Continuing Education
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STEM-900: Inspire STEM Learning

Independent Study Online Course Syllabus

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Course Description

STEM is an interdisciplinary approach to teaching and learning that integrates science, technology, engineering, and mathematics to help students make sense of the world around them. Rather than introducing these subjects in isolation, STEM learning invites students to investigate real-world problems, ask meaningful questions, design solutions, and think critically across disciplines. At its core, STEM emphasizes creativity, collaboration, and problem solving, preparing students to apply knowledge in authentic contexts.

In this course, you will:

- discover the research and rationale behind STEM education and why it matters for today's learners.
- explore three unique approaches to integrating STEM disciplines.
- apply five guiding principles of effective STEM instruction.
- enhance STEM investigations through collaborative project-based learning.
- gain tools for classroom management, assessment, and project sharing
- network with a wider teaching community as you share and evaluate research, resources, lessons, and strategies.

You'll walk away with ready-to-use STEM lesson plans, an expanded bank of high-quality resources, authentic assessment tools, a clear framework for interdisciplinary instruction, and greater confidence in implementation. All activities are aligned with the Common Core State Standards and Next Generation Science Standards. This course may be taken with or without students

Note: Required book must be acquired separately.

Required Texts and Course Materials

Book: Vasquez, J., Sneider, C., & Comer, M. (2013). *STEM Lesson Essentials: Integrating Science, Technology, Engineering, and Mathematics*. ISBN-13: 978-0325043586
https://www.amazon.com/STEM-Lesson-Essentials-Grades-3-8/dp/0325043582

Canvas: This course will be delivered totally online. Canvas is a web-based learning management system (LMS) that provides students access to online resources, documents, videos, assignments, quizzes, forums, etc. Canvas is easy to learn and has a user-friendly interface.

Online Resources: Relevant online resources that support the course content and encourage further investigation will be available throughout the course assignments. Active hyperlinks are utilized throughout the course and will link to the appropriate information when clicked. These include videos, resource banks, online activities, journal articles and other resources.

Course Dates

Self-paced; students may enroll at any time and take up to one year, from the date of registration, to complete assignments. Students may complete assignments in no less than three weeks for a 3-unit course (one week per unit).

National Standards Addressed in This Course

National Board for Professional Teaching Standards (NBPTS)
(http://www.nbpts.org/standards-five-core-propositions/)

First published in 1989 and updated in 2016, *What Teachers Should Know and Be Able to Do* articulates the National Board's Five Core Propositions for teaching. The Five Core Propositions - comparable to medicine's Hippocratic Oath — set forth the profession's vision for accomplished teaching. Together, the propositions form the basis of all National Board Standards and the foundation for National Board Certification. Course assignments have been designed so students can demonstrate excellence against these professional teaching standards whenever possible.

- Proposition 1: Teachers are committed to students and their learning
- Proposition 2: Teachers know the subject they teach and how to teach those subjects to students
- Proposition 3: Teachers are responsible for managing and monitoring student learning
- Proposition 4: Teachers think systematically about their practice and learn from experience
- Proposition 5: Teachers are members of learning communities

ISTE Standards:
http://www.iste.org/standards/ISTE-standards/standards-for-teachers

Next Generation Science Standards:
http://www.nextgenscience.org/next-generation-science-standards

Common Core Standards for Mathematics
http://www.corestandards.org/the-standards/mathematics

Common Core Standards for Mathematical Practice
http://www.corestandards.org/Math/Practice/

Common Core Standards for English Language Arts
http://www.corestandards.org/ELA-Literacy

Continuing Education Student Learning Outcomes (CE-SLO)

CE-SLO 1	Demonstrate proficient written communication by articulating a clear focus, synthesizing arguments, and utilizing standard formats in order to inform and persuade others, and present information applicable to targeted use.
CE-SLO 2	Demonstrate comprehension of content-specific knowledge and the ability to apply it in theoretical, personal, professional, or societal contexts.
CE-SLO 3	Reflect on their personal and professional growth and provide evidence of how such reflection is utilized to manage personal and professional improvement.
CE-SLO 4	Apply critical thinking competencies by generating probing questions, recognizing underlying assumptions, interpreting and evaluating relevant information, and applying their understandings to the professional setting.
CE-SLO 5	Reflect on values that inspire high standards of professional and ethical behavior as they pursue excellence in applying new learning to their chosen field.
CE-SLO 6	Identify information needed in order to fully understand a topic or task, organize that information, identify the best sources of information for a given enquiry, locate and critically evaluate sources, and accurately and effectively share that information.

Course Student Learning Outcomes (C-SLO)

Student Learning Outcomes for This Course By the end of this course the student will be able to:		**National Standards Addressed***	**CE-SLO Addressed****
C-SLO 1	Design rigorous, interdisciplinary STEM learning experiences aligned to Common Core State Standards and Next Generation Science Standards that promote student curiosity, creativity, and real-world problem solving.	NBPTS 1, 2	CE 2, 4, 6
C-SLO 2	Reflect systematically on current instructional practices and evaluate how STEM integration enhances student learning.	NBPTS 1, 3, 4	CE 3, 4, 5
C-SLO 3	Analyze STEM guiding principles, research, and best practices, and communicate their application through professional written responses, discussions, and lesson planning.	NBPTS 2, 3	CE 1, 2, 6
C-SLO 4	Apply integrated STEM approaches, including project-based learning and inquiry-based strategies, to develop instruction that fosters critical thinking and collaboration.	NBPTS 2, 5	CE 2, 4, 6
C-SLO 5	Develop authentic assessment strategies to monitor and evaluate student learning within STEM contexts.	NBPTS 3, 4	CE 1, 4

C-SLO 6	Plan, implement, and reflect on an integrated STEM lesson, incorporating peer feedback and professional collaboration.	NBPTS 3, 4, 5	CE 3, 4, 5

* Please refer to the section on **National Standards Addressed in This Course**
** Please refer to the section on **Continuing Education Student Learning Outcomes**

Topics, Assignments, and Activities

Module Title	Module Assignments and Activities	Points Possible
Home Page	• Welcome Video • Course Syllabus • Policies and Procedures	
Module 1 – Getting Started	• Introductions and goals for class. • 1.1 Submit Orientation • 1.2 Class Introductions	4, 4
Module 2 – What is STEM?	• How can I tell if a lesson is really a STEM lesson? • What is STEM literacy and why is it important? • What is a useful definition of STEM? • What are the three main flavors of STEM? • What are some examples of STEM lessons? • 2.1 STEM Notes Ch. 1-2 • 2.2 How will STEM principles enhance instruction?	10, 4
Module 3 – Research and Rationale	• Explore the rationale for incorporating STEM lessons in your classroom. • 3.1 How are STEM learning opportunities different?	4
Module 4 – STEM Guiding Principles	• Reflect on STEM guiding principles. • 4.1 STEM Notes Ch. 3-4 • 4.2 How will you use Guiding Principles?	10, 4
Module 5 – STEM Practices	• Explore connections to standards. • Consider application to current curriculum. • 5.1 STEM Notes Ch. 5-6 • 5.2 Presenting STEM practices	10, 4
Module 6 – Three Approaches to Integrated STEM	• Discover three approaches to integrated STEM teaching. • 6.1 STEM Notes Ch. 8 • 6.2 How do you use the three approaches to integrated STEM?	10, 4
Module 7 – Classroom examples	• Analyze video and text peer STEM lessons. Reflect on vignettes and analyze STEM approaches. • 7.1 Reflecting on a Lesson	4
Module 8 – PBL and Assessment	• Explore models of project-based learning and assessment. • 8.1 PBL Strategies	10
Module 9 – Resources and Sample Activities	• Explore and evaluate online STEM resources and activities. Network with online community via forum postings. • 9.1 STEM Resource Evaluations	4

Module Title	Module Assignments and Activities	Points Possible
Module 10 – Lesson Planning and Implementation	• Plan and implement effective integrated STEM lesson. Participate in peer lesson review. Reflect on lesson implementation and assessment. • 10.1 Lesson Plan and Reflection • 10.2 Sharing Your Lesson Plan	20, 4
Module 11 – Reflection	• Develop a checklist or create presentation • 11.1 Final Reflection	20
Course Wrap-up – Grading and Evaluation	• Course Evaluation • Course Completion Checklist • Grade Request / Transcript Request	
	TOTAL POINTS	**130 points**

Grading Policies, Rubrics, and Requirements for Assignments

Grading Policies

- Assignments will be graded per criteria presented in the course rubrics.
- A = 90-100% and B = 80-89%, (anything below 80% will not receive credit.)
- The discernment between an A or a B letter grade is at the discretion of the instructor based on the quality of work submitted (see course rubrics).
- Coursework falling below a B grade will be returned with further instructions.
- All assignments must be completed to receive a grade and are expected to reflect the quality that teacher-training institutions require of professional educators. If completed assignments do not meet this standard, students will be notified with further instructions from the instructor.

Grading Rubrics

Grade	Percent	Description	Rubric
A	90-100%	Excellent	Meets all course / assignment requirements with significant evidence of subject mastery and demonstration of excellent graduate level professional development scholarship.
B	80-89%	Very Good	Adequately meets criteria for all course/assignment requirements - demonstrates subject competency with very good graduate level professional development scholarship.
NC	Below 80%	Unacceptable	Does not meet the minimum criteria for all course/assignment requirements and demonstrated little, if any, evidence of acceptable graduate level professional development scholarship.

Writing Requirements

- **Superior:** Writing is clear, succinct, and reflects graduate level expectations. Clearly addresses all parts of the writing task. Maintains a consistent point of view and organizational structure. Includes relevant facts, details, and explanations.

- **Standard:** Writing is acceptable with very few mistakes in grammar and spelling. Addresses most parts of the writing task. Maintains a mostly consistent point of view and organizational structure. Includes mostly relevant facts, details, and explanations.
- **Sub-standard:** Writing contains noticeable mistakes in grammar and spelling. Does not address all parts of the writing task. Lacks a consistent point of view and organizational structure. May include marginally relevant facts, details, and explanations.

Lesson Plan Requirements

- **Superior:** Instructional goals and objectives clearly stated. Instructional strategies appropriate for learning outcome(s). Method for assessing student learning and evaluating instruction is clearly delineated and authentic. All materials necessary for student and teacher to complete lesson clearly listed.
- **Standard:** Instructional goals and objectives are stated but are not easy to understand. Some instructional strategies are appropriate for learning outcome(s). Method for assessing student learning and evaluating instruction is present. Most materials necessary for student and teacher to complete lesson are listed.
- **Sub-standard:** Instructional goals and objectives are not stated. Learners cannot tell what is expected of them. Instructional strategies are missing or strategies used are inappropriate. Method for assessing student learning and evaluating instruction is missing. Materials necessary for student and teacher to complete lesson are missing.

Instructor/Student Contact Information

Throughout the course participants will be communicating with the instructor and their classmates on a regular basis using asynchronous discussion forums. Students are provided with instructor contact information in the event they want to make email or phone contact. In addition, students are encouraged to email or phone the instructor at any time. Students will also receive feedback on the required assignments as they are submitted.

Forums

Participation is an important expectation of this course and all online courses. Online discussions promote reflection and analysis while allowing students to appreciate and evaluate positions that others express. While students may not be engaging with the same students throughout this course, they will be expected to offer comments, questions, and replies to the discussion question whenever possible. The faculty role in the discussion forum is that of an observer and facilitator.

Coursework Hours

Based on the Carnegie Unit standard, a unit of graduate credit measures academic credit based on the number of hours the student is engaged in learning. This includes all time spent on the course: reading the textbook, watching videos, listening to audio lessons, researching topics, writing papers, creating projects, developing lesson plans, posting to discussion boards, etc. Coursework offered for FPU Continuing Education graduate credit adheres to 45 hours per semester unit for the 900-level courses. Therefore, a student will spend approximately 135 hours on a typical 3-unit course.

Services for Students with Disabilities

Students with disabilities are eligible for reasonable accommodations in their academic work in all classes. In order to receive assistance, the student with a disability must provide the Academic Support Center with documentation, which describes the specific disability. The documentation must be from a qualified professional in the area of the disability (i.e. psychologist, physician or educational diagnostician). Once documentation is on file, arrangements for reasonable accommodations can be made. For more information and for downloadable forms, please go to https://www.fresno.edu/departments/disability-access-education.

Plagiarism and Academic Honesty

All people participating in the educational process at Fresno Pacific University are expected to pursue honesty and integrity in all aspects of their academic work. Academic dishonesty, including plagiarism, will be handled per the procedures set forth in the Fresno Pacific University Catalogue and Handbook - https://handbook.fresno.edu/graduate/academic-policies

Technology Requirements

To successfully complete the course requirements, course participants will need Internet access, can send and receive email, know how to manage simple files in a word processing program, and have a basic understanding of the Internet. Please remember that the instructor is not able to offer technical support. If you need technical support, please contact your Internet Service Provider.

Getting Help with Canvas: If you need help with Canvas, please contact the FPU Help Desk by phone: (559) 453-3410 or email: helpdesk@fresno.edu. Help is available Mon-Fri 8:00 am to 7:00 pm.

Final Course Grade and Transcripts

When all work for the course has been completed, students will need to logon to the Continuing Education website (https://ce.fresno.edu/my-account) and "Request Final Grade". Once the instructor receives the requests and submits the grade online, students may log back in to view their Final Grade Report or order transcripts online. Please allow at least two weeks for the final grade to be posted. For more information, see the Continuing Education Policies and Procedures at https://ce.fresno.edu/ce-policies-and-procedures.

University Policies and Procedures

Students are responsible for becoming familiar with the information presented in the Academic Catalog and for knowing and observing all policies and procedures related to their participation in the university community. A summary of university policies may be found on the university website at https://www.fresno.edu/departments/registrars-office/academic-catalogs.

Fresno Pacific University Student Learning Outcomes (FPU-SLO)

FPU-SLO 1	**Oral Communication:** Students will *exhibit* clear, engaging, and confident oral communication – in both individual and group settings – and will critically *evaluate* content and delivery components.

FPU-SLO 2	**Written Communication:** Students will *demonstrate* proficient written communication by *articulating* a clear focus, *synthesizing* arguments, and utilizing standard formats in order to *inform* and *persuade* others.
FPU-SLO 3	**Content Knowledge:** Students will *demonstrate* comprehension of content-specific knowledge and the ability to apply it in theoretical, personal, professional, or societal contexts.
FPU-SLO 4	**Reflection**: Students will *reflect* on their personal and professional growth and *provide evidence* of how such reflection is utilized to manage personal and vocational improvement.
FPU-SLO 5	**Critical Thinking:** Students will *apply* critical thinking competencies by *generating* probing questions, *recognizing* underlying assumptions, *interpreting* and *evaluating* relevant information, and *applying* their understandings to new situations.
FPU-SLO 6	**Moral Reasoning:** Students will *identify* and *apply* moral reasoning and ethical decision-making skills, and *articulate* the norms and principles underlying a Christian worldview.
FPU-SLO 7	**Service**: Students will *demonstrate* service and reconciliation as a way of leadership.
FPU-SLO 8	**Cultural and Global Perspective:** Students will *identify* personal, cultural, and global perspectives and will employ these perspectives to *evaluate* complex systems.
FPU-SLO 9	**Quantitative Reasoning**: Students will accurately *compute* calculations and symbolic operations and *explain* their use in a field of study.
FPU-SLO 10	**Information Literacy:** Students will *identify* information needed in order to fully understand a topic or task, *explain* how that information is organized, *identify* the best sources of information for a given enquiry, *locate* and critically *evaluate* sources, and accurately and effectively *share* that information.