School District of Marshfield Course Syllabus

Course Name: Grade 8 Career Quest – Technology Component
Length of Course: Year (1/3 Business, 1/3 FACS, 1/3 Technology)
Credit: 1 Credit

Program Goal:

Empower learners to be college and career ready through standards-based experiences in the classroom and career-based learning experiences with business and industry partners. Learners will engage through technology in design, building, problem-solving, repair or service, in a collaborative environment through theory and hands-on experiences.

Course Description:

Learners will utilize decision making and problem solving skills while exploring a variety of career choices within the area of Technology Education. Hands-on activities will be offered in Engineering, Construction/Manufacturing, Design, and Electricity/Electronics.

Board Approved April 2023

Wisconsin Standards for Technology and Engineering (TE)	
Broad-Based (BB)	
BB1: Students will analyze the core concepts of technology.	
Analyze and use technological systems BB1.a	1.a.3.m: Identify inputs, processes, outputs and, at times, feedback components for technological systems. 1.a.4.m: Explain how common energy, power and transportation systems have provisions that detect, bypass, or compensate for failures within a system.
Analyze and use tools and materials BB1.b	1.b.3.m: Students will describe how resources are the things needed to complete a task (e.g., tools, machines, materials, information, energy, people, capital, and time). 1.b.4.m: Use appropriate tools to measure and layout a piece of material (e.g., length, width, thickness, angles, circles, arcs, and volume) within tolerances.
Analyze and use mechanisms BB1.c	1.c.2.m: Explain the relationship between the inputs and outputs of linear, rotary and compound motion mechanisms in terms of direction, distance, and force. 1.c.3.m: Define mechanical concepts such as force, work, power, torque, velocity, mechanical advantage, and gear ratio.
Analyze and use electricity and electronic systems BB1.d	1.d.2.m: Define basic electrical concepts (i.e., voltage, direct and alternating current, resistance, power, polarity, conductor, insulator, series circuit, parallel circuit, series-parallel circuit, inductance, capacitance, continuity, digital, analog). 1.d.3.m: Measure current, voltage and resistance in series, parallel and series-parallel circuits, and components. 1.d.4.m: Locate and identify shorts to power & ground, opens and high resistance problems in circuits and components.
Analyze, explain, and use control systems BB1.e	1.e.4.m: Explain how quality control is a planned process to ensure that a product, service, or system meets established criteria.
Architecture and Construction (AC)	
AC1: Students will be able to select and use architecture and construction technologies.	
Analyze construction requirements, materials, structures, techniques and maintenance AC1.a	1.a.5.m: Select designs for structures based on factors such as building codes and requirements, style, convenience, cost, climate, culture, and function. 1.a.8.m: Identify a variety of materials and subsystems that buildings generally contain.
Apply measurement systems in the planning and layout process used in the residential construction industry AC1.b	1.b.8.m: Demonstrate basic dimensioning skills including the use of: dimension, extension, center, and leader lines. 1.b.9.m: Demonstrate use of the Standard Measuring System to the 1/16” and the Metric Measuring System to millimeters. 1.b.10.m: Add, subtract, multiply, and divide in the Standard Measuring System to the 1/16” and the Metric Measuring System to millimeters.

Demonstrate the safe and appropriate use of hand tools common to the residential and commercial construction industry AC1.c	1.c.3.m: Demonstrate proficiency in the use of simple hand tools such as hammers, screwdrivers, handsaws, planes, sandpaper, nail sets, tin shears, framing squares, utility knives, chalk lines, etc. 1.c.4.m: Demonstrate proficiency in obtaining and storing simple hand tools.
Demonstrate the safe and appropriate use of portable power tools that are common to the residential construction industry and are appropriate to the individual student's level AC1.d	1.d.2.m: Demonstrate the safe and proper use of power tools. 1.d.4.m: Demonstrate proficiency in the proper care of all tools used in a class or lab.
Demonstrate project management procedures and processes as they occur in a construction project AC1.e	1.e.11.m: Explain the importance of positive and constructive communication skills.
Demonstrate the value and necessity of practicing occupational safety in the construction industry facility and job site AC1.f	1.f.4.m: Recognize the potential accidents and injuries that may occur in a given work environment.
Electronics (EL)	
EL1: Students will develop, use, and apply basic electronics and electricity concepts.	
Apply electronic theory to practice EL1.a	1.a.5.m: Describe atomic structure, the components of the atom, their charges and importance to electronics technology. 1.a.6.m: Construct electrical systems and explain material's tendency toward being a conductor or insulator. 1.a.7.m: Identify the fundamental and supplementary units that are the bases of the International System of Units (SI). 1.a.8.m: Describe current, voltage, resistance, power, and their application to DC electronics. 1.a.9.m: Summarize Ohms law.
EL2: Students will develop the ability to use symbols, measurements, and schematics to build, test and troubleshoot electronic circuits and systems.	
Construct and measure a basic circuit using electronic components EL2.a	2.a.4.m: Identify the following electronic components and their usages: source, load, insulator conductor and control device. 2.a.5.m: Build a DC motor to identify the primary parts and demonstrate how it functions. 2.a.6.m: Identify electrical generation including mechanical, solar, chemical, thermocouple, piezo and fuel cells. 2.a.7.m: Construct a basic circuit using a solder-less breadboard to demonstrate a source, load, connector, safety device and control device.
Demonstrate electronic measurement to series, parallel and combination circuits EL2.b	2.b.3.m: Construct a series circuit and explain its basic concepts.

	2.b.4.m: Construct a parallel circuit, explain its basic concepts and be able to calculate resistance total.
EL3: Students will analyze and use digital electronics.	
Analyze, develop, use and apply digital electronics EL3.a	3.a.2.m: Demonstrate basic logic decision making using switches.
EL4: Students will analyze and use combinational logic analysis and design.	
Design and build a combinational logic circuit that satisfies a need, to design constraints EL4.a	4.a.4.m: Use switches to create circuits that function as AND and OR gates.
EL7: Demonstrate safe and appropriate use of tools, machines, and materials in electronics technology.	
Demonstrate, apply and measure electronic safety concepts applied to circuits EL7.a	7.a.3.m: Demonstrate good organization at workstation within total laboratory. 7.a.4.m: Explain precautions needed in the area of electronic safety. 7.a.5.m: Describe solder safety as it pertains to burns and potential fires or damage to facilities or customer products.
Engineering (ENG)	
ENG1: Students will analyze and demonstrate the attributes of design.	
Analyze engineering design theory ENG1.a	1.a.5.m: Design is a creative planning process that leads to useful products and systems. 1.a.6.m: There is no perfect design. 1.a.7.m: Explain how the design process has many criteria which ultimately lead to a solution. 1.a.8.m: Requirements for a design are made up of criteria and constraints.
ENG2: Students will analyze and demonstrate engineering design.	
Analyze the attributes of engineering design ENG2.a	2.a.3.m: Design involves a set of steps, which can be performed in different sequences and repeated as needed. 2.a.4.m: Examine how brainstorming is an individual or group design process step used to generate ideas to solve a problem. 2.a.5.m: Discuss the engineering design process involves defining a problem, generating ideas, selecting a solution, testing the solution(s), making the item, evaluating it, and presenting the results.
Describe and apply engineering design ENG2.b	2.b.3.m: Modeling, testing, evaluating, and modifying are used to transform ideas into practical solutions.
ENG3: Students will demonstrate and analyze the role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.	
Discuss the importance of the problem solving process ENG3.a	3.a.4.m: Explain troubleshooting is a problem-solving method used to identify the cause of a malfunction in a system.

Analyze the procedures for innovation and invention ENG3.b	3.b.3.m: Invention is a process of turning ideas and imagination into devices and systems. Innovation is the process of modifying an existing product or system to improve it. 3.b.4.m: Explain some technological problems are best solved through experimentation.
ENG4: Students will develop abilities to apply the design process.	
Research the background information of a proposed design ENG4.a	4.a.3.m: Specify criteria and constraints for the design. 4.a.4.m: Demonstrate two-dimensional and three-dimensional representations of the designed solution.
Design solutions based on gathered information ENG4.b	4.b.3.m: Apply a design process to solve problems in and beyond the laboratory-classroom.
Evaluate completed solutions and provide feedback ENG4.c	4.c.4.m: Test and evaluate the design in relation to pre-established criteria and constraints and refine as needed. 4.c.5.m: Make a product or system and document the solution.
ENG5: Students will develop the abilities to use and maintain technological products and systems.	
Use information to describe and design systems ENG5.a	5.a.4.m: Identify information provided in manuals, protocols or by experienced people to identify how things work. 5.a.5.m: Demonstrate and use tools, materials, and machines safely to create, diagnose, adjust, and repair systems.
Use tools to maintain systems ENG5.b	5.b.4.m: Operate and maintain systems in order to achieve a given purpose. 5.b.5.m: Use computers, calculators, and technology in various applications.
ENG6: Students will develop the abilities to assess the impact of products and systems.	
Collect information about products and systems ENG6.a	6.a.2.m: Design and use instruments and technology to gather data.
Interpret data from collected information to assess impacts of products and systems ENG6.b	6.b.4.m: Collect data to analyze and interpret trends in order to identify the positive and negative effects of a technology. 6.b.5.m: Identify trends and monitor potential consequences of technological development. 6.b.6.m: Interpret and evaluate the accuracy of the information obtained and determine if it is useful.
Information and Communication Technology (ICT)	
ICT1: Students will analyze, select, and use information and communication technologies.	
Analyze how communication happens, the different forms of communication and how it affects society ICT1.a	1.a.10.m: Analyze how the use of symbols, measurements and drawings promotes clear communication by providing a common language to express ideas.
Manufacturing (MNF)	
MNF1: Students will be able to select and use manufacturing technologies.	

Identify, select and safely use tools, machines, products and systems for specific tasks MNF1.a	1.a.4.m: Discuss health and safety procedures in the workplace that keep workers safe. 1.a.5.m: Use tools, materials, and machines safely to diagnose, adjust and repair systems. 1.a.6.m: Explore both customary and metric systems of measurement and conversions.
Create and communicate alternative solutions MNF1.b	1.b.3.m: Practice appropriate problem-solving approaches and critical thinking skills to on-the-job issues and tasks. 1.b.4.m: Comprehend and engage in communication methods to convey ideas, concepts and requirements to other individuals and teams.
Demonstrate cooperation with others in ways to exhibit respect for individual and cultural differences and for the attitudes and feelings of others MNF1.c	1.c.3.m: Learn how to cooperate with others in ways to exhibit respect for individual and cultural differences and for the attitudes and feelings of others. 1.c.4.m: Recognize characteristics and benefits of teamwork, leadership and citizenship in the school, community, and manufacturing settings. 1.c.5.m: Participate in the student organization SkillsUSA competitive career development events to enrich academic skills, encourage career choices and contribute to employability.
Power and Energy (PE)	
PE1: Students will be able to select and use energy and power technologies.	
Discuss, analyze and use energy systems PE1.a	1.a.6.m: Define how energy is the ability to do work. 1.a.7.m: Discuss how energy can be used to do work, using various processes. 1.a.8.m: Analyze how power is the rate at which energy is converted from one form to another or transferred from one place to another or the rate at which work is done. 1.a.9.m: Examine how power systems are used to drive and provide propulsion to other technological products and systems. 1.a.10.m: Discuss that much of the energy used in our environment is not used efficiently.
Analyze, use and discuss machine and tool use relating to energy and power systems PE1.b	1.b.5.m: Explain the machines and systems used in energy systems to do work. 1.b.7.m: Follow safe procedures when using tools and equipment related to power and energy systems. 1.b.8.m: Define and use specific tools and technology related to power and energy systems. (Such as: multi-meter and computer software programs).
Transportation (TR)	
TR1: Students will be able to select and use transportation technologies.	
Analyze and explain how transportation vehicles and transportation vehicle systems work TR1.b	1.b.5.m: Explain that transportation vehicles are made up of subsystems, such as structural, propulsion, suspension, guidance, control, and support that must function together to make them work effectively.

	1.b.6.m: Identify that a transportation system may lose efficiency or fail if one part is missing or malfunctioning or if a subsystem is not properly working.
Develop the skill set necessary to diagnose, problem solve and repair transportation vehicles TR1.c	1.c.5.m: Use STEM – Science, Technology, Engineering and Math to solve problems related to the transportation field. 1.c.6.m: Use simple machines to construct transportation-related devices.
Wisconsin Common Career Technical Standards (WCCTS)	
Creativity, Critical Thinking, Communication and Collaboration (4C)	
4C1: Students will think and work creatively to develop innovative solutions to problems and opportunities.	
Develop original solutions, products, and services to meet a given need 4C1.a	1.a.4.m: Analyze elements of a problem to develop creative solutions. 1.a.6.m: Describe how past experiences can inform current problem solving.
Work creatively with others to develop solutions, products, and services 4C1.b	1.b.4.m: Explain how multiple people can develop better solutions than an individual. 1.b.5.m: Explain how multiple people and perspectives can develop better ideas than an individual. 1.b.6.m: Explain how multiple people and perspectives can improve an existing product or process better than an individual.
4C2: Students will formulate and defend judgments and decisions by employing critical thinking skills.	
Develop effective resolutions for a given problem, decision or opportunity using available information 4C2.a	2.a.5.m: Analyze symptoms to identify the root cause of a problem. 2.a.6.m: Develop multiple resolutions for a given problem, decision, or opportunity. 2.a.7.m: Identify problems that became worse due to poorly thought out or poorly informed solutions. 2.a.8.m: Explain how implementation of a solution or action may affect one or more corresponding systems. 2.a.9.m: Explain how different resolutions may be appropriate under different circumstances. 2.a.10.m: Explain the process for choosing an action or making a decision.
Develop and implement a resolution for a new situation using personal knowledge and experience 4C2.b	2.b.3.m: Analyze problems to determine what past experiences might be related and relevant. 2.b.4.m: Analyze a problem to determine how it relates to existing knowledge.
4C3: Students will communicate and collaborate with others to accomplish tasks and develop solutions to problems and opportunities.	
Communicate thoughts and feelings with others using verbal and non-verbal language 4C3.a	3.a.8.m: Implement effective listening skills in resolving a situation.

Work collaboratively with others 4C3.b	3.b.4.m: Use idea generating practices as part of a group. 3.b.5.m: Describe ways to facilitate group collaboration. 3.b.6.m: Demonstrate the use of various tools to communicate effectively with an individual or a group.
Use interpersonal skills to resolve conflicts with others in an ethical manner 4C3.c	3.c.5.m: Contribute to resolving conflicts that occur within a team or group. 3.c.6.m: Explore the ethical considerations of a current or historical action or decision.
Career Development (CD)	
CD1: Students will consider, analyze, and apply an awareness of self, identity, and culture to identify skills and talents.	
Identify person strengths, aptitudes, and passions CD1.a	1.a.2.m: Assess personal strengths, aptitudes and passions related to potential future careers.
Demonstrate effective decision-making, problem solving and goal setting CD1.b	1.b.4.m: Identify long and short-term goals.
Interact effectively with others in similar and diverse teams CD1.c	1.c.7.m: Display cooperative behavior and identify personal strengths and assets in groups.
Apply a range of relevant decision-making strategies CD1.d	1.d.4.m: Apply decision-making strategies to personal and team interactions.
CD2: Students will identify the connection between educational achievement and work opportunities in order to reach personal and career goals.	
Apply academic experiences to the world of work, inter-relationships, and the community CD2.a	2.a.2.m: Describe a diverse range of opportunities available beyond high school.
Assess attitudes and skills that contribute to successful learning in school and across the life span CD2.b	2.b.5.m: Apply academic information from a variety of sources to enhance career preparedness and lifelong learning. 2.b.6.m: Research local and regional labor market and job growth information to analyze career opportunities.
CD3: Students will create and manage a flexible and responsive individualized learning plan to meet their career goals.	
Investigate the world of work in order to gain knowledge of self in order to make informed career decisions CD3.a	3.a.5.m: Demonstrate the ability to use technology to retrieve and manage career information that inspires educational achievement. 3.a.6.m: Build an ongoing awareness of personal abilities, skills, interests, and motivation and determine how these fit with chosen career pathway. 3.a.7.m: Develop an individual learning plan to enhance educational achievement and attain career goals based on a career pathway. 3.a.9.m: Use assessment results in educational planning including career awareness.

Examine and evaluate opportunities that could enhance life and career plans and articulate plans to guide decisions and actions CD3.b	3.b.2.m: Describe educational levels (e.g., work-based learning, certificate, two-year, four-year, and professional degrees) and performance skills needed to attain personal and career goals. 3.b.3.m: Demonstrate openness to exploring a wide range of occupations and career pathways.
Employ career management strategies to achieve future career success and satisfaction CD3.c	3.c.3.m: Identify work values and needs. 3.c.4.m: Define adaptability and flexibility in the world of work.
CD4: Students will identify and apply employability skills.	
Identify and demonstrate positive work behaviors and personal qualities needed to be employable CD4.a	4.a.4.m: Demonstrate flexibility and willingness to learn new knowledge and skills. 4.a.5.m: Identify positive work-qualities typically desired in each of the career cluster's pathways.
Demonstrate skills related to seeking and applying for employment to find and obtain a desired job CD4.b	4.b.3.m: Use technology to assist in career exploration and job-seeking activities. 4.b.4.m: Compare and contrast personal attributes with employment needs and trends.
Identify and exhibit traits for retaining employment CD4.c	4.c.3.m: Distinguish between appropriate behaviors in a social vs. professional setting.
Develop positive relationships with others CD4.d	4.d.4.m: Use cooperative behavior in helping peers accomplish goals and tasks.
Environment Health and Safety (EHS)	
EHS1: Students will identify the importance and interrelationships of health, safety and environmental systems and evaluate the impacts of these systems on organizational performance for continuous improvement.	
Implement personal and jobsite safety rules and regulations to maintain and improve safe and healthful working conditions and environments EHS1.d	1.d.5.m: Recognize and use systems in school and in the community that protect and enhance personal, environmental health and safety. 1.d.6.m: Discuss employee rights and responsibilities and how to apply them in a workplace setting.

Key Vocabulary:			
3D Modeling	Critical Thinking	Wattage	Isometric Drawing
Problem Solving	Constraint	Chassis	Transmission
Gear Ratio	Torque	Potential Energy	Kinetic Energy
Friction/ Friction loss	Energy	Work	Voltage
Current	Resistance	Ohm's Law	Watts Law
Electrical Load	Electricity	Electronics	Alternating Current
Direct Current	Insulator	Conductor	Simple Circuit

Orthographic Drawing	Series Circuit	Parallel Circuit	Machine/tool Identification
Mechanical Advantage			

Topics/Content Outline- Units and Themes:

Rotation A:

- Computer Aided Design Unit
  - Measurement
  - 3D Modeling
  - Orthographic drawing creation and application
- Manufacturing/Mass Production Unit
  - Machine Identification and Safety
  - Project Construction

Rotation B:

- Transportation Unit
  - Vehicle Terminology
  - Mechanisms/Simple Machines
  - Gear Ratio
  - Six Step Design Process
- Electricity Unit
  - Generating Electricity
  - Components of/types of Circuits
  - Ohm's Law

Rotation C:

- Design and development project

Primary Resource(s):

Autodesk Inventor Software
Project Lead the Way Curriculum