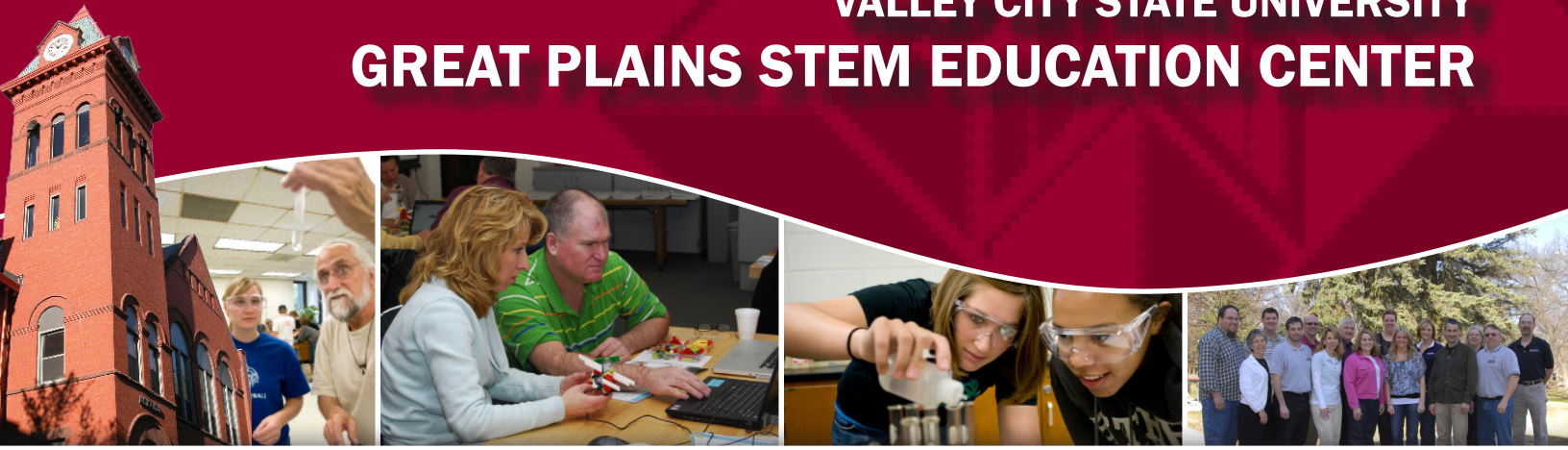


VALLEY CITY STATE UNIVERSITY GREAT PLAINS STEM EDUCATION CENTER



STEM Education Certificate - Undergraduate Offerings

Elementary Education Option:

Required Courses

3 Hours

STEMED 355 STEM CURRICULUM & METHODS for Elementary 3 Hours

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. (Spring)

Electives

9 Hours

STEMED 306 & 306L INVENTIONS & INNOVATIONS – Technology Education for Children 3 Hours

A 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. (Elementary). An opportunity to participate in lab-format activities that support the STEM ED 306 course. (Fall)

STEMED 310 & 310L DESIGN, TECHNOLOGY & ENGINEERING FOR CHILDREN 3 Hours

A course focused including technology, design and the engineering process, as well as methods integrating STEM activities into thematic units in the elementary school curriculum. (Elementary). An opportunity to participate in lab-format activities that support the STEM ED 310 course. (Summer)

STEMED 342 BUILDING MATH 3 Hours

A course focused on the implementation of hands-on transdisciplinary investigations with project-based engineering design activities for middle school students. Algebraic thinking skills are emphasized through the collection and analysis of data to solve real problems as well as analysis and supplementation of available STEM education curricula. (Summer)

Secondary Education Option:

Required Courses

3 Hours

STEMED 411 CURRICULUM & METHODS 3 Hours

Students examine the former Standards for Technological Literacy (STL) and the new Standards for Technological and Engineering Literacy (STEL). Students learn the history and evolution of Technology Education and STEM. STEM classroom teaching methods and management techniques, including the laboratory are studied. (Fall)

Electives

9 Hours

STEMED 331 & 331L INNOVATION & ENGINEERING DESIGN 3 Hours

Prepares prospective teachers to teach a middle school course using engineering design concepts and activities to understand how criteria, constraints, and processes affect designs. Activities include brainstorming, visualizing, modeling, constructing, testing and refining designs. An opportunity to participate in lab-format activities that support the STEM ED 331 course. (Summer)

STEMED 342 BUILDING MATH 3 Hours

A course focused on the implementation of hands-on transdisciplinary investigations with project-based engineering design activities for middle school students. Algebraic thinking skills are emphasized through the collection and analysis of data to solve real problems as well as analysis and supplementation of available STEM education curricula. (Summer)

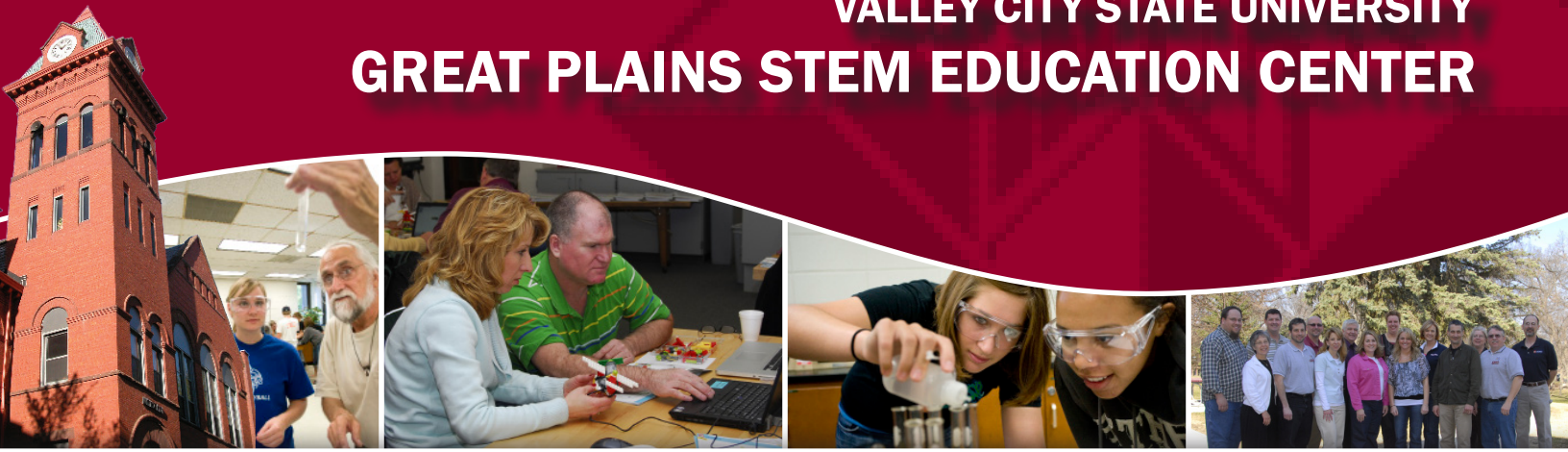
STEMED 431 DESIGN FOR ENGINEERING 3 Hours

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 modeling 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. (Fall)

STEMED 450 ENGINEERING THE FUTURE USING COMPUTATIONAL THINKING 3 Hours

This course is designed to provide an examination of 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. Students practice these skills through programming challenges in the Python programming language. (Spring)

VALLEY CITY STATE UNIVERSITY GREAT PLAINS STEM EDUCATION CENTER



STEM Education Certificate - Graduate Offerings

Elementary Education Option:

Required Courses **3 Hours**
STEM ED 655 **STEM Curriculum and Methods in Elementary** **3 Hours**

An overview for elementary teachers of the evolution, philosophy, methods, character, and purpose of each of the STEM disciplines. The course includes contemporary strategies unique and common among the disciplines such as analysis, modeling, inquiry, design, thematic instruction, team challenges, and practical problem solving. Current forces and trends acting on STEM education will also be explored. The overlay between STEM education and Gifted Education curriculum and methods will be emphasized. (Fall)

Electives **9 Hours**
STEM ED 665 **Invention and Innovation** **3 Hours**

A study of the concepts related to engineering design as well as concepts surrounding inventions and innovations. This course covers the standards, benchmarks, content, and techniques necessary to successfully teach a recommended core course at the middle school Level and utilizes the curriculum concepts from Engineering by Design from the ITEEA. The intersection of STEM and Gifted and Talented standards will be emphasized. (Summer)

STEM ED 670 **Design, Technology, and Engineering for Elementary** **3 Hours**

A course focused on creating standards-based thematic units at the elementary level using the engineering design process and design challenges to integrate science, mathematics and other subject areas. A primary goal of the course is to expand the range of activities implemented in the self-contained elementary classroom, while meeting the specific needs of Gifted and Talented students and fostering technological literacy in all elementary students. (Spring)

STEM ED 671 **Inquiry Based Thematic Instruction** **3 Hours**

A course focused on the use of scientific inquiry, mathematics concepts, the engineering design process, design challenges, and additional subject areas in the implementation of standards-based thematic STEM and Gifted and Talented education units at the elementary level. Emphasis is also placed on evaluating and enhancing available thematic STEM and Gifted and Talented education curricula. (Fall)

STEM ED 680 **Building Math** **3 Hours**

A course focused on hands-on activities that integrate engineering design while developing algebraic thinking skills through the collection and analysis of data used to solve real-world problems. Students will develop the ability to apply math knowledge and concepts to their investigations and use the engineering design process. Suitable for secondary and middle school level teachers; and will provide opportunities to create standards-based materials in STEM for all students, while meeting the specific needs of Gifted and Talented students. (Summer)

Secondary Education Option:

Required Courses **3 Hours**
STEM ED 650 **STEM Curriculum and Methods** **3 Hours**

A thorough review of content standards (Standards for Technological Literacy) and program standards for technology education (Advancing Excellence in Technological Literacy). Opportunities are provided to compare and contrast with the Next Generation Science Standards and the Common Core. The course covers standards-based curriculum development and methods. (Fall)

Electives **9 Hours**
STEM ED 660 **Design for Engineering** **3 Hours**

A study of the concepts related to engineering design, a cornerstone of the standards-based approach to technology education. The course covers the standards, benchmarks, content, and techniques necessary to successfully teach a recommended core course at the secondary level and utilizes the Engineering by Design curriculum developed by the ITEEA. (Fall)

STEM ED 665 **Invention and Innovation** **3 Hours**

A study of the concepts related to engineering design as well as concepts surrounding inventions and innovations. This course covers the standards, benchmarks, content, and techniques necessary to successfully teach a recommended core course at the middle school Level and utilizes the curriculum concepts from Engineering by Design from the ITEEA. The intersection of STEM and Gifted and Talented standards will be emphasized. (Summer)

STEM ED 680 **Building Math** **3 Hours**

A course focused on hands-on activities that integrate engineering design while developing algebraic thinking skills through the collection and analysis of data used to solve real-world problems. Students will develop the ability to apply math knowledge and concepts to their investigations and use the engineering design process. Suitable for secondary and middle school level teachers; and will provide opportunities to create standards-based materials in STEM for all students, while meeting the specific needs of Gifted and Talented students. (Summer)

STEM ED 682 **Engineering the Future** **3 Hours**

A course focused on the use of concepts in physics, mathematics, and the engineering design process while exploring the social, historical and environmental contexts of current and emerging technologies. Suitable for secondary level teachers; and will provide opportunities to plan and create standards-based materials. (Spring)