Continuing Education
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STEM 904 - Teaching Robotics: An Introduction

Independent Study Online Course Syllabus

Instructor: Paul Reimer **Phone Number:** (559) 916-1314 **Email:** paulreimer@me.com **Website:** www.reimermath.com	**Number of Graduate Semester Units:** 3 **Target Audience:** PK - 12th grade teachers **Course Access:** ce-connect.fresno.edu

Course Description

This course will help teachers and students harness the power of app-enabled robots to learn the basic principles of programming and robotics. Based on their grade level, participants in this course will explore robots that help bring coding to life in the classroom. Course activities will focus on familiarizing participants with robotics tools, developing classroom practices that enhance students' coding skills, and collaborating with colleagues to support implementation efforts. Drawing from key principles of computer science, this course will provide teachers with the knowledge and tools necessary to engage students in powerful STEM learning experiences. All of the readings and activities included in this course support the Common Core Mathematics Content and Practice Standards, the Next Generation Science Standards (NGSS), and the ISTE Standards for Computer Science Educators.

Required Texts and Course Materials

Several research-based journal articles are used with permission and available in pdf format in the course management system. Additional materials will include a variety online videos and web-based 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 (one week per credit), to complete the course.

National Standards Addressed in This Course

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

- Counting & Cardinality
- Operations & Algebraic Thinking
- Number & Operations in Base Ten

- Number & Operations—Fractions
- Measurement & Data
- Geometry
- Ratios & Proportional Relationships
- The Number System
- Expressions & Equations
- Functions
- Statistics & Probability

Common Core Standards for Mathematical Practice - http://www.corestandards.org/Math/Practice/
- Standard 1: Make sense of problems and persevere in solving them
- Standard 2: Reason abstractly and quantitatively
- Standard 3: Construct viable arguments and critique the reasoning of others
- Standard 4: Model with mathematics
- Standard 5: Use appropriate tools strategically
- Standard 6: Attend to precision
- Standard 7: Look for and make use of structure
- Standard 8: Look for and express regularity in repeated reasoning

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 English Language Arts - http://www.corestandards.org/ELA-Literacy/
- Anchor Standards
- Reading: Literature
- Reading: Informational Text
- Reading: Foundational Skills
- Writing
- Speaking & Listening
- Language
- Range, Quality, & Complexity
- Literacy in Science & Technical Subjects

National Board for Professional Teaching Standards - http://www.nbpts.org/five-core-propositions
- Proposition 1: Teachers are committed to students and their learning.
- Proposition 2: Teachers know the subjects 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.

Continuing Education Program Student Learning Outcomes

CE 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 2	Demonstrate comprehension of content-specific knowledge and the ability to apply it in theoretical, personal, professional, or societal contexts.
CE 3	Reflect on their personal and professional growth and provide evidence of how such reflection is utilized to manage personal and professional improvement.
CE 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 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 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.

Student Learning Outcomes (SLOs) for This Course

Student Learning Outcomes for This Course By the end of this course student will be able to:	**National Standards Addressed in This Course***	**Continuing Education Program Student Learning Outcomes Addressed****
1. Demonstrate through written reflection an understanding of current research and policy that supports the integration of robotics into current Common Core, ISTE, and STEM standards.	NBPTS Prop. 1, 2	CE 1, CE 2, CE 4, CE 6
2. Demonstrate effective use of tools, resources, and pedagogies that support implementation of robotics lessons in the classroom.	NBPTS Prop. 2, 4	CE 2, CE 4, CE 6
3. Analyze, design, facilitate, and reflect on robotics lessons.	NBPTS Prop. 2, 3, 4, 5	CE 2, CE 3, CE 4, CE 6
4. Collaborate with teaching peers and online colleagues to share insights and deepen their professional practice.	NBPTS Prop. 1,2,4, 5	CE 1, CE 3, CE 4, CE 5, CE 6

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

Evidence of Learning

1. Student demonstrated critical thinking and thoughtful engagement with the course objectives through reflective written assignments.

2. Student applied new learning to teaching practice through thoughtful lesson design and reflection.
3. Student identified and evaluated key strategies and made appropriate connections to state/local standards and teaching in general.
4. Student created original lessons and demonstrated effective implementation of lesson planning and teaching.
5. Student interacted thoughtfully with online colleagues and contributed productively to online forum discussions, peer lesson review, and collaborative assignments.

Topics, Assignments, and Activities

Module Title	Module Assignments and Activities	Points Possible for Each Assignment	Estimated Time to Complete Activity
Welcome Module			
Module 1 – Orientation and Introductions	Introductions and goals for class.	8 pts	5 hrs
Module 2 – About Robotics	Reflect on historical development of robotics and current applications and benefits. Watch video, read topic articles, write reflection, and participate in forum discussions.	8 pts	10 hrs
Module 3– Research and Rationale	Research the rationale for integrating robotics into classroom instruction. Explore connections to relevant standards and STEM learning. Read articles and watch videos provided in this topic then participate in forum discussions.	4 pts	10 hrs
Module 4 – The Tools of Robotics	Explore practical robotics tools then participate in a Google+ community collaboration.	4 pts	20 hrs
Module 5 – Robotics Lesson Resources	Examine resources for robotics lesson implementation. Evaluate online lessons in forum postings and discussions.	4 pts	20 hrs

Module Title	Module Assignments and Activities	Points Possible for Each Assignment	Estimated Time to Complete Activity
Module 6 – Peer Tips and Techniques	Observe video peer lessons. Reflect on vignettes and analyze approaches to classroom applications. Gather tools for assessment, student collaboration, and teacher facilitation. Create and share a graphic organizer.	4 pts	20 hrs
Module 7 – Lesson Design and Implementation	Design lessons relevant for your grade level. Conduct lessons with your class and reflect. Connect with online robotics community. Participate in peer lesson review.	28 pts	30 hrs
Module 8 – Further Exploration	Explore additional online robotics networks. Articulate plan for next steps, goals, and continued collaboration.	4 pts	10 hrs
Module 9 – Final Reflection	Develop a checklist, create presentation, reflective conversation with colleague	10 pts	10 hrs
	TOTAL POINTS / HOURS	**74 pts**	**135 hours**

Grading Policies and Rubrics for Assignments

- Each assignment is graded on a 4 point or 10 point Assessing Rubric. Assignment totals will be averaged for a final grade upon completion of the course. Please view the assignment rubrics in the next section for detailed expectations for quality of work.
- Students must earn a minimum of 80% to received credit
- A = 90-100%, B = 80-89%, (anything below 80% will not receive credit.)
- Grading policies:
  - The discernment between an A or a B is at the discretion of the instructor based on the quality of work submitted (see assignment rubrics).
  - Coursework falling short of a quality equaling a B or a Credit Grade will be returned with further instructions.
  - All assignments must be completed in order to receive a grade. In addition, all assignments 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.
- Assignment Rubric:

- Written assignments and papers need to follow APA formatting (1" margins, Times New Roman font - size 12, double spaced; centered title, student first and last name on paper. Instructors may add additional APA writing requirements as needed.) Details regarding quality of assignment expectations are provided in the assignment rubric found in the course management system.

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). Students with disabilities should contact the Academic Support Center to discuss academic and other needs as soon as they are diagnosed with a disability. 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/students/academic-support/services-students-disabilities.

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 - https://www.fresno.edu/students/registrars-office/academic-catalogs

Discussion 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.

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.

Moodle:
This course will be delivered totally online. Moodle is a learning management system that provides students access to online resources, documents, graded assignments, quizzes, discussion forums, etc. with an easy to learn and use interface. To learn more about Moodle, go to: (https://docs.moodle.org/30/en/Student_FAQ). There are some student tutorials on the Center for Online Learning website at Fresno Pacific University – http://col.fresno.edu/student.

Moodle Site Login and Passwords – (or other online course access information):
Students will need to have internet access to log onto https://ce-connect.fresno.edu. The username and password numbers for Moodle access will be sent to you by the university using the email address you submitted at the time of registration. The instructor will then contact you with a welcome letter and login instructions. If you need help with the username and password recovery, please contact the Center for Professional Development at (800) 372-5505 or (559) 453-2000 during regular office hours - Mon-Fri 8:00 am to 5:00 pm. or email prof.dev@fresno.edu.

Getting Help with Moodle:
If you need help with Moodle, please contact the Center for Online Learning (COL), by telephone or the website. Help by phone (559) 453-3460) is available Mon-Thurs 8:00 am to 8:00 pm and on Fridays from 8:00 am to 5:00 pm, or by filling out a "Request Services" form at http://col.fresno.edu/contact/request-services. Please identify that you are with the "School = Continuing Education".

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. A virtual office is utilized for class questions and students are provided with instructor contact information in the event they want to make phone or email 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.

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 http://registrar.fpu.edu/catalog.

Fresno Pacific University Student Learning Outcomes

Student Learning Outcomes 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.
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.
Content Knowledge: Students will *demonstrate* comprehension of content-specific knowledge and the ability to apply it in theoretical, personal, professional, or societal contexts.
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.
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.
Moral Reasoning: Students will *identify* and *apply* moral reasoning and ethical decision-making skills, and *articulate* the norms and principles underlying a Christian world-view.
Service: Students will *demonstrate* service and reconciliation as a way of leadership.
Cultural and Global Perspective: Students will *identify* personal, cultural, and global perspectives and will employ these perspectives to *evaluate* complex systems.
Quantitative Reasoning: Students will accurately *compute* calculations and symbolic operations and *explain* their use in a field of study.
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.