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**Course Outline for ECE 42**  
**EARLY CHILDHOOD MATH AND SCIENCE**  
**Effective: Spring 2019**

**I. CATALOG DESCRIPTION:**

ECE 42 — EARLY CHILDHOOD MATH AND SCIENCE — 3.00 units

An examination of the constructivist approach to teaching science, technology, engineering and mathematics (STEM) to young children; emphasizing application to everyday experiences of children.

3.00 Units Lecture

**Prerequisite**

ECE 63 - Early Childhood Curriculum  
with a minimum grade of C

**Grading Methods:**

Letter Grade

**Discipline:**

- Child Development/Early Childhood Education

	<b>MIN</b>
<b>Lecture Hours:</b>	54.00
<b>Total Hours:</b>	54.00

**II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1**

**III. PREREQUISITE AND/OR ADVISORY SKILLS:**

**Before entering the course a student should be able to:**

**A. ECE63**

1. plan curriculum for an early childhood program utilizing the theories and principles of child growth and development.
2. demonstrate and discuss the learning process in early childhood as it relates to play;
3. observe, plan, assess, and evaluate the curriculum in ECE environments, including the role of the teacher as related to providing developmentally appropriate curriculum;
4. plan and evaluate curriculum and environment to meet the needs of groups, typical and atypical children;
5. plan and facilitate the following curriculum for all young children from an anti-bias perspective using developmentally appropriate practices: language arts/literacy, dramatic play, creative arts, sensori-motor exploration, outdoor, nutrition and health, music/movement, math and science, blocks, and manipulatives;
6. evaluate teacher behaviors for best practices reflecting current research and the impact it has on children's learning and development.

**IV. MEASURABLE OBJECTIVES:**

**Upon completion of this course, the student should be able to:**

- A. Define the theories, standards and guiding principles associated with the teaching of mathematics and science to young children
- B. Explain the pedagogical role of play in teaching science, technology, engineering and mathematics (STEM) to children
- C. Demonstrate familiarity with the use of a variety of tools and simple machines which can be used by young children to solve problems of interest to them
- D. Identify developmentally appropriate concepts and terminology (subject matter content) in mathematics, physical science, and natural science
- E. Apply the principles of developmentally appropriate practice to develop and evaluate environments and curriculum that facilitate math and science learning in young children.
- F. Through observation identify examples of math and science learning in the activities of young children as well as emergent themes for further exploration
- G. Evaluate the impact of personal experiences with STEM concepts on teaching effectiveness.

**V. CONTENT:**

- A. Theory, standards and guiding principles
  1. Brain research
  2. Developmental theories (Piaget)
  3. Early learning theories (Vygotsky, Gardner)
  4. Developmentally Appropriate Practices (DAP)
  5. National Council of Teachers of Mathematics (NCTM)
  6. California Preschool Curriculum Framework

- 7. Common Core
- B. Math and science pedagogy for young children
  - 1. Inquiry and play
  - 2. Creating a culture of inquiry
  - 3. Hands-on exploration
  - 4. Appropriate questioning
  - 5. Loose parts and open-ended material
- C. Simple machines, mechanical concepts and technology
- D. Early science and math vocabulary and concepts
  - 1. Science
    - a. Physical science
    - b. Natural science (life science, earth science)
    - c. Simple tools and machines
  - 2. Scientific behaviors
    - a. Observation
    - b. Recording and documentation
    - c. Predictions/forming hypotheses
    - d. Reporting
  - 3. Mathematics
    - a. Numbers
    - b. Algebra and functions
    - c. Measurement
    - d. Geometry
- E. Planning and preparing the learning environment for STEM
  - 1. Organization
  - 2. Selection of materials
  - 3. Creation of "invitations"
- F. Planning STEM learning opportunities and activities for young children
  - 1. Observation as a tool to plan math and science learning activities for young children
  - 2. Identifying emerging interests
  - 3. Embedding science and math in everyday experiences
  - 4. Designing in-depth projects and explorations
  - 5. Document children's experiences to evaluate and communicate learning
  - 6. Engaging families and sharing understanding of early math and science learning
  - 7. Inclusion of all children
- G. Personal attitudes and experiences with STEM concepts

#### VI. METHODS OF INSTRUCTION:

- A. **Lecture** -
- B. **Observation and Demonstration** -
- C. **Field Trips** -
- D. **Classroom Activity** -
- E. **Discussion** -
- F. Multi-media presentations
- G. **Research** -

#### VII. TYPICAL ASSIGNMENTS:

- A. Class activity - Demonstrate STEM activity (student's choice from instructor generated list)
- B. Discussion - Based on observation #3, discuss examples of children's numeracy, number awareness, and ability to sort, group and classify objects.
- C. Field trip - Planned field trip to a community site that has implemented STEM into everyday curriculum
- D. Lecture - lecture 2 - Theory, standards and guiding principles as they pertain to STEM concepts
- E. Observation and Demonstration - Use the "reflective curriculum process to provide opportunities for children to explore gravity. Create two "invitations" that build upon the child's interest to explore gravity. Document which of the "invitations" most capture child's interest and document what the child said when exploring the materials.
- F. Multi-media presentation - Create a Powerpoint or Prezi that documents math/science learning based on instructor provided criteria
- G. Research - Research the California Preschool Curriculum Framework for Math and Science learning in children 0 - 5.

#### VIII. EVALUATION:

##### **Methods/Frequency**

- A. Quizzes
  - 3 per semester.
- B. Research Projects
  - Once per semester.
- C. Oral Presentation
  - Twice per semester.
- D. Group Projects
  - Once per semester
- E. Class Participation
  - Each week.
- F. Home Work
  - Every other week.

#### IX. TYPICAL TEXTS:

- 1. Moomaw, Sally. *Teaching STEM in the Early Years: Activ.for Integrating Sci., Tech., Eng., and Math.* 1st ed., Redleaf Press, 2013.
- 2. Charlesworth, Ph.D. , Rosalind . *Math and Science for Young Children.* 8th ed., Cengage, 2016.
- 3. , The Early Math Collaborative from the Erikson Institute. *Big Ideas of Early Mathematics.* 1st ed., Pearson, 2014.
- 4. Chaille, Christine, and Sara Davis. *Integrating Math and Science in Early Childhood Classrooms Through Big Ideas A Constructivist.* 1st ed., Pearson, 2016.
- 5. Van de Walle, John, LouAnn Lovin, Kare Karp, and Jennifer Bay-Williams. *Teaching Student-Centered Mathematics: Developmentally Appropriate Instruction for Grades Pre-K-2.* 3rd ed., Pearson, 2018.
- 6. California State Preschool Learning Foundations

<http://www.cde.ca.gov/sp/cd/re/documents/preschool.pdf>

- X. OTHER MATERIALS REQUIRED OF STUDENTS:
- A. Internet access is strongly recommended