



LINCOLN-WOODSTOCK COOPERATIVE SCHOOL DISTRICT COURSE SYLLABUS

Course Name: STEM/Robotics

Length: Full Year

Teacher: Dave Webster

Course Description:

The objective of this course is to introduce students to the multiple fields of STEM and stimulate their interests in science and engineering through participation in the entire engineering design process. STEM education is essential for developing critical thinking, problem-solving, and analytical skills that are highly valued in the modern workforce. Engaging in STEM provides students with hands-on experiences, fostering creativity, curiosity, and a passion for innovation. STEM education prepares students for the ever-evolving technological landscape, equipping them with the necessary skills and knowledge for future career success in STEM-related fields.

Competencies or Standards Assessed:

The ISTE standards for high school focus on integrating technology into learning, while STEM standards emphasize interdisciplinary approaches in science, technology, engineering, and mathematics.

Empowered Learner: Students leverage technology to take an active role in their learning process.

Digital Citizen: Students understand the ethical and safe use of technology.

Knowledge Constructor: Students use digital tools to gather and evaluate information.

Innovative Designer: Students apply technology creatively to solve problems.

Computational Thinker: Students use technology to develop problem-solving strategies.

Creative Communicator: Students communicate clearly and express themselves creatively using digital tools.

Global Collaborator: Students use digital tools to broaden their perspectives and work with others globally.



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For STEM standards, they often align with the Next Generation Science Standards (NGSS), which focus on:

Science and Engineering Practices: Engaging in scientific inquiry and engineering design.

Crosscutting Concepts: Identifying patterns and connections across different scientific domains.

Disciplinary Core Ideas: Understanding key concepts in physical sciences, life sciences, earth and space sciences, and engineering.

Anchor Texts or Major Curriculum:

3d Printers

Cura

Glowforge Pro

Educo Drones

Soldering Materials

TinkerCad

Robolink <https://www.robolink.com/products/codrone-edu>

Arduino IDE

Arduino Sensors, Shields, various components

Various Resource Manuals

Adobe Suite

Pi Stuff

Raspberry Pi imager <https://www.raspberrypi.com/software/>

Thonny ide – Students need to be able to download Libraries ect.

PyCharm – Students need to be able to download Libraries ect.

JetBrains that runs the PyCharmEd Version – Students need to be able to download Libraries ect.

Blender Suite <https://www.blender.org/download/>

Unity Hub/ Unity Suite: Need access to [Asset Store](https://unity.com/download) <https://unity.com/download>

Course Outline (major units of study):

Unit Title	Essential Question or Overarching Understanding
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Unit 1 The most significant development in personal fabrication may be 3D design hardware and software. Today, additive (3D printers) and subtractive (laser cutters, vinyl cutters, computer-controlled mills, and lathes) technologies allow users to design an object on the computer and "print" it out in a variety of materials. Software like cloud-based TinkerCAD and SketchUp put 3D design within students' reach. Among other things, this will allow us to concretize mathematics instruction.	How can 3D design and fabrication technologies transform the way we learn and apply mathematical concepts in real-world scenarios?
Unit 2 Learn the basics of soldering, a fundamental skill every maker should have. The first-hand soldering exercises depend on the components actually used in the client's products, including some or all of the following: Soldering 101 provides beginning soldering students or those new to the electronics industry with knowledge and firsthand skills for both through-hole and surface mount technologies. Each student will then populate a functioning PCB, soldering the components in place to make a working project. This basic soldering course will teach the basic principles of hand soldering.	How does mastering soldering techniques empower makers to create and innovate with electronic components?"
Unit 3 Electrical: Design and construct an electronic machine and simple circuit pieces (PCB). Students will be able to interpret and draw accurate circuit diagrams using US standard electronic	How can understanding and designing electronic circuits empower us to solve real-world problems and innovate in technology?



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symbols, and additionally be able to assemble circuits on a breadboard when given a circuit diagram. Students will be able to measure and calculate the electric properties of circuits and circuit pieces, such as voltage, current, resistance, and power.	
Unit 4 Arduino is an open-source computer that allows different components to work together and can be programmed with C or C++ languages on the Arduino Web Editor or the Arduino IDE. The Arduino can be connected to a variety of sensors, motors, and displays that can be used to create advanced projects or prototypes. An Arduino Uno board has many parts, such as a microprocessor, a voltage regulator, a reset button, a DC Barrel Port, and a USB-B port to connect to a computer.	How can programming and integrating Arduino components enhance our ability to create innovative solutions and prototypes?
Unit 5 STEM Integrated Robotics: Design and construct a simple machine out of mechanical construction elements to perform a specified task. This integrates the interdependent disciplines of Science, Technology, Engineering, and Math (STEM) into a focused and invigorating real-world, relevant Robotics curriculum. Also embedded are engineering (mechanical, electrical, & software), design, innovation, communications, small group collaboration, and Portairt of a learner and knowledge relevant for student success in college, career, and	How can designing and building robots using STEM principles prepare us for solving complex challenges in the real world?



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the community.	
Unit 6 The CoDrone EDU is a programmable drone for learning. Code it in Python/PyCharm Edu coding. With its color sensors, a front range sensor, a bottom range sensor, programmable lights, and access to seven other sensors make it an excellent learning tool and a great way to learn coding and engineering skills.	How can programming and operating drones like the CoDrone EDU enhance our understanding of coding, engineering, and real-world problem-solving?

Portrait of a Learner

Independent Learner

I make thoughtful plans and do my best to reach personal goals using feedback to work through challenges.

Responsible Collaborator

I work with others to achieve shared goals by listening actively, contributing ideas, and managing conflict.

Critical Thinker

I analyze information, ask thoughtful questions, and apply reasoning skills to solve problems and make decisions.

Effective Communicator

I express ideas clearly, adapting strategies based on the audience, setting, and/or purpose.

Global Citizen

I show that I care and take responsibility by helping in my community and the world around me.

Additional Classroom Expectations:



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1. Student-Centered Learning:
 - o Personalized Education: Tailor learning experiences to meet the diverse needs and interests of students.
 - o Active Engagement: Foster a hands-on, inquiry-based learning environment where students actively participate in their education.
2. Interdisciplinary Approach:
 - o Integrated Curriculum: Combine science, technology, engineering, and mathematics with other subjects to provide a holistic education.
 - o Real-World Problems: Use interdisciplinary projects to solve real-world problems, demonstrating the interconnectedness of STEM disciplines.
3. Equity and Inclusion:
 - o Access for All: Ensure that all students, regardless of background, have access to high-quality STEM education.
 - o Cultural Relevance: Incorporate diverse perspectives and culturally relevant materials into the curriculum.
4. Inquiry and Exploration:
 - o Curiosity-Driven Learning: Encourage students to ask questions, explore, and experiment.
 - o Problem-Solving Skills: Develop critical thinking and problem-solving skills through project-based learning and hands-on activities.
5. Collaboration and Teamwork:
 - o Group Projects: Promote collaboration through group projects and cooperative learning activities.
 - o Community Partnerships: Build partnerships with local businesses, universities, and STEM organizations to provide real-world learning opportunities and resources.
6. Innovation and Creativity:
 - o Creative Thinking: Encourage students to think creatively and explore multiple solutions to problems.
 - o Entrepreneurial Mindset: Foster an entrepreneurial mindset by encouraging students to design, build, and test their ideas.
7. Lifelong Learning:
 - o Growth Mindset: Instill a growth mindset, encouraging students to view challenges as opportunities for growth and learning.
 - o Continuous Improvement: Commit to continuous improvement and professional development for educators to stay current with STEM advancements.
8. Community and Global Connections:
 - o Local Impact: Engage students in projects that address local community issues and needs.



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- o Global Awareness: Develop global awareness and understanding of how STEM can address global challenges.
- 9. Technology Integration:
 - o Digital Literacy: Ensure students are proficient in using technology as a tool for learning, communication, and problem-solving.
 - o Innovative Tools: Integrate cutting-edge technology and tools into the classroom to enhance learning experiences.
- 10. Ethical and Responsible Citizenship:
 - o Ethical Considerations: Teach students to consider the ethical implications of scientific and technological advancements.
 - o Social Responsibility: Encourage students to use their STEM knowledge to contribute positively to society and the environment.