Department of Technology and STEM Education

Regional Technology Center, Suite 2
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www.vcsu.edu/departments/technology/ (http://teched.vcsu.edu)

The Department of Technology offers a fully online curriculum for a major or minor in Technology or STEM Education. The major or minor can be taken online or on campus. Paths to STEM Certification, STEM Endorsements, or Teacher Licensure are also online.

This program has the flexibility to be offered as a four-year degree major, two-year degree minor, or the ability to meet state certification/licensure requirements for Technology Education content coursework. Certification requirements are determined by your home state.

The Technology Education and STEM Education programs are based on the Standards for Technological and Engineering Literacy (STEL - 2020), Standards for Technological Literacy (STL - 2007), Common Core, and Next Generation Science Standards.

Master of Education

For more information on the Master of Education program, please see the Graduate Program (http://catalog.vcsu.edu/graduate-catalog/programs/master-education-concentration-technology-education/) section of this catalog.

Gjovik, Knut Peder (2008) Emeritus Professor; A.A. Lake Region State College, B.S. Valley City State University, M.S. University of North Dakota, Ph.D. North Dakota State University.

Krumwiede, Elisa (2019) Assistant Professor; B.S. North Dakota State University, M.Ed. Valley City State University

Mannie, Clayton (2020) Assistant Professor; B.S. and M.Ed. Valley City State University

Ross, Richard (1999) Associate Professor; B.A., B.S. Minot State University, M.S. Tri-College University

Majors

- Career and Technical Education - Composite (B.S.) (http://catalog.vcsu.edu/undergraduate-catalog/programs/majors/career-technical-education/)
- Technology Education (B.S. in Education) (http://catalog.vcsu.edu/undergraduate-catalog/programs/majors/technology-education/)

Minor

- Technology Education (http://catalog.vcsu.edu/undergraduate-catalog/programs/minors/technology-education/)

Certificates

- STEM Education–Elementary (http://catalog.vcsu.edu/undergraduate-catalog/programs/certificates/stem-education-elementary/)
- STEM Education–Secondary (http://catalog.vcsu.edu/undergraduate-catalog/programs/certificates/stem-education-secondary/)

Endorsement

- STEM Education

STEM ED 160. Integrative Physical Science for Elementary. 4 Credits.
A conceptual physical science course intended for elementary education majors. Topics include the study of the structure and properties of matter, interactions and energy, interactions and forces, interactions and systems (electricity and magnetism), and the study of waves (including light and sound). This course includes exploration of PLTW Launch Modules and other hands-on activities.
Typically Offered: Fall, Spring, Summer.

STEM ED 199. Special Topics. 1-4 Credits.
Courses not offered in the regular catalog that provide an opportunity to extend student learning.
Typically Offered: On sufficient demand.
Repeatable: Up to 12 Credits.

STEM ED 306. Inventions and Innovations - Technology Education for Children. 3 Credits.
An elementary course focused on technology and society, invention and innovation, engineering for children, evaluating available integrated STEM curricula, as well as exploring methods for the implementation of integrated STEM activities in the elementary classroom. The course includes a lab component.
Typically Offered: Fall.

STEM ED 310. Design, Technology and Engineering for Children. 3 Credits.
An elementary course focused on technology and the engineering design process, as well as methods for integrating STEM activities in elementary school curriculum. The course includes a lab component.
Typically Offered: Spring.

STEM ED 331. Innovation and Engineering Design. 3 Credits.
Prepares prospective teachers to teach engineering design concepts to understand how criteria, constraints, and processes affect designs. Activities include brainstorming, visualizing, modeling, constructing, testing, and refining designs. This course includes embedded lab activities to support learning content and the application thereof.
Typically Offered: Fall.

STEM ED 342. Data Collection and Analysis. 3 Credits.
A course focused on hands-on transdisciplinary labs using project-based engineering design activities that focus on the collection and analysis of lab data to solve real world problems. Activities include data graphing, charting, tables, sketching, modeling, constructing, testing, and refining designs.
Typically Offered: Summer.

STEM ED 355. STEM Curriculum and Methods for Elementary. 3 Credits.
Foundational course for fully implementing effective elementary-level STEM (Science, Technology, Engineering, and Mathematics) Education. Reviews and explores current trends in STEM Education using PLTW Launch Modules and other standards-based education curricula. Students also examine interdisciplinary methods for successfully engaging students in Reading, Science, Math, Art, and other elementary subjects.
Typically Offered: Spring.

STEM ED 411. STEM Curriculum and Methods. 3 Credits.
This course is designed to prepare students to teach courses in program areas like STEM, technology education, and CTE technology and engineering education. Students will learn instructional planning techniques, curriculum development, methods, and how to properly integrate instruction in the classroom, lab, shop, or other workspace.
Typically Offered: Fall.

STEM ED 431. Design for Engineering. 3 Credits.
This course is designed to provide prospective teachers with experience in Project-Based Learning (PBL) using the Engineering Design Process (EDP). Students will examine engineering practices related to analytical and physical modelling to design, build, modify, test, and demonstrate in a virtual and real-world environment. Students are introduced to virtual simulations, 2D and 3D Modeling Techniques, and other elements of design. At course conclusion students will be familiar with the iterative process engineers use to create design solutions. This course Includes embedded lab activities to support learning and application.
Typically Offered: Fall.

STEM ED 450. Engineering the Future Using Computational Thinking. 3 Credits.
This course examines the use of computational thinking in technology, or how problems and their solutions can be formulated to be effectively executed by a computing platform. Students develop the skills to break problems into smaller parts, identify patterns, focus on the relevant details of a problem, and think of solutions to problems in an algorithmic fashion. This course includes embedded lab activities to support learning content and the application thereof.
Typically Offered: Spring.

STEM ED 499. Special Topics. 1-4 Credits.
Courses not offered in the regular catalog that provide an opportunity to extend student learning.
Typically Offered: On sufficient demand.
Repeatable: Up to 12 Credits.

TECH 161. Technology, Engineering, and Design. 4 Credits.
An introductory course that examines the engineering design process and its use to solve technological challenges. The course will cover the nature of technology, technology systems, and the history, evolution, and characteristics of technology, as well as learning activities to apply technology, science, and mathematics concepts.
Typically Offered: Fall, Spring.

TECH 165. Technology Solutions for Society. 4 Credits.
An introductory course that examines the impacts of technology and society. This course will cover concepts related to heat transfer, crop production, material properties, structural forces, and energy conservation. Working through the Engineering Design Process students will research societal problems, gather data, propose design ideas, and build practical solutions.
Typically Offered: Spring.

TECH 199. Special Topics. 1-4 Credits.
Courses not offered in the regular catalog that provide an opportunity to extend student learning.
Typically Offered: On sufficient demand.
Repeatable: Up to 12 Credits.

TECH 299. Special Topics. 1-4 Credits.
Courses not offered in the regular catalog that provide an opportunity to extend student learning.
Typically Offered: On sufficient demand.
Repeatable: Up to 12 Credits.

TECH 300. 3D Modeling and Design. 3 Credits.
An introduction to the principles of graphic design and 3D parametric modeling in the creation and visualization of engineering designs and drawings. Students will be able to illustrate parametric 3D part modeling, assembly, rendering, and production of working drawings from design ideas. The course includes a lab component.
Typically Offered: Fall.

TECH 325. Technology and Engineering I. 3 Credits.
This course is designed to provide technology education and STEM content expertise through examination of a myriad of ITEEAs Engineering by Design (EbD) curricular challenges. Students will use Middle and High School authentic Problem-Project Based Learning (PBL) content and lab-based activities to complete engineering design challenges selected from EbD Courses Exploring Technology, Invention and Innovation, Technological Systems, Foundations of Technology and Engineering, and Technological Design. All units of study will promote the design process, critical thinking and problem-solving through completion of embedded lab activities that support learning content and the application thereof.
Typically Offered: Fall.

TECH 330. Technology and Engineering II. 3 Credits.
This course is designed to provide technology education and STEM content expertise through examination of a myriad of PLTWs curricular challenges. Students will use Activity and Problem Based Learning (APBL) content and lab-based activities to complete engineering design challenges selected from PLTW Gateway Units Design and Modeling, Magic of Electrons, Automation and Robotics, and Flight and Space. All units of study will promote the design process, critical thinking and problem-solving through completion of embedded lab activities that support learning content and the application thereof.
Typically Offered: Spring.

TECH 356. Safety and Management in Technology Education. 3 Credits.
An examination of safety in Technology/STEM and Career and Technical Education (CTE) workspaces including makerspaces, fab labs, STEM labs, and traditional shop settings. This course covers essential understandings related to legal responsibilities, controls for safety, machine safety, as well as hazard mapping and mitigation of the workspace(s) students operate within. By completing all elements of this course prospective teachers will understand the value of a well-documented Technology/STEM and Career and Technical Education (CTE) safety program that both supports student awareness and protects teachers from tort liability.
Typically Offered: Spring.

TECH 371. Technology Systems. 3 Credits.
A focus on content and processes associated with technological systems. Students apply systems thinking, reverse engineering, and other related concepts in projects to better understand systems design, maintenance, and troubleshooting. The course includes a lab component.
Typically Offered: Spring.

TECH 391. Foundations of Technology. 3 Credits.
An exploration of the foundations of technology using the design process. Students learn to innovate and engineer practical solutions. The course includes a lab component.
Typically Offered: Spring.

TECH 394. Independent Study. 1-3 Credits.
Directed reading, study, and/or activities in selected topics.
Typically Offered: On sufficient demand.
Repeatable: Up to 12 Credits.

TECH 399. Special Topics. 1-4 Credits.
Courses not offered in the regular catalog that provide an opportunity to extend student learning.
Typically Offered: On sufficient demand.
Repeatable: Up to 12 Credits.

TECH 416. Innovations in Energy and Power Technologies. 3 Credits.
A foundation of key concepts in energy, power, and electronics. Students develop an understanding of the science of energy and its application in technology; power plant technologies; sustainability; life cycle assessment; and analog and digital circuitry. This course includes embedded lab activities to support learning content and the application thereof.
Typically Offered: Fall.

TECH 421. Computer Science, Programming, and Robotics. 3 Credits.
An introduction to basic computer systems, programming, and logic. Students will learn about computer hardware and general digital functionality of major system components. Students will learn how software used to program computer systems can create new functionality within the same system or additional system components. Students will use new knowledge and understanding to read and create basic coding operations to complete a task or solve a problem in a robotic setting. This course includes embedded lab activities to support learning content and the application thereof.
Typically Offered: Spring.

TECH 456. Intelligent Machines. 3 Credits.
A focus on the structure and integration of artificial intelligence (AI) concepts and components to create an AI system and machine. Students will be required to build varied technological devices that contribute to creating artificial intelligence and machine learning. Through use of electronics, microcontrollers, sensors, and coding students will gain an understanding of digital and analog controls embedded in AI systems and machines. This course includes embedded lab activities to support learning content and the application thereof.
Typically Offered: Fall.

TECH 478. Technology, Society, and Sustainability. 3 Credits.
This course is designed to provide the student with conceptual knowledge and know-how to better assess the impact of technology on society and the environment. It will familiarize students with environmentally friendly consumer products that may lead to a more sustainable future. This course includes embedded lab activities to support learning content and the application thereof.
Typically Offered: Fall.

TECH 491. Senior Portfolio. 1 Credit.
A course to assist the student in developing the digital portfolio used to assess the completion of the program outcomes. The course addresses both technical application and content and allows the student to demonstrate program outcome competencies.
Typically Offered: Fall, Spring, Summer.
Grading: S/U only.

TECH 497. Internship. 3-12 Credits.
An opportunity for students to apply classroom learning to an on-the-job work experience. Internship must be related to the student's major or minor course of study and may be in any geographic location. Credit is granted in the range of three to twelve hours per semester and may be repeated up to a maximum of 12 credit hours. Application and approval through Career Services.
Typically Offered: Fall, Spring, Summer.
Prerequisites: Junior Standing or Senior Standing and cum GPA of 2.50 or higher.
Grading: S/U only.
Repeatable: Up to 12 Credits.

TECH 499. Special Topics. 1-4 Credits.
Courses not offered in the regular catalog that provide an opportunity to extend student learning.
Typically Offered: On sufficient demand.
Repeatable: Up to 12 Credits.