# Wyoming Department of Education Required Virtual Education Course Syllabus

## BIG HORN COUNTY SCHOOL DISTRICT #1

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| Program Name | WYCA | Content Area | Vocational Education |
| Course ID | CAOT86317 | Grade Level | 9, 10, 11, 12 |
| Course Name | Concepts of Engineering and Technology | # of Credits | 0.5 |
| SCED Code | 21006G0.5011 | Curriculum Type | Connections Academy |

### COURSE DESCRIPTION

*Each day, we are surrounded by technology and engineering projects. From our phones to the bridges we drive over, engineering and technology influence many parts of our lives. In Concepts of Engineering and Technology, you will learn more about engineering and technology careers and what skills and knowledge you'll need to succeed in these fields. You'll explore innovative and cutting-edge projects that are changing the world we live in and examine the design and prototype development process. Concepts of Engineering and Technology will also help you understand the emerging issues in this exciting career field.*

### WYOMING CONTENT AND PERFORMANCE STANDARDS

| STANDARD# | BENCHMARK |
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| CV12.1.1 | College and career-ready students evaluate current knowledge and interests in order to set career goals. |
| CV12.1.2 | College and career-ready students explore careers including outlook, salary, needed training, duties and lifestyle utilizing all available resources including mentors and industry experts. |
| CV12.1.3 | College and career-ready students prepare an educational and career plan to enable them to gain desired knowledge and experience. |
| CV12.1.4 | College and career-ready students demonstrate employability skills that enable them to be responsible and contributing citizens and employees. |
| CV12.2.1 | College and career-ready students communicate clearly, effectively, and with reason. |
| CV12.2.2 | College and career-ready students identify and model integrity, ethical leadership and effective management skills. |
| CV12.2.3 | College and career-ready students work productively in teams while using cultural global competence. |
| CV12.2.4 | College and career-ready students apply safe, legal, and responsible use of information and technology as appropriate to the task. |
| CV12.3.1 | College and career-ready students identify and define authentic problems and significant questions for investigation. |
| CV12.3.2 | College and career-ready students identify trends, forecast possibilities, and explore complex systems and issues. |
| CV12.3.3 | College and career-ready students employ valid and reliable research strategies and apply prior knowledge to solve a problem or complete a project. |
| CV12.3.4 | College and career-ready students demonstrate creativity and innovation while considering the environmental, social, and economic impacts of decisions. |
| CV12.4.1 | College and career-ready students produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. |
| CV12.4.2 | College and career-ready students determine the meaning of symbols, key terms, and other content-specific words and phrases as they are used in technical context. (*Adapted from CCSS RL.9.11) |
| CV12.4.3 | College and career-ready students acquire, manipulate, analyze, diagnose, and/or report information, using the appropriate technology. |
| CV12.4.4 | College and career-ready students precisely follow a complex multistep procedure when performing technical tasks. (*Adapted from CCSS RL.9.3) |
| CV12.5.1 | College and career-ready students manage resources to develop, analyze, and implement systems and applications. |
| CV12.5.2 | College and career-ready students productively complete tasks taking constraints, priorities and resources into account. |
| CV12.5.3 | College and career-ready students safely and ethically use current industry-standard tools and emerging technologies. |
| CV12.5.4 | College and career-ready students utilize technology to develop innovative solutions or products. |

### SCOPE AND SEQUENCE

| UNIT OUTLINE | STANDARD# | OUTCOMES |
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| **Unit 1: Development & Understanding of Engineering**<br>Have you ever wondered how civilization continues to design, build, and improve machines and structures around the world? Looking at the skyline of any major city, you can see a crazy number of tall buildings, lengthy bridges, and engines purring under endless equipment. We all know these inventions are critical to our modern way of life, yet we don't always understand the knowledge required to create such innovation. Have you ever peered up at a towering skyscraper and marveled at the mere impossibility of it? It is, in fact, not only possible but also just part of a day's work for an engineer. In this course, you'll be exploring the various fields of this occupation, its history, the important role it plays in human life, and the ethical issues related to engineering. So buckle up; here you go! | CV12.2.1, CV12.2.4, CV12.3.1, CV12.3.2, CV12.3.3, CV12.4.1, CV12.4.2, CV12.4.3, CV12.5.1, CV12.5.3, CV12.5.4 | • Distinguish the differences between science, technology, and engineering.<br>• Understand and use technical terms.<br>• Discuss important technological developments from the past.<br>• Identify the various technological ages and the rate of current development.<br>• Discuss some of the ethical concerns around technology. |

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| **Unit 2: Making Problems into Ideas**<br>It's easy to identify a problem but not always as easy to figure out a solution. An engineer's job is to take problems and apply a functional process that will eventually result in a technological solution. That problem-solving process involves a series of important steps, steps that are imperative for success. Understanding these techniques is critical for an engineer, as is knowing the differences among the various technological systems that aid in the process. You could say that an engineer has a sizable toolbox of strategies at her disposal. This unit will explain those tools and how they can best be used on the job. It will also help you to develop your own process through the development of an engineering notebook. | CV12.1.1, CV12.1.3, CV12.1.4, CV12.2.1, CV12.2.4, CV12.3.1, CV12.3.2, CV12.3.3, CV12.3.4, CV12.4.1, CV12.4.2, CV12.4.3, CV12.4.4, CV12.5.1, CV12.5.3, CV12.5.4 | • Discuss open and closed systems.<br>• Identify how technological systems interact to achieve goals.<br>• Find technological solutions through problem solving.<br>• Design and maintain a computation engineering notebook. |
| **Unit 3: From Sketches to Products**<br>As an engineer, you will likely find yourself in a situation where you know exactly what you want to build, but the only problem is your ideas are stuck in your head. Finding a way to express ideas and bring them to fruition is a challenge, even for an engineer, and understanding the design process is a critical part of the course of action. Obviously, designing something requires that you also have a firm grasp on the materials needed and how they are characterized within an experiment. Simply put, this means engineers must conceptualize their goals while remembering the pragmatic elements required to achieve them. How can I get what I want with what I have? Working out a design process is a balancing act between the creative and the scientific worlds. Having a vision is essential, but understanding the reality of how to achieve that vision is equally important. You can't have one without the other. | CV12.1.1, CV12.1.2, CV12.1.3, CV12.1.4, CV12.2.1, CV12.2.2, CV12.2.3, CV12.2.4, CV12.3.1, CV12.3.2, CV12.3.3, CV12.3.4, CV12.4.1, CV12.4.2, CV12.4.3, CV12.4.4, CV12.5.1, CV12.5.3, CV12.5.4 | • Describe the fundamental processes needed for a project, including design and prototype development.<br>• Identify the chemical, mechanical, and physical properties of engineering materials.<br>• Assess risks and benefits of a design solution.<br>• Maintain a professional portfolio. |
| **Unit 4: Civil Engineering**<br>Are you a practical person? Do you like to see things running smoothly and efficiently? Do you worry about systems that break down and create problems? If the answers are yes, you may want to learn more about civil engineering, a field that focuses on precisely these issues in the real world. The world is filled with roads, buildings, airports, tunnels, dams, bridges, and water supply systems. The world needs a qualified person to design, build, supervise, operate, and maintain these things. And as we all know, these "things" are not negotiable. They must be supported with ideas and hard work to keep our society chugging along and, in some cases, sprinting along as we continue to evolve into an increasingly accelerated species. Civil engineering is arguably the oldest discipline in this field, dating back to 3000 BCE, and definitely one of the most pragmatic. I mean, if you don't have a roof over your head, what do you have? | CV12.1.1, CV12.1.2, CV12.1.3, CV12.1.4, CV12.2.1, CV12.2.2, CV12.2.3, CV12.2.4, CV12.3.1, CV12.3.2, CV12.3.3, CV12.3.4, CV12.4.1, CV12.4.2, CV12.4.3, CV12.4.4, CV12.5.1, CV12.5.3, CV12.5.4 | • Assume different roles within an engineering project and apply the design process.<br>• Develop and test a project model.<br>• Use time-management skills to meet project objectives.<br>• Use criteria to meet project expectations.<br>• Describe and demonstrate team functions, quality, and requirements. |
| **Unit 5: Concepts of Engineering & Technology Midterm Quiz**<br>In this unit, you will review the information you learned up to this point in this course and take a quiz to demonstrate your newly acquired knowledge. | | • Review information acquired and mastered from this course up to this point.<br>• Take a quiz based on material from units 1-4 in this course. |

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| **Unit 6: Mechanical Engineering**<br>Were you one of those kids who liked to take things apart or, more truthfully, break them to see what was inside? Did you pull apart your new mechanical toy to examine how the parts were attached? Maybe you even managed to put it back together. These preoccupations with machinery and its secrets are also the wonderings of a mechanical engineer. How does this broad field really function? What type of engineer does it require? A mechanical engineer has a large, albeit sometimes unusual, scope of interests and plays an integral part in the running of the modern world. So maybe the kid taking the remote control apart instead of watching the actual television is on her way to an exciting career as a mechanical engineer. | CV12.1.1, CV12.1.2, CV12.1.3, CV12.1.4, CV12.2.1, CV12.2.2, CV12.2.3, CV12.2.4, CV12.3.1, CV12.3.2, CV12.3.3, CV12.3.4, CV12.4.1, CV12.4.2, CV12.4.3, CV12.4.4, CV12.5.1, CV12.5.3, CV12.5.4 | • Define and describe the applications of physical and mechanical systems.<br>• Describe various career opportunities and emerging issues within these fields.<br>• Explain the history of mechanical engineering and its current trajectory.<br>• Apply design concepts to problems in physical and mechanical systems. |
| **Unit 7: Chemical Engineering**<br>It's awesome to study and understand the natural world through science or identify the makeup of different substances through the wonders of chemistry; however, what does it take to use both of the disciplines of chemistry and engineering to create something entirely new? Something that can improve human life, feed the planet, save lives, and change the face of reality? As you will soon find out, it takes a chemical engineer. Chemical engineering, a complex and challenging field of engineering, is particularly exciting because of its relationship to substances and conceptualizing how they can be used to form new ones. A chemical engineer not only has to understand science, mathematics, and chemistry but must also have the skills to funnel all that knowledge into the alchemy of any entirely new and innovative result. Now you have the essence of chemical engineering. | CV12.1.1, CV12.1.2, CV12.1.3, CV12.1.4, CV12.2.1, CV12.2.2, CV12.2.3, CV12.2.4, CV12.3.1, CV12.3.2, CV12.3.3, CV12.3.4, CV12.4.1, CV12.4.2, CV12.4.3, CV12.4.4, CV12.5.1, CV12.5.3, CV12.5.4 | • Describe applications of process control and automation systems.<br>• Describe career opportunities in process control and automation systems.<br>• Apply design concepts and identify fields related to process control and automation systems while identifying emerging issues.<br>• Understand and follow safety tests and guidelines while recognizing how to classify and dispose of hazardous materials and waste. |
| **Unit 8: Biological Engineering**<br>If you consider healing the world a worthwhile endeavor, then you have the spirit of a bioengineer. Nature is filled with different materials under the ground, in the sky, and far down in the murky depths of the sea. Learning how to use these organisms is the key to this evolving world of discovery. The natural world continues to provide many priceless resources that we can use; however, we must remember to remain ethical and thoughtful in this process so as not to deplete the world and ourselves. Unlike chemical engineering, which creates synthetic materials through nature, bioengineers simply use the materials of Earth to generate what is needed to improve human life. Just remember: biology plus engineering equals bioengineering. Bioengineers are the naturalists of the engineering world and some of the most effective innovators of our time. | CV12.1.1, CV12.1.2, CV12.1.3, CV12.1.4, CV12.2.1, CV12.2.2, CV12.2.3, CV12.2.4, CV12.3.1, CV12.3.2, CV12.3.3, CV12.3.4, CV12.4.1, CV12.4.2, CV12.4.3, CV12.4.4, CV12.5.1, CV12.5.3, CV12.5.4 | • Describe applications of process control and automation systems.<br>• Describe career opportunities in process control and automation systems.<br>• Apply design concepts and identify fields related to process control and automation systems while identifying emerging issues.<br>• Understand and follow safety tests and guidelines while recognizing how to classify and dispose of hazardous materials and waste. |
| **Unit 9: Impossible Engineering!**<br>Thinking back on all the incredbile challenges engineers have overcome in their profession, it's easy to be positively astonished by the amount of innovation the world has seen. Rarely do people have the ability to predict the future, yet engineers have proved time and time again that dreams can eventually become reality. Looking back at all the engineering developments over the years and remembering that at one time they too seemed impossible, it's safe to say society is likely in store for a lot of surprising advancements in the next hundred years. What are the areas engineers hope to develop during the 21st century? How will society look as a result? Engineers must have a lot of tools in their toolboxes, but the word impossible is definitely not one of them. | CV12.1.1, CV12.1.2, CV12.1.3, CV12.1.4, CV12.2.1, CV12.2.2, CV12.2.3, CV12.2.4, CV12.3.1, CV12.3.2, CV12.3.3, CV12.3.4, CV12.4.1, CV12.4.2, CV12.4.3, CV12.4.4, CV12.5.1, CV12.5.3, CV12.5.4 | • Define impossible engineering.<br>• Conduct and present research on emerging and innovative technology.<br>• Describe ethical behavior and decision making through the use of examples.<br>• Differentiate among discrimination, harassment, and equality. |

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| **Unit 10: Concepts of Engineering & Technology Final Exam**<br>In this unit, you will review the information you learned throughout this course and take an exam to demonstrate your newly acquired knowledge. | | • Review information acquired and mastered from this course up to this point.<br>• Take a course exam based on material from units 5-8 in this course. |