

ENGINEERING & MANUFACTURING

T65101 Introduction to Industry (4800)

Open to grades 9-12

2 semesters, 1 credit per semester

Meets requirements of: THD, AHD, Core 40

Introduction to Industry is a course that specializes in using modern technological processes, computers, design, and production systems in the production of products and structures through the use of automated production systems. Emphasis is placed on using modern technologies and on developing career related skills for electronics, manufacturing, precision machining, welding, and architecture career pathways. Students apply ingenuity using tools, materials, processes, and resources to create solutions in electronics, manufacturing, precision machining, welding, and architecture. The content and activities should be developed locally in accordance with available advanced technologies in the school. Course content addresses major technological content related to topics such as: Architectural drawing and print design, design documentation using CAD systems; assignments involving the interface of CAD, CNC, CAM, and CIM technologies; computer simulation of products and systems; publishing of various media; animation and related multimedia applications; 3-D modeling of products or structures; digital creation and editing of graphics and audio files; control technologies; and automation in the modern workplace.

T65211 Introduction to Engineering Design (4802)

Open to grades 9-12

2 semesters, 1 credit per semester

Meets requirements of: AHD, THD, CORE 40

Recommendation(s): Algebra

Dual Credit may be available

This is an introductory course which develops student problem-solving skills using the design process. Students document their progress of solutions as they move through the design process. Students develop solutions using elements of design and manufacturability concepts. They develop hand sketches using 2D and 3D drawing techniques and Computer Aided Design (CAD).

T65221 Principles of Engineering (5644)

Open to grades 10-12

2 semesters, 1 credit per semester

Meets requirements of: AHD, THD, CORE 40

Prerequisite(s): Introduction to Engineering Design

Recommendation(s): Algebra I and Geometry

Dual Credit may be available

Note: Qualifies as a Quantitative Reasoning course.

Note: Fulfills Core 40 Science Credit.

This course focuses on the process of applying engineering, technological, scientific, and mathematical principles in the design, production, and operation of products, structures, and systems. It is designed to provide students interested in engineering careers to explore experiences related to specialized fields such as civil, mechanical, and materials engineering. Students will engage in research, development, planning, design, production, and project management to simulate a career in engineering. The topics of ethics and the impacts of engineering decisions are also addressed. Classroom activities are organized to allow students to work in teams and use modern technological processes, computers, CAD software, and production systems in developing and presenting solutions to engineering problems.

T6525I Civil Engineering & Architecture (5650)

Open to grades 11-12

2 semesters, 1 credit per semester

Meets requirements of: AHD, THD, CORE 40

Recommendation(s): Algebra I, Geometry

Prerequisite(s): Introduction to Engineering Design and Principles of Engineering

Civil Engineering and Architecture introduces students to the fundamental design and development aspects of civil engineering and architectural planning activities. Application and design principles will be used in conjunction with mathematical and scientific knowledge. Computer software programs allow students opportunities to design, simulate, and evaluate the construction of buildings and communities. During the planning and design phases, instructional emphasis is placed on related transportation, water resources, and environmental issues. Activities include the preparation of cost estimates as well as a review of regulatory procedures that would affect the project design.

T6523I Computer Integrated Manufacturing (5534)

Open to grades 11-12

2 semesters, 1 credit per semester

Meets requirements of: AHD, THD, CORE 40

Recommendation(s): Algebra I, Geometry

Prerequisite(s): Introduction to Engineering Design and Principles of Engineering

Note: Qualifies as a Quantitative Reasoning course.

This course applies principles of rapid prototyping, robotics, and automation. This course builds upon the computer solid modeling skills developed in Introduction to Engineering Design. Students will use computer controlled rapid prototyping and CNC equipment to solve problems by constructing actual models of their three-dimensional designs. Students will also be introduced to the fundamentals of robotics and how this equipment is used in an automated manufacturing environment. Students will evaluate their design solutions using various techniques of analysis and make appropriate modifications before producing their prototypes.

T5509I Engineering Design and Development (5698)

Open to grades 11-12

2 semesters, 1 credit per semester

Meets requirements of: AHD, THD, CORE 40

Recommendation(s): Algebra I, Geometry

Prerequisite(s): Introduction to Engineering Design, Principles of Engineering , & (Civil Engineering and Architecture OR Computer Integrated Mfg)

Engineering Design and Development (EDD) is an engineering research course in which students work in teams to research, design, test, and construct a solution to an open-ended engineering problem. The product development life cycle and a design process are used to guide the team to reach a solution to the problem. The team and/or individual(s) communicates their solution to a panel of stakeholders at the conclusion of the course. As a capstone course in the Engineering Pathway, EDD engages students in critical thinking, problem-solving, time management, and teamwork skills. NOTE: This course aligns with the PLTW Engineering Design and Development curriculum.

T6532I & T6531I Automation & Robotics I & Principles (7103 & 7108)

Must take both concurrently

Open to grades 10-12

2 semesters, 2 credit per semester

Meets requirements of: THD, AHD, Core 40

Recommendation(s): Introduction to Industry: Engineering & Manufacturing, Introduction to Engineering Design

Dual Credit may be available

Industrial Automation and Robotics I introduces students to a curriculum covering the multi-craft skills needed by Industrial technicians to complete the complex and varied tasks for the career. Students will gain skills to design and build basic robots that use sensors and actuators to solve specific problems and complete specific tasks. This will include introductory programming autonomous mode. Students will also learn to program a humanoid robot, tethered and in autonomous mode, able to react to specific circumstances and perform human-like tasks when programming is complete. This course will provide fundamental knowledge and skills in basic lasers, pneumatics, hydraulics, mechanics, basic electronics and programmable logic controllers along with an understanding of career pathways in this sector. The Year One curriculum will include General Industry: OSHA 10 safety certification.

T6533I & T6534I Automation & Robotics II & Capstone (7106 & 7224)

Must take both concurrently

Open to grades 11-12

2 semesters, 2 credit per semester

Meets requirements of: THD, AHD, Core 40

Prerequisite(s): Automation and Robotics I & Principles

Recommendation(s): Introduction to Industrial Technology, Introduction to Manufacturing, Introduction to Engineering Design

Note: Qualifies as a Quantitative Reasoning course.

Dual Credit may be available

Industrial Automation and Robotics II includes the study of industrial robots, programming PLC's, automating cells, advanced programming and designing/building task-oriented robots. Students will engage in active learning, critical thinking, and problem solving through advanced robotic procedures and processes. Students will learn industrial robotic programming languages, strategies for automating to improve efficiencies, and be introduced to advanced programming languages that are common in local industry. Students will study basic computer numerical controlled (CNC) machining and will combine automation and CNC machining. They will apply information in real world situations to create working solutions and will complete projects, including building robots to perform tasks in autonomous mode and analyze their own career pathway plans in this sector.

T6542I & T6541I Precision Machining I & Principles (7105 & 7109)

Must take both concurrently

Open to grades 10-12

2 semesters, 2 credits per semester

Meets requirements of: THD, AHD, Core 40

Recommendation(s): Introduction to Industry: Engineering & Manufacturing

Note: Qualifies as a Quantitative Reasoning course.

Dual Credit may be available

Precision Machining I is designed to provide students with a basic understanding of the precision machining processes used in industry, manufacturing, maintenance, and repair. The course instructs the student in industrial safety, terminology, tools and machine tools, measurement, and layout. Students will become familiar with the setup and operation of power saws, drill presses, lathes, milling machines, grinders, and have

an introduction to CNC (computer controlled) machines.

T6543I & T6544I Precision Machining II & Capstone (7107 & 7219)

Must take both concurrently

Open to grades 11-12

2 semesters, 2 credits per semester

Meets requirements of: THD, AHD, Core 40

Prerequisites: Precision Machining I & Principles

Note: Qualifies as a Quantitative Reasoning course.

Precision Machining II is a more in-depth study of skills learned in Precision Machining I with a stronger focus in CNC setup/operation/programming. Classroom activities will concentrate on precision set-up and inspection work as well as machine shop calculations. Students will develop skills in advanced machining and measuring parts involving tighter tolerances and more complex geometry. A continued focus on safety will also be included.

T6552I & T6551I Welding I & Principles (7111 & 7110)

Must take both concurrently

Open to grades 10-12

2 semesters, 2 credits per semester

Meets requirements of: THD, AHD, Core 40

Recommendation(s): Introduction to Industry

Dual Credit may be available

Welding I includes classroom and laboratory experiences that develop a variety of skills in Oxy-fuel Cutting and Shielded Metal Arc Welding (SMAW). This course is designed for individuals who intend to make a career as a Welder, Technician, Sales, Designer, Researcher, or Engineer. Emphasis is placed on safety at all times. OSHA standards and guidelines endorsed by the American Welding Society (AWS) are used. Instructional activities emphasize properties of metals, safety issues, blueprint reading, electrical principles, welding symbols, and mechanical drawing.

T6553I & T6554I Welding II & Capstone (7101 & 7226)

Must take both concurrently

Open to grades 11-12

2 semesters, 2 credits per semester

Meets requirements of: THD, AHD, Core 40

Prerequisite(s): Welding I & Principles

Dual Credit may be available

Welding Technology II builds on the Gas Metal Arc Welding, Flux Cored Arc Welding, Gas Tungsten Arc Welding, Plasma Cutting, and Carbon Arc skills covered in Welding Technology I. Emphasis is placed on safety at all times. OSHA standards and guidelines endorsed by the American Welding Society (AWS) are used. Instructional activities emphasize properties of metals, safety issues, blueprint reading, electrical principles, welding symbols, and mechanical drawing through projects and exercises that teach students how to weld and be prepared for college and career success.

T5500I Advanced Manufacturing: Special Topics CAD/CAM (4880)

Open to grades 10-12

2 semesters, 1 credit hour per semester

Recommendation(s): Intro to Engineering Design, or Precision Machining II, or

Computer Integrated Manufacturing, or Introduction to Industry: Engineering & Manufacturing

Dual Credit may be available

This course provides students with a basic understanding of the skills commonly used by engineers to design and prototype parts. Areas of study include: computer-aided drafting, three-dimensional modeling, working drawings, machine tool programming, and machine tool set-up. Students will gain valuable hands-on experience with CAD/CAM software and a variety of automated machine tools. They will be expected to complete several projects (increasing in difficulty) relating to product design and development, automated programming, and operation of machine tools. Mechanical Drafting CAD/CAM is a project-based, hands-on introduction for students interested in advanced manufacturing careers.