUENCE

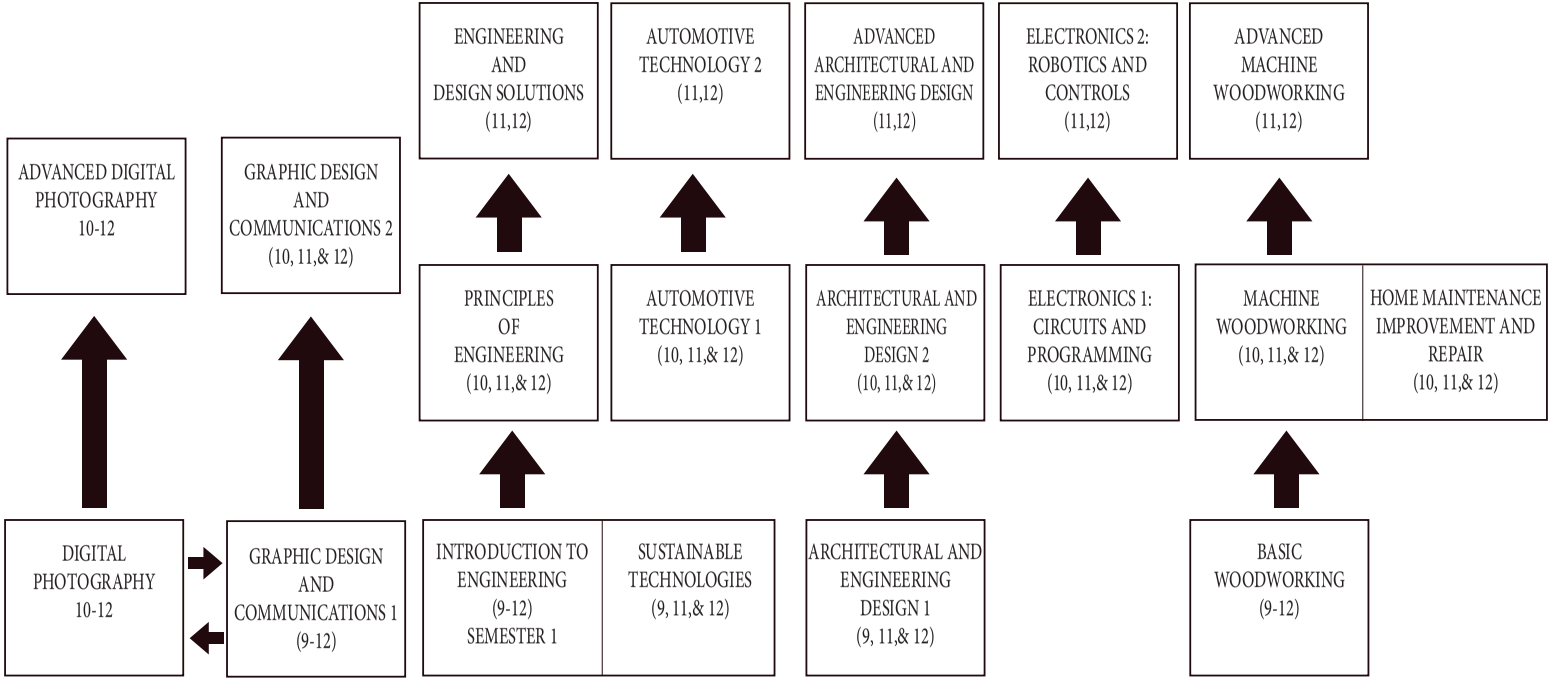


Table of Contents

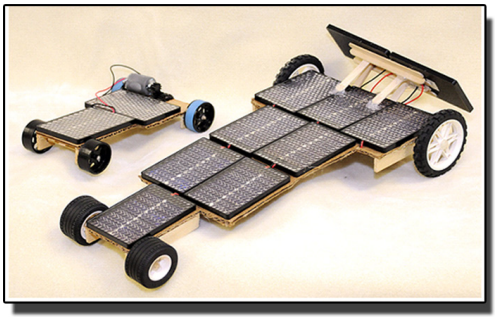
(Courses grouped by suggested sequence
with Freshman offerings in **RED)**

Introduction To Engineering

Grades 9-12 ~ Semester – 2.5 Credits

Prerequisites: None

Engineering is problem-solving so are you ready to come up with solutions to challenges that require you to design and build projects to solve real-world problems? In this course, students will develop interdisciplinary knowledge and skills in science, technology, engineering and math (STEM) through design-oriented project-based learning, critical thinking, and problem-solving. With a focus on Engineering, students will learn about our original "DECIDER" design process and use it to problem-solve and design on hands-on projects such as model structures, animal prosthetics, and solar-powered inventions. Students will also have the opportunity to learn some basic CAD modeling, introducing them to the foundations of computer aided design. This course is credited toward the 21st Century Life Careers/Career Technical Education credit requirement for graduation.



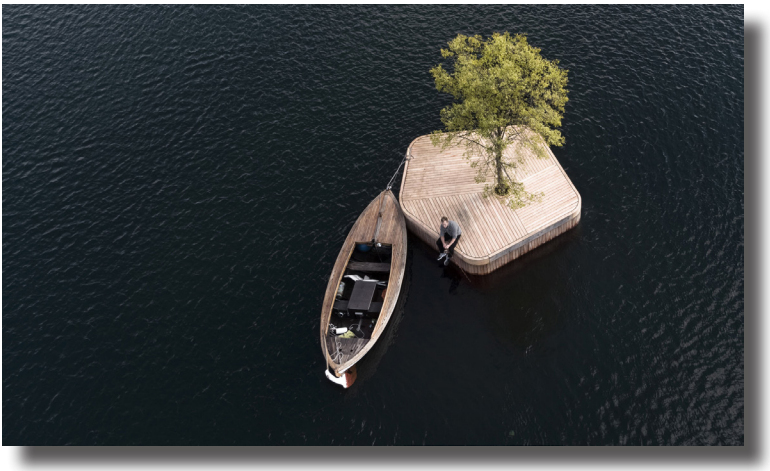
1.

Sustainable Technologies

Grades: 9-12 ~ Semester – 2.5 Credits

Prerequisites: None

The importance of sustainability is greater than ever and studying the role technology plays in conserving and enhancing our resource base to improve our lives is vital. This semester course introduces students to the beliefs, philosophies, and scientific principles that support a more sustainable world. Students learn about the various technologies dealing with sustainability to secure the future of the natural resources of our world. Students design and build projects that provide sustainable solutions to real-world problems that will serve to improve our natural world for future generations. Students design and fabricate project prototypes that serve to make our world more sustainable such as the oil spill project and the wind turbine project. This course is credited toward the 21st Century Life Careers/Career Technical Education credit requirement for graduation.



Artificial Island Project

Wind Turbine Project

Oil Spill Project

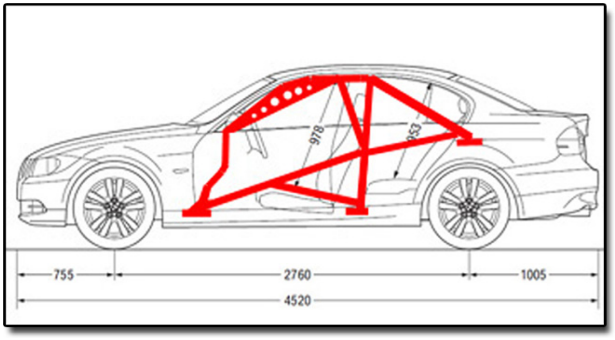
Principles of Engineering

Grades: 10,11,12 ~ Full Year – 5 Credits

Prerequisite: Introduction to Engineering or Sustainable Technologies

There are so many different Engineering fields to choose from so why not learn about and experience the major disciplines to see which one you want to pursue? This course introduces students to the principles of various Engineering fields (civil, mechanical, electrical, materials, and aerospace) and how they connect to a sustainable future. Students apply those principles by engineering projects that solve real-world problems with solutions that exhibit sustainability while learning the various employability skills that are necessary for future engineers. Students apply our original "DECIDER" design process to solve real-world problems through design solutions. Problem-based projects include remote control boats (which are tested at the Degnan Pond), Lego pneumatic inventions, designing and constructing your own RC plane, car crash safety vehicles, and more. Throughout the course, students develop an "engineering portfolio" detailing the progress of all their projects that can be used to demonstrate their work to potential colleges and universities. This course meets the 21st Century Life Careers/Career Technical Education credit requirement for graduation.

Aerospace Engineering



Crash Safety Design

Engineering & Design Solutions

Grades 11 & 12 ~ Full Year – 5 Credits

Prerequisites: Principles of Engineering

Welcome to the capstone course of our engineering where all your knowledge and skills will be challenged through authentic learning experiences and competitions. This course expands upon student understanding of engineering fundamentals previously learned in Principles of Engineering. The course emphasizes the creation of engineering design solutions to 21st Century Problems. Students will comprehend how the collection and interpretation of data contributes to the material and design decisions of a product. The majority of this course is dedicated to students identifying a societal problem then developing and proposing solutions to that problem by applying the "DECIDER" engineering design process. They will learn about the entire product development process along with how to patent their invention ideas. Invention ideas are prototyped using fabrication technologies like 3d printers and laser engraving/cutting to machine parts. Students will have the opportunity to enter their invention ideas into the annual STEAM Tank competition where winners receive money to patent their invention ideas. This course meets the 21st Century Life Careers/Career Technical Education credit requirement for graduation.

Prototyping

Design Solutions

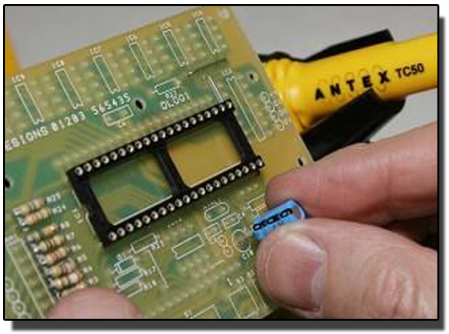
Laser Cutting

Electronics 1: Circuits and Programming

Grades 10, 11, &12 ~ Full Year – 5 Credits

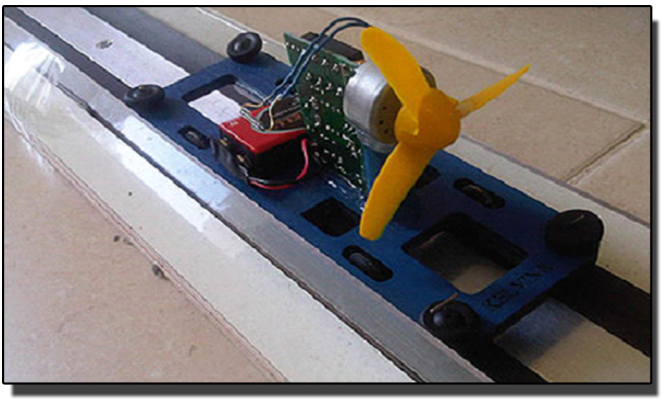
Prerequisites: None

Electronics are all around us and have played a huge role in the Digital and Information Age we are currently in. This course covers the introductory concepts of electricity, solder fundamentals, circuits, and programming. Students will learn how to calculate mathematical formulas such as Ohm's law, read resistor color codes, and series/parallel circuit voltage drops. Students will learn how to read circuits by recognizing schematic symbols and using proper formulas to decipher proper component placement and how to program robots and microcontrollers to perform various functions. Student projects completed during this full-year course include: alarm circuits, magnetic levitation vehicles, Sumo Bots, building and programming Lego Mindstorms, and Battlebots. The laboratory work provides students with opportunities for technical experiences helpful in determining vocational interest in engineering, science or technical careers. This course meets the 21st Century Life Careers/Career Technical Education credit requirement for graduation.



Electronic Fabrication

Mindstorms

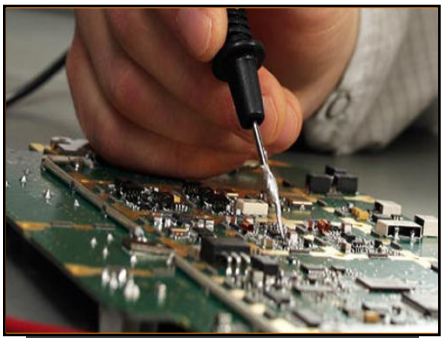


Magnetic Levitation Vehicle

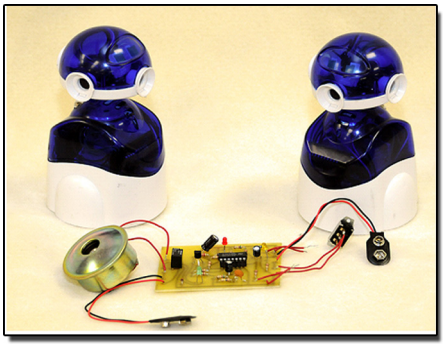
Electronics 2: Robotics and Control

Grades 11 & 12 ~ Full Year – 5 Credits
Prerequisites: Electronics 1: Circuits and Programming

Electronics 2 increases the rigor of content learned in Electronics 1 where now students will learn how to use electronics to control systems and systems such as robots, drones, and advanced circuitry. This course starts with a review of the major principles of electricity, circuits, and programming learned in the prerequisite Basic Electronics 1: Circuits and Programming course. Students will learn about the study of the flow of electrons in active devices, such as transistors, semiconductors, diodes, or integrated circuits. Mathematical formulas such as Ohm's law, capacitance, resistor color code, and series/parallel equations are presented throughout the course. Students will complete hands-on activities and projects such as burglar alarms, electronic communication experiments, Rube Goldberg Machines, Lego Mindstorm Robotics, and fabricating and programming quadcopter drones. This course meets the 21st Century Life Careers/Career Technical Education credit requirement for graduation.

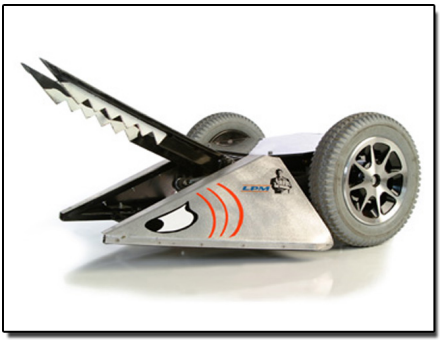


Advanced Fabrication



Design Solutions

Quadcopter / Drones



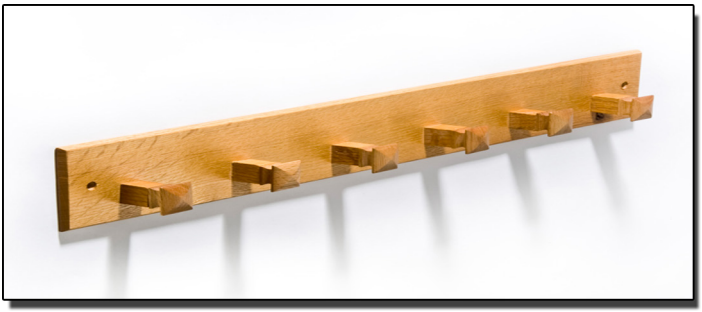
Battlebots

Basic Woodworking

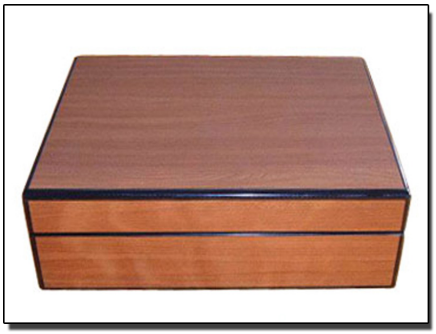
Grades: 9, 10, 11, 12 ~ Semester - 2.5 Credits

Prerequisites: None

Wood is an amazing renewable resource and is the primary building material used around the world. During this course this sustainable resource will be used to provide the opportunity for students to design and create useful objects using both hand and machine woodworking tools. This single-semester course introduces students to problem-solving design methods using wood as the primary material. Safety, wood science, hand carving, joinery, and basic machine knowledge found in this course provide a foundation for more advanced levels of technical woodworking. This course focuses on developing students' understanding of how to create without the need for thousands of dollars of expensive tools and equipment so they can hopefully continue to foster their skills at home after the course is over. Students will have the opportunity to apply their knowledge of woodworking through the design and construction of wooden spoons, clothes rack, clock, and a jewelry or keepsake box. This course is credited toward the 21st Century Life Careers/Career Technical Education credit requirement for graduation.



Clothes Rack



Jewelry Box

Clock

Machine Woodworking

Grades: 10, 11, 12 ~ Full Year – 5 Credits
Prerequisites: Basic Woodworking

Want to utilize advanced machinery and produce higher-end woodworking projects? Machine woodworking builds upon the skills that students learned in Basic Woodworking by teaching the proper and safe use of all the machinery that can be found in a cabinet shop. Students will gain experience using traditional machinery such as the band saw, table saw, drill press, lathe, jointer, edge sander, and planer as well as advanced Computer aided manufacturing tools such as a CNC Router and Laser engraver. This blend of old and new technology will prepare students for a future career in not only woodworking but manufacturing as well. Students who complete this course will be on track to get a job right out of high school at the EAS carpenters union training program. Students will combine hand, machine, and computer processes to develop and create original designs for wooden toys, cutting boards, and larger pieces of furniture such as stools, tables, and cabinets. Students will be exposed to problem-solving techniques, wood science, and machining to tolerances. This course meets the 21st Century Life Careers/Career Technical Education credit requirement for graduation.

Coffee Table

Wooden Toys

Dovetail Box

Advanced Machine Woodworking

Grades 11 & 12 ~ Full Year - 5 Credits

Prerequisites: Machine Woodworking

Advanced Machine Woodworking is the culminating course in the woodworking sequence. This course focuses on design and craftsmanship in order to hone students' woodworking skills and prepare them for careers in the woodworking field. Students will combine their knowledge of traditional hand and machine woodworking equipment and processes and add in Computer-Aided Design as well as Computer-Aided Manufacturing through the use of a CNC Laser Cutter. Advanced machine woodworking will focus on preparing students to move their designs and skills into an ever-growing and more technologically centered industry. During this course, students will design and construct chairs, a community project to be selected by the class, and a signature furniture piece to be designed and created by each student to showcase their craftsmanship and design skills. Students will create their designs to be focused on sustainability and real-world production. Students who complete this course will be interviewed to get a job right out of high school at the EAS carpenters union training program. This course meets the 21st Century Life Careers/Career Technical Education credit requirement for graduation.

Jewelry Cabinet

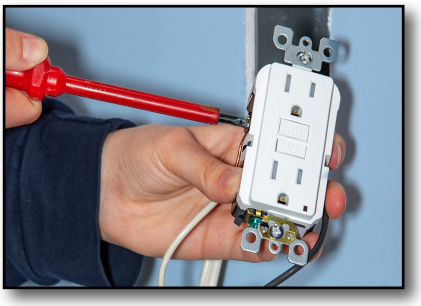
Custom Chair

Home Maintenance, Improvement, & Repair

Grades: 10, 11, & 12 ~ Semester - 2.5 Credits
Prerequisites: None

Everyone lives in some form of home and having the skills to maintain and repair common problems that arise can save you thousands of dollars and also possibly lead to a lucrative career path. This course will provide students with a variety of building trade skills applied in the area of home maintenance, improvement, and repair. Through a hands-on project-based approach students will learn about building trades such as construction, plumbing, electrical, HVAC, and masonry. Students will become more self-sufficient in maintaining, improving, and repairing their own homes as well as equip them with a strong foundation for a variety of careers in the skilled trades. This course is credited towards the 21st Century Life Careers/Career Technical Education credit for graduation.

Plumbing Repair



Electrical Repair

Drywall Repair

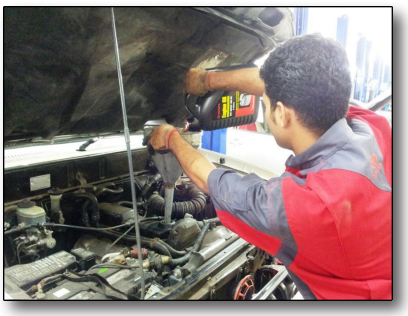
Automotive Technology 1

Grades 10-12 ~ Full Year - 5 Credits

Prerequisites: None

Learning about fundamental maintenance skills can save you thousands of dollars or even lead to many lucrative careers associated within the automotive industry. Students will gain foundational knowledge and skills for entering careers in automotive service and repair. Through direct instruction, hands-on activities, simulation-based learning, and live learning experiences students will learn shop safety and procedures, automotive industry careers, automotive hand, and power tools, tires and wheels, engine fundamentals, preventive maintenance, electrical fundamentals, tires, gaskets, and sealants. Students will be able to complete a full oil change with fluid and filter service, utilize the vehicle lift safely, rotate and balance tires, and diagnose and change brake pads. This course meets the 21st Century Life/Career Technical Education credit requirement for graduation.

Wheel Balancing



Oil Change

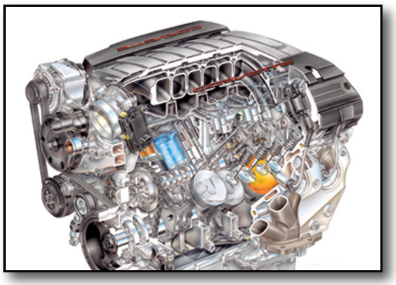
Diagnostics

Tire Rotation

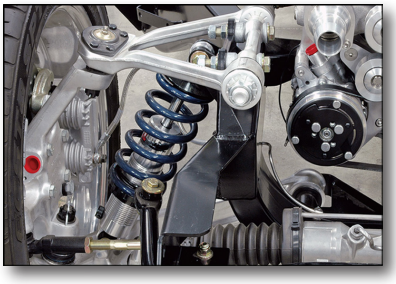
Automotive Technology 2

Grades: 11,&12 ~ Full Year - 5 Credits
Prerequisites: Automotive Technology 1

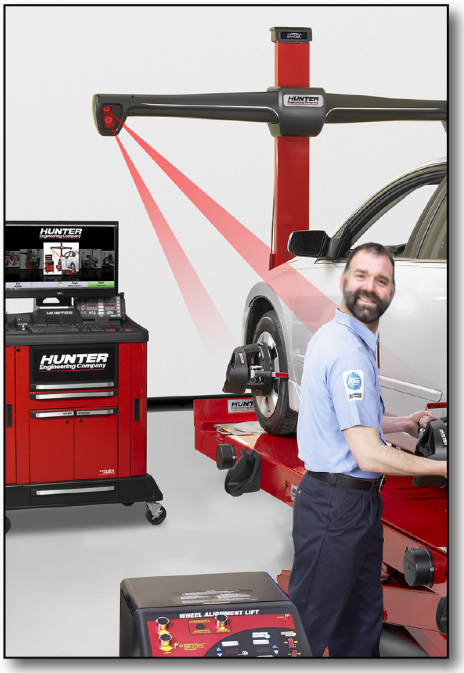
Ready to take your automotive knowledge and skills to the next level? Automotive Technology 2 builds upon the content mastered in Automotive Technology 1 with deeper and more advanced study of the automotive industry. Through direct instruction, hands-on activities, simulation-based learning, and live learning experiences students will learn about engine repair, transmissions, drive train and axles, front end, suspension, brakes, electrical systems, heating, and air conditioning, computer diagnostics, wheel alignment systems, and engine performance. Students will be able to complete a full oil change with fluid and filter service, utilize the vehicle lift safely, rotate and balance tires, full wheel alignment, front end and suspension repair, and full brake service. Through our partnership with the International Association of Machinists (IAM) Apprenticeship Program 12th graders enrolled in this course have the opportunity to gain admission into an apprenticeship program (after graduation) which provides paid on-the-job training and classroom instruction leading to Automotive Service Excellence (A.S.E.) certification. This course meets the 21st Century Life/Career Technical Education credit requirement for graduation.



Engine Diagnosis
& Performance



Advanced
Suspension Systems



Wheel Alignment

Graphic Design & Communications 1

Grades 9-12 ~ Full Year – 5 Credits

Prerequisites: None

In today's digital world we are surrounded by digital graphics. In this course, students will be introduced to the visual power of Graphic Design and Communications. Through hands-on experiences in logo design, digital design, image creation, vinyl cutting, digital image manipulation, and digital image capture, all through an introduction to Adobe Photoshop, Adobe Illustrator, Adobe InDesign, and Adobe Premiere computer software. Using state-of-the-art equipment we create projects including calendars, stickers, vinyl heat transfer T-shirts and hoodies, business sets, advertisements, and more! This course meets the 21st Century Life Careers/ Career Technical Education credit requirement for graduation.

Photoshop

Logo Design

Vinyl Graphics

Graphic Design & Communications 2

Grades 10-12 ~ Full Year – 5 Credits

Prerequisites: Graphic Design & Communications 1

Graphic Design and Communications 2 allows students to gain expert skills in digital realism, web design, portfolio design, presentation, signage, logo design, and animation through in-depth use of Adobe Creative Cloud, including Adobe Photoshop, Adobe Illustrator, Adobe InDesign, and Adobe Premiere computer software. Students design and create professional quality projects utilizing state of the art equipment. Students learn through hands-on experiences by creating projects including digital realism, advanced digital image manipulation, multi-color vinyl heat transfer T-shirts and hoodies, business branding, and large format printing. This course meets the 21st Century Life Careers/Career Technical Education credit requirement for graduation.

Animation

Packaging

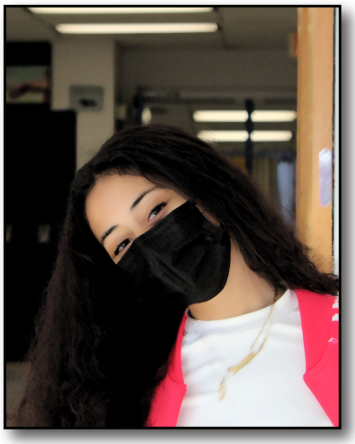
Digital Realism

Digital Photography

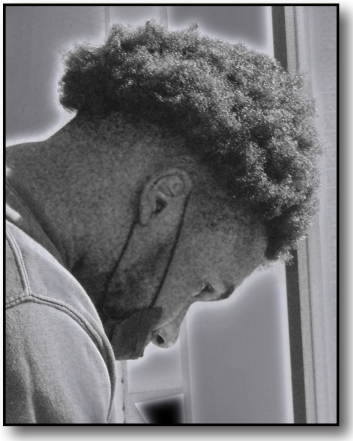
Grades 10-12 ~ Semester - 2.5 Credits

Prerequisites: None

Photography is all around us - telling stories, sharing emotions, and capturing a memory. Students will learn technical components of DSLR cameras including aperture, shutter speed, and lighting. Learning to take well-composed photographs serves as the basis for more advanced techniques both in taking and editing photographs. Students will create projects using Adobe Photoshop to both enhance photographs while keeping their original overall look as well as editing using filters and various image adjustments. Major projects include: close-up photography, portrait and landscape photography, and green screen animation.



Portrait Photography



Photoshop Filters

Perspective

Advanced Digital Photography

Grades 11-12 ~ Semester - 2.5 Credits

Prerequisites: Digital Photography

Beautiful photographs serve to optimize the communication of ideas, emotions, and purpose. Students will learn advanced digital photography techniques such as exposure, lighting and lenses in order to produce the most successful images. Whether it's using macro lenses or using a variety of zoom lenses with our DSLR cameras, they will be advancing their techniques when composing photographs to create and tell stories. Advanced lighting techniques will add an element that in conjunction with advanced tools within Adobe Photoshop for editing, creating composite photos, or retouching photos, will create enhanced photographs. Projects will be maintained in a portfolio for the duration of the course.

Advanced Macro Photography

Advanced Studio Lighting Techniques

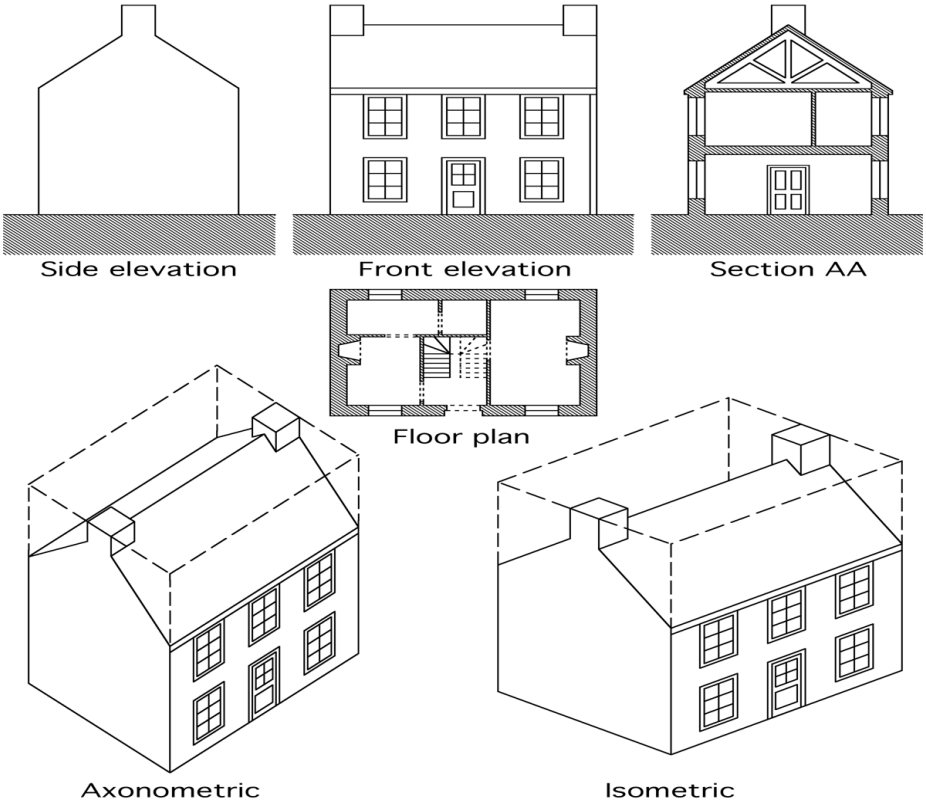
Motion Blur Photography

Architectural and Engineering Design 1

Grades 9-12 ~ Semester – 2.5 Credits

Prerequisites: None

Design is all around us and it is the first step to producing anything from the shoes we wear to the homes we live in. Communicating ideas through drawings plays a vital role in the design industry. This is a foundational course for the Architecture and Engineering Design Program. The fundamentals of drafting are introduced and applied through freehand sketching, mechanical drawings, and 3D design. Students will gain knowledge on the basics of drafting by learning about abstract visualization through multi-view drawings of physical objects and 3D digital software. Students will also examine the necessity of a variety of technical drawings to accurately represent the “designed environment” which surrounds them. Students are introduced to the art of hand-drafting, CAD modeling software and 3D Printers (LulzBot, Ultimaker & MakerBot). Students will also use the design process to solve authentic problems and project their solutions in drawings and digital format.

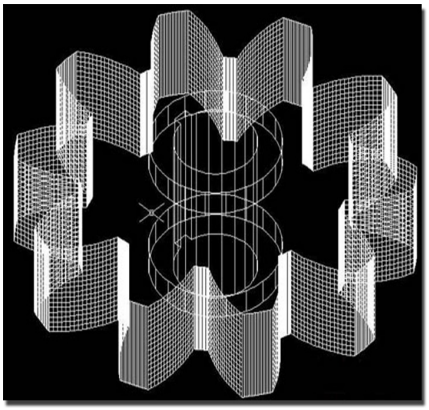


Architectural and Engineering Design 2

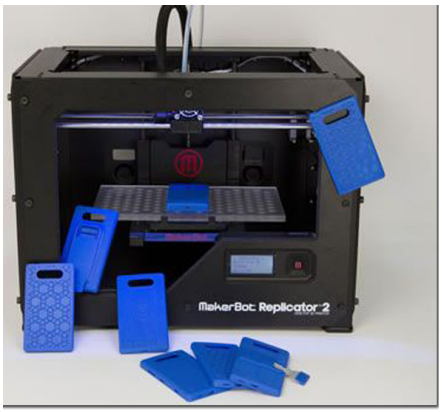
Grades 10-12 ~ Full Year – 5 Credits

Prerequisites: Architectural & Engineering Design 1

Design is purposeful and always evolving. Following AED 1, students will further articulate their design choices and strengthen their CAD (computer-aided drafting) skills software commonly used in the fields of Architecture and Engineering. Students use the latest AutoCAD and Rhino software to produce a variety of architectural drawings and 3D prototypes. Through prototyping, students will become familiar with the functions of our state-of-the-art 3D printers. One such project is where students design and 3D print their own cell phone case!



3D Design



3D Prototyping

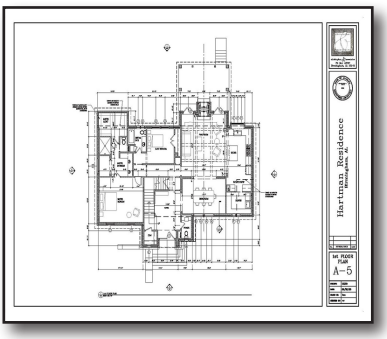
3D Printing

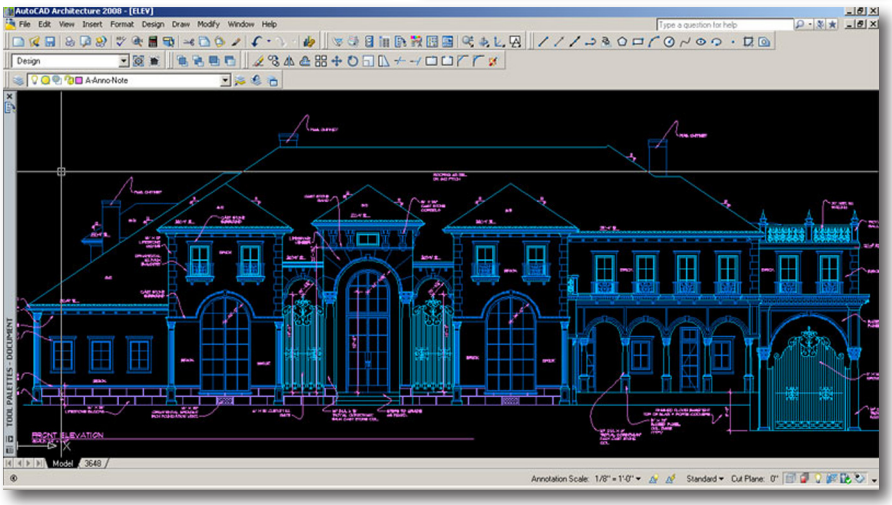
Honors Architectural & Engineering Design 3

Grades 11-12 ~ Full Year – 5 Credits

Prerequisites: Architectural & Engineering Design 2

Welcome to the WOHS Design Studio. Honors Architectural and Engineering Design is the capstone course in the Architecture and Engineering Design program where students apply their technical drawing and design skills through authentic real-world design challenges. With projects ranging from landscape architecture to industrial design, students master AutoCAD and 3D prototyping software to deepen their knowledge of using 3D printing as a design and modeling tool. While developing professional skills like preparing for a client meeting, oral speaking, time management and presenting to an audience. Projects include: designing their own architectural studio, tiny house, furniture, skyscraper, and designing their very own dream house! Our Architectural and Engineering Studio contains cutting-edge technologies such as a professional multi-functional plotter, industry-leading 2D and 3D software, and four dynamic 3D printers.





Join Us On Social Media

Visit our social media for an inside look into one of the best Technology and Engineering departments in the country! See the incredible student projects, our amazing labs, and our award winning students and staff in action!

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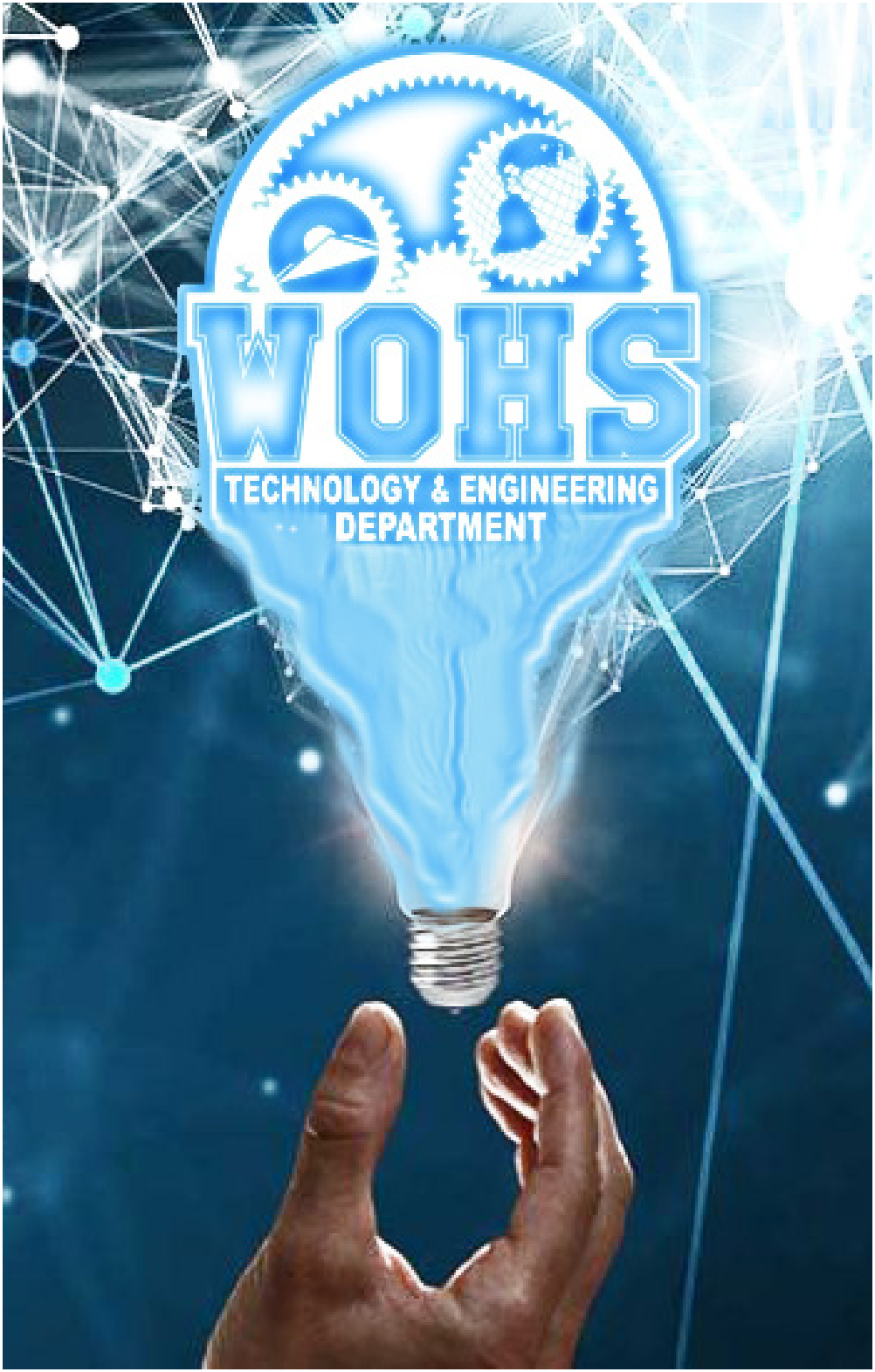
WEST ORANGE HIGH SCHOOL
MOUNTAINEERS
UNITY • INTEGRITY • PRIDE
UNITY • INTEGRITY • PRIDE
ONE FAMILY
ONE COMMUNITY
ACADEMIC EXCELLENCE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TECHNOLOGY & ENGINEERING
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