

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; standards-based education and backward design; integration of content; evolution, philosophy, purpose, methods, and standards of STEM disciplines; and interdisciplinary methods for successfully engaging students and achieving STEM literacy. (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 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**

The study of the history and evolution of technology education from the 19th century to the current standards movement. Methods and management techniques appropriate to the technology education laboratory are studied including the management of student organizations. (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 & 431L DESIGN FOR ENGINEERING **3 Hours**

An orientation and exposure to the careers and challenges of engineering and other STEM fields. Major engineering concepts included are modeling, systems, optimization, technology-society interaction, design and ethics. An opportunity to participate in lab-format activities that support the STEM ED 431 course. (Fall)

STEMED 450 ENGINEERING THE FUTURE **3 Hours**

A course focused on concepts in physics, mathematics, and the engineering design process while exploring the social, historical, and environmental contexts of current and emerging technologies. Students develop a practical understanding of society influence on the development of technology and the importance of technological literacy for everyone. (Spring)

VALLEY CITY STATE UNIVERSITY GREAT PLAINS STEM EDUCATION CENTER



STEM Education Certificate - Graduate Offerings

Elementary Education Option:

Required Courses **3 Hours**
STEMED 655 **STEM CURRICULUM AND METHODS - 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; standards-based education and backward design; integration of content; evolution, philosophy, purpose, methods, and standards of STEM disciplines; and interdisciplinary methods for successfully engaging students and achieving STEM literacy. (Fall)

Electives **9 Hours**
STEMED 665 **INVENTIONS AND INNOVATIONS** **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. (Summer)

STEMED 670 **DESIGN, TECHNOLOGY, AND ENGINEERING FOR CHILDREN** **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 fostering technological literacy in elementary students. (Spring)

STEMED 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 education units at the elementary level. Emphasis is also placed on evaluating and enhancing available thematic STEM education curricula. (Fall)

STEMED 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 (Summer)

Secondary Education Option:

Required Courses **3 Hours**
STEMED 650 **STANDARDS-BASED CURRICULUM & 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**
STEMED 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)

STEMED 665 **INVENTIONS AND INNOVATIONS** **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. (Summer)

STEMED 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 (Summer)

STEMED 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)