FRESNO PACIFIC
U N I V E R S I T Y

CSED-712/901: Computational Thinking

Independent Study Online Course Syllabus

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Course Description

Computational thinking is a skill set for solving problems efficiently. Through a series of computing processes–decomposing, pattern recognition, abstraction, and algorithmic thinking–students who think computationally engage their questions and curiosities methodically. This fully online course prepares K-12 educators to foster computational thinking through any discipline. Participants will develop practices to support students as they apply computational thinking to problems both inside and outside the classroom. Block based coding will also be explored for use in the classroom.

This course may be applied towards the Computer Science Authorization program. Drawing on the CSTA Computer Science Standards, ISTE Standards for Computer Science Educators, Next Generation Science Standards, and Common Core State Standards, this course will equip educators to cultivate the next generation of creative, clever, and persistent problem solvers.

Note: There is no required textbook for this course.

Course Materials

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, podcasts, worksheets, 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

CSTA Computer Science Standards
https://www.csteachers.org/Page/standards

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 State Standards (CCSS) (www.corestandards.org)

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

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

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 student will be able to:		National Standards Addressed*	CE-SLO Addressed**
C-SLO 1	Identify the essential elements of computational thinking.	NBPTS 1, 2, 3, 4	CE 2, 4, 6
C-SLO 2	Articulate the rationale for teaching computational thinking across disciplines.	NBPTS 1, 2, 4	CE 1, 2, 4, 6
C-SLO 3	Apply computational thinking to content-specific problems and coding exercises.	NBPTS 1, 2, 3, 4	CE 2, 4, 6
C-SLO 4	Develop best practices in the use of computational thinking in the classroom.	NBPTS 1, 2, 3, 4	CE 1, 2, 3, 4, 5, 6
C-SLO 5	Locate standards-based curricula and lessons for computational thinking.	NBPTS 1, 2, 3, 4	CE 2, 4, 6
C-SLO 6	Collaborate with teaching peers and online colleagues to share insights and deepen professional practice.	NBPTS 1, 2, 4, 5	CE 2, 3, 4, 6

* 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 for Each Assignment
Module 1 – Introductions	- Introductions and goals for class - Making Monsters: A Computational Thinking Activity 1.1 Assignment: Submit Orientation 1.2 Forum: Monster and Me	4, 4
Module 2 – What is Computational Thinking (CT)?	- CT Definition: What it is and isn't - Video: Computational thinking for children - Four pillars of computational thinking - Rationale for teaching CT - Computational thinking across the curriculum - CT vocabulary and progression chart 2.1 Assignment: CT Knowledge Quiz 2.2 Assignment: Connect, Extend, Challenge	CR, 10
Module 3 – Decomposition and Pattern Recognition	- The first two pillars of CT - What is decomposition? - What is pattern recognition? 3.1 Assignment: Decomposition Knowledge Quiz 3.2 Assignment: Pattern Recognition Knowledge Quiz 3.3 Forum: Examples of Decomposition and Pattern Recognition	CR, CR, 4
Module 4 – Abstraction and Algorithms	- The second two pillars of CT - What is abstraction? - What are algorithms? - Evaluating solutions - A computational thinking example with donuts 4.1 Assignment: Abstraction Knowledge Quiz 4.2 Assignment: Algorithms Knowledge Quiz 4.3 Forum: Putting it All Together	CR, CR, 4
Module 5 – Computational Thinking Through Coding with Scratch	- Difference between coding and CT - CT defined through Scratch - Explore block coding with Scratch - Preview Creative Computing Curriculum - Tips for getting started in the classroom - Activity choice: Creative Computing Curriculum OR Scratch starter projects. 5.1 Forum: Scratch Gallery Walk	4

Module 6 – Computational Thinking with Code.org	• Explore code.org's CS Fundamentals courses • Select and work through one unit • Share and discuss process • 6.1 Assignment: CS Fundamentals Completion	20
Module 7 – Classroom Culture of Computing	• Video: Growth mindset in CT • Habits of a computational thinker • Teaching tips • Best practices for computing culture • Assessing computational thinking • Self-reflection tool • 7.1 Forum: Guidelines and Practices	4
Module 8 – Computational Thinking Curricula & Lessons	• Explore CT lessons, tools, and curricula. • Try a lesson with students and reflect. • 8.1 Forum: Lesson Jigsaw • 8.2 Assignment: Lesson Implementation Reflection	4, 10
Module 9 – Communities of Practice	• Plan for ongoing collaboration • Final Project • 9.1 Assignment Choice: Poster or Presentation • 9.2 Forum: Communities of Practice	20, 4
Course Wrap-up – Grading and Evaluation	• Course Evaluation • Grade Request / Transcript Request	
	TOTAL POINTS	92 points

Grading Policies, Rubrics, and Requirements for Assignments

Grading Policies
- Assignments will be graded per criteria presented in the course rubrics.
- The discernment between letter grades is at the discretion of the instructor based on the quality of work submitted (see appropriate course rubric).
- 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 (for CSED-712)

Grade	Percent	Description	Rubric
A A -	92.0-100% 90.0-91.9%	Outstanding Outstanding -	Outstanding in every way. Meets all course / assignment requirements with significant evidence of subject mastery and demonstration of outstanding graduate level scholarship.
B + B B -	88.0-89.9% 82.0-87.9% 80.0-81.9%	Good + Good Good -	Meets criteria for all course/assignment requirements - demonstrates subject competency with good graduate level scholarship.
C + C C -	78.0-79.9% 72.0-77.9% 70.0-71.9%	Marginal + Marginal Marginal -	Marginally meets criteria for all course/assignment requirements - demonstrates marginal graduate level scholarship.

F	Below 70.0%	Unsatisfactory	Does not meet the minimum criteria for all course/assignment requirements and demonstrated little, if any, evidence of satisfactory graduate level scholarship.

Grading Rubrics (for CSED-901)

Grade	Percent	Description	Rubric
A	90.0-100%	Outstanding	Outstanding in every way. Meets all course / assignment requirements with significant evidence of subject mastery and demonstration of outstanding graduate level scholarship.
B	80.0-89.9%	Good	Meets criteria for all course/assignment requirements - demonstrates subject competency with good graduate level scholarship.
N/C	Below 80.0%	Unsatisfactory	Does not meet the minimum criteria for all course/assignment requirements and demonstrated little, if any, evidence of satisfactory graduate level 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 forums 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 graduate credit adheres to 60 hours per semester unit for the 700-level courses and 45 hours per semester unit for the 900-level courses. Therefore, a student will spend approximately 180 hours (700-level) or 135 hours (900-level) for 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 - https://www.fresno.edu/students/registrars-office/academic-catalogs

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	**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.
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 world-view.
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.