

STEM - Science, Technology, Engineering, and Mathematics Education

STEM 102 Step 2 - Inquiry Based STEM Lesson Design (1 Credit Hour)

This course continues the exploration of inquiry-based lesson design in STEM education. In this course, students build upon and practice lesson design skills developed in Step 1 while also becoming familiar with exemplary mathematics or science curricula at the middle school level. With the guidance of the master teacher, students engage in one observation and prepare and teach three inquiry-based lessons in a middle school classroom. Students incorporate and demonstrate their content knowledge in developing the inquiry-based lessons. At the end of Step 2, students are generally ready to make a decision about whether they want to pursue a pathway to teacher licensure through the MonarchTeach program.

Prerequisites: a grade of C or higher in STEM 101

STEM 103 Foundations of STEM Teaching: An Inquiry-Based Approach (2 Credit Hours)

In this introductory STEM teacher preparation course, students delve into the 5-E Model of inquiry-based lesson design within real classroom settings. Guided by mentors and experienced master teachers, students actively engage in authentic hands-on experiences in elementary and middle school classes. Throughout the course, they develop essential skills in effective lesson design, questioning strategies, and the integration of educational technologies. Students are also introduced to mathematics or science curricula, with a focus on developing pre- and post-assessment instruments, analyzing student work, and honing classroom management skills.

STEM 110T Technology and Your World (3 Credit Hours)

An overview of the resources and systems of technology. Emphasis is on impacts that technology has on individuals and their careers. Activities explore the evolution of technology, its major systems and their impact on individuals and their careers.

STEM 201 Knowing and Learning in STEM Education (3 Credit Hours)

This course is designed to expand the students' understanding of current theories of learning and conceptual development in STEM. Students will investigate theories of knowing and learning in STEM and implications for teaching secondary mathematics and science. Students will examine their own assumptions about learning as well as critically examine the needs of a diverse student population in the classroom. Students are expected to independently register for and take the Praxis I examination while enrolled in this course.

Pre- or corequisite: STEM 101 or STEM 102 or STEM 103

STEM 202 Classroom Interactions in STEM Education (3 Credit Hours)

This course provides students with an overview of principles for teaching middle and secondary school mathematics or science through an exploration of the role of content, pedagogy, curriculum and technology as they promote learning and impact equity. Students are introduced to ways in which curriculum and technology are used in the classroom to build interrelationships among teachers and students. Frameworks for teaching students of diverse backgrounds equitably are emphasized in the course. A field component that consists of observations and teaching in the high school classroom is included.

Prerequisites: grade of C or better in STEM 101 and STEM 102, or a C or better in STEM 103

Pre- or corequisite: STEM 201

STEM 221 Industrial Materials (3 Credit Hours)

A study of materials used by industry to produce products. Emphasis is on the study of ceramics, plastics, composites, and biotechnological materials. Students learn materials identification, use and processing.

STEM 231 Materials and Processes Technology (3 Credit Hours)

A study of the production processes used with metallic and forest product materials. Industrial resources, their location, extraction, and processing into standard stocks are also covered. Students learn properties, uses and processing of metal and wood materials.

STEM 241 Energy Systems: Basic Electricity (3 Credit Hours)

A study of direct and alternating current and its use in contemporary technology. Activities include experiments and projects to supplement the theory of electricity.

STEM 242 Technological Systems Control (3 Credit Hours)

Students will develop an understanding of systems control technology for application to energy and power, manufacturing, processing and transportation systems. Emphasis will be placed on research and development, creativity and experimentation, and trouble shooting in designing control systems.

STEM 251G Computer Literacy: Communication and Information (3 Credit Hours)

A guided review of communication technology and information sources to help students discern between reliable and unreliable sources and techniques. Students develop skills in computer applications, information retrieval, filtering and analyzing data, and formatting and presenting information.

STEM 320 Manufacturing and Construction Technology (3 Credit Hours)

A study of production processes used in manufacturing and construction systems. Students will research and design manufactured products for mass production and constructed products for building. The social, cultural, environmental and economic impacts of manufacturing and constructed products on society are discussed.

Prerequisites: STEM 221, STEM 231 or permission of instructor

STEM 321 Manufacturing Technology (3 Credit Hours)

A study of the production processes used in manufacturing systems. Emphasis is placed upon planning, organizing and principles of manufacturing. Students research and design enterprise systems for mass production. Emphasis is on manufacturing design requirements and the social, cultural, and economic impacts of manufactured products on society and the environment.

Prerequisites: STEM 221, STEM 231 or permission of instructor

STEM 330 Medical, Agricultural, and Biological Technologies (3 Credit Hours)

A course for technology education majors that studies technological systems related to medical and food processing technologies. Students learn the basis of these technologies and complete activities that integrate the content with processes and products found in our technological world.

Prerequisites: junior standing or permission of department

STEM 350 Communication Technology Processes (3 Credit Hours)

The study of communication design principles and techniques for technology education. Emphasis is placed on the skills and equipment used in design, production, and distribution of communications. Print and electronic media are explored through technical illustration, video, audio, and other specialty processes of communications.

Prerequisites: STEM 251G

STEM 351 Communication Technology (3 Credit Hours)

A study of the development and impact of communication technology. Emphasis is placed on the integration of technical skills to produce information-based products such as print and telecommunications media.

Prerequisites: junior standing or permission of the instructor

STEM 360 Energy, Power, and Transportation Technologies (3 Credit Hours)

Study of the development of energy, power, and transportation systems and the movement of energy, power, people, and cargo. Areas of concern include vehicle systems design and support systems.

Prerequisites: junior standing or permission of the instructor

STEM 365 Safety and OSHA Certification (3 Credit Hours)

This course introduces safety programs used in the workplace and to increase the safety environment at work. The course covers four key topics: preliminary hazard analysis, failure modes and effects analysis, and OSHA hazard analysis and safety review requirements, which leads to an OSHA 10 Certificate.

Prerequisites: Junior status

STEM 367 Cooperative Education (1-3 Credit Hours)

Available for pass/fail grading only. Student participation for credit based on the academic relevance of the work experience, criteria, and evaluative procedures as formally determined by the department and the Cooperative Education program prior to the semester in which the work experience is to take place.

Prerequisites: approval by the department and Career Development Services, in accordance with the policy for granting credit for Cooperative Education programs

STEM 370T Technology and Society (3 Credit Hours)

A multidisciplinary course designed to provide insight into the fundamental, historical, and contemporary nature of technology as an area of human knowledge. Attention is given to the positive and negative aspects of technology and how they affect society. (This is a writing intensive course.)

Prerequisites: grade of C or better in ENGL 211C or ENGL 221C or ENGL 231C; junior standing or permission of the instructor

STEM 382 Industrial Design (3 Credit Hours)

Students will analyze and design products representative of today's industrial technological society. Emphasis will be placed upon design methodology, aesthetic value, and design thinking.

Prerequisites: junior standing

STEM 401 Project Based Instruction in STEM Education (3 Credit Hours)

Through a dynamic process of investigation and collaboration, students aim to master techniques for project-based investigations in STEM classrooms, and teach project-based lessons in the secondary classroom. Students work in teams to formulate questions, make predictions, design investigations, collect and analyze data, make products and share ideas. The use of assessments to improve student learning is emphasized in the course. This course includes a field component that consists of two observation days and three teaching days in a secondary classroom.

Prerequisites: STEM 201 and STEM 202

STEM 402 Perspectives on STEM (3 Credit Hours)

This course explores the historical, social, and philosophical implications of mathematics and science through investigations of significant episodes in their history. Students are brought to understand that science and mathematics are not merely body of facts, theories, and techniques but involve diverse processes by which they are continually generated and reformulated.

Prerequisites: Junior standing, admission to the MonarchTeach program plus 12 credit hours of science or math courses, and STEM 401

Pre- or corequisite: STEM 485

STEM 433/533 Developing Instructional Strategies PreK-6: Mathematics (3 Credit Hours)

Following a theory into practice philosophy, students explore, develop, and use instructional strategies, materials, technologies, and activities to promote children's development of attitudes, behaviors, and concepts in mathematics in grades PreK-6 in support of NCTM national instructional standards and the Virginia Standards of Learning.

Prerequisites: MATH 102M, MATH 302, TLED 326, and Junior standing

STEM 434/534 Developing Instructional Strategies PreK-6: Science (3 Credit Hours)

Following a theory into practice philosophy, students explore, develop, and use instructional strategies, materials, technologies, and activities to promote children's development of attitudes, behaviors, and concepts in science in grades PreK-6 in support of AAAS national instructional standards and the Virginia Standards of Learning.

Prerequisites: TLED 326 and Junior standing

STEM 485 Apprentice Teaching (9 Credit Hours)

Internship in school. Available for pass/fail grading only. Offers prospective teacher candidates a culminating experience that provides them with the tools needed for their first teaching jobs. Students are immersed in a local secondary school for 10 consecutive weeks and experience the expectations, processes, and rewards of teaching. As part of their Apprentice Teaching experience, candidates will be required to attend a one hour weekly seminar that will bring them together with master teachers to share experiences and to explore issues, problems, concerns, and processes related to their teaching experiences and to entering the profession of teaching.

Prerequisites: Completion of all course work in the MonarchTeach professional development sequence program and BIOL 468W or CHEM 468 or OEAS 468W or PHYS 468W or SCI 468, passing scores on PRAXIS I or equivalent SAT or ACT scores as established by VA Board of Education, passing scores on the appropriate PRAXIS II content examination and the Virginia Communication and Literacy Assessment, departmental approval, minimum major and overall GPA of at least 2.75 and a criminal background check

Corequisites: STEM 402

STEM 495/595 Topics (1-3 Credit Hours)

The advanced study of selected topics designed to permit small groups of qualified students to work on subjects of mutual interest which, due to their specialized nature, may not be offered regularly. These courses will appear in the course schedule.

Prerequisites: permission of the instructor

STEM 533 Developing Instructional Strategies PreK-6: Mathematics (3 Credit Hours)

Following a theory into practice philosophy, students explore, develop, and use instructional strategies, materials, technologies, and activities to promote children's development of attitudes, behaviors, and concepts in mathematics in grades PreK-6 in support of NCTM national instructional standards and the Virginia Standards of Learning.

Prerequisites: TLED 617

STEM 534 Developing Instructional Strategies PreK-6: Science (3 Credit Hours)

Following a theory into practice philosophy, students explore, develop, and use instructional strategies, materials, technologies, and activities to promote children's development of attitudes, behaviors, and concepts in science in grades PreK-6 in support of AAAS national instructional standards and the Virginia Standards of Learning.

STEM 595 Topics (1-3 Credit Hours)

The advanced study of selected topics designed to permit small groups of qualified students to work on subjects of mutual interest which, due to their specialized nature, may not be offered regularly. These courses will appear in the course schedule.

STEM 655 Culturally Responsive Classroom (3 Credit Hours)

This course will focus on the following elements of effective teaching practice: understanding discipline specific content and methods, employing best-practice strategies to teach discipline specific skills and concepts, assessing student learning, legal and safety issues, use of technology, issues of diversity, engagement with the community, and strategies for continuing to grow as a teacher and learner.

STEM 720 STEM Educational Foundations (3 Credit Hours)

A multidisciplinary course designed to provide insights about the fundamental concepts and basis for STEM education programs. Standards for the school subjects of science, technology, engineering education and mathematics literacy will be reviewed. Connections between these subjects will be explored.

STEM 721 Science, Technology, Engineering, and Mathematics Connection and Integration (3 Credit Hours)

A course designed to teach how to plan integrated STEM curriculum and instructional materials. A review of projects that have undertaken STEM integration will be made. Students will learn how to map STEM content and then design STEM integrated curriculum and instructional materials.

Prerequisites: STEM 720 or STEM 820

STEM 730 Introduction to Technology (3 Credit Hours)

Order and structure the discipline of technology by identifying and analyzing the component parts and examining technical means as critical variables in the affairs of humankind. Based on the Standards for Technological Literacy.

STEM 731 Technical Systems (3 Credit Hours)

Analyze the technical concepts common and unique to the technical systems of technology.

STEM 732 Program Development for Technology Education (3 Credit Hours)

Plan and develop effective program in technology related activities. Focus is on identification and development of resources, activities, and materials for classroom programs.

STEM 795 Topics (1-3 Credit Hours)

Topics.

STEM 820 STEM Educational Foundations (3 Credit Hours)

A multidisciplinary course designed to provide insights about the fundamental concepts and basis for STEM education programs. Standards for the school subjects of science, technology, engineering education and mathematics literacy will be reviewed. Connections between these subjects will be explored.

STEM 821 Science, Technology, Engineering, and Mathematics Connection and Integration (3 Credit Hours)

A course designed to teach how to plan integrated STEM curriculum and instructional materials. A review of projects that have undertaken STEM integration will be made. Students will learn how to map STEM content and then design STEM integrated curriculum and instructional materials.

Prerequisites: STEM 720 or STEM 820

STEM 830 Introduction to Technology (3 Credit Hours)

Order and structure the discipline of technology by identifying and analyzing the component parts and examining technical means as critical variables in the affairs of humankind. Based on the Standards for Technological Literacy.

STEM 831 Technical Systems (3 Credit Hours)

Analyze the technical concepts common and unique to the technical systems of technology.

STEM 832 Program Development for Technology Education (3 Credit Hours)

Plan and develop effective program in technology related activities. Focus is on identification and development of resources, activities, and materials for classroom programs.

STEM 895 Topics (3 Credit Hours)

Topics.