

**STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK**



MASTER SYLLABUS

ECHE 304: STEM in The Early Years

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**SCHOOL OF BUSINESS AND LIBERAL ARTS
SOCIAL SCIENCE DEPARTMENT – EARLY CHILDHOOD
FALL 2021**

- A. **TITLE:** STEM in the Early Years
- B. **COURSE NUMBER:** ECHD 304
- C. **CREDIT HOURS:** 3 lecture hours per week for 15 weeks
- D. **WRITING INTENSIVE COURSE:** No
- E. **GER CATEGORY:** None
- F. **SEMESTER(S) OFFERED:** Fall or Spring
- G. **COURSE DESCRIPTION:**
 This course focuses on integrating STEM (Science, Technology, Engineering, and Math) in early childhood settings and curriculum. Young children acquire STEM skills through exploration, inquiry, and active engagement. Topics will include methods for promoting scientific discovery and learning, integrating science and technology, developing mathematical concepts, and facilitating active experimentation and engagement in the early childhood classroom. Basic components of STEM and effective ways to incorporate STEM into curriculum and everyday activities with young children will be studied.
- H. **PRE-REQUISITES/CO-REQUISITES:**
 a. Pre-requisite(s): ENGL 101
 b. Co-requisite(s): None
- I. **STUDENT LEARNING OUTCOMES:**
 By the end of this course, the student will be able to:

PLO 8: Apply skills of curriculum planning and age appropriate early childhood learning environments that support the development of children from infancy to age 5 based upon developmentally appropriate teaching practices.		
<u>Student Learning Outcomes [SLO]</u>	<u>PLO</u>	<u>ISLO</u>
a. Define and examine STEM Education for Young Children and its importance in promoting critical and creative thinking and scientific inquiry.	8	5 Industry, Professional
b. Determine strategies and practices for engaging young children in scientific discovery, mathematical thinking, and spatial reasoning through STEM activities.	8	5
c. Explore and design age-appropriate STEM curriculum and activities to promote inquiry-based learning opportunities for young children.	8	5
d. Identify and assess environments that invite young children to observe, explore, investigate, problem-solve, and experiment.	8	5
e. Identify and select appropriate formal and informal observation and assessment tools to assess STEM learning.	3	5

J. APPLIED LEARNING COMPONENT: Yes
Classroom/Lab

K. TEXTS:
Moomaw, S. (2013). *Teaching STEM in the early years: Activities for integrating science, technology, engineering, and mathematics*. St. Paul, MN: Redleaf Press.

L. REFERENCES:

- Ashbrook, P. (2010). *Science is simple: Over 250 activities for preschoolers*. Beltsville, MD: Gryphon House.
- Barbe, J. (2017). *Baby steps to STEM: Infant and toddler science, technology, engineering, and math activities*. St. Paul, MN: Redleaf Press.
- Beaver, N., Wyatt, S., and Jackman, H. (2018). *Early education curriculum: A child's connection to the world*. Boston, MA: Cengage
- Chalufour, I., & Worth, K. (2004). *Building structures with young children*. St. Paul, MN: Redleaf Press.
- Charlesworth, R. (2016). *Math and science for young children*. Australia: Cengage Learning.
- Donohue, C. (ed). (2015). *Technology and digital media in the early years: Tools for teaching and learning*. New York, NY: Routledge and NAEYC
- Heroman, C. (2017). *Making and Tinkering with STEM*. Washington, DC: NAEYC.
- Shillady, A. (2012). *Spotlight on young children: exploring math*. Washington, DC: NAEYC.
- Shillady, A. (ed.) (2013). *Spotlight on young children: Exploring science*. Washington, DC: NAEYC.
- NAEYC's Technology and Young Children Interest Forum's Resources for Teachers and Families. (2012). *YC: Young Children*, 67(5), 62-64
- NAEYC & Fred Rogers Center for Early Learning and Children's Media. 2012. "Technology and Interactive Media as Tools in Early Childhood Programs Serving Children from Birth through Age 8." Joint position statement. Washington, DC

M. EQUIPMENT: University Supplied Equipment

N. GRADING METHOD: A-F

O. MEASUREMENT CRITERIA/METHODS

- Various Project Based Assignments
- Quizzes
- Assessments
- STEM Activities developed for use in early childhood settings

P. DETAILED COURSE OUTLINE:

I. Introduction to STEM

- A. Components of STEM
- Science
 - Technology

- Engineering
- Math
- B. Importance of STEM in the early years

II. Science in Early Childhood

- A. Basic Scientific Process Skills and Concepts
- B. What is Science?
 - Life Science
 - Physical Science
 - Earth and Space
 - Geology
 - Meteorology
 - Astronomy
 - Ecology
 - Science and Technology
- C. Methods of Inquiry
 - Investigate
 - Observe
 - Describe
 - Compare
 - Question
 - Predict
 - Experiment
- D. Materials and Equipment
- E. Science and Discovery Learning Centers
- F. Activities

III. Math in Early Childhood

- A. Mathematical Thinking
 - Acquisition of Math Skills: Infancy – Age 5
 - Physical Knowledge
 - Logical-Mathematical Knowledge
 - Concept Development
- B. Math Concepts
 - Numbers and Operations
 - Rational Counting and Rote Counting
 - Classifying and Sorting
 - Patterns, Functions, and Algebra
 - Geometry and Spatial Sense
 - Graphs and Charts
 - Measurement
 - Problem Solving
- C. Math Experiences
 - Environment
 - Everyday Experiences
 - Through Play
 - Self-Guided Discoveries
 - Manipulatives
- D. Math and the Curriculum:
 - Math and Science
 - Math and Cooking

- Math and Art
- Math and Language
- Math and Literacy
- Math and Technology
- Math and Construction [Block Play]
- E. Math Manipulatives and Materials
- F. Learning Centers
- G. Activities

IV. Engineering in Early Childhood

- A. Inquiry Process:
 - Questioning
 - Planning
 - Designing
 - Testing
 - Experimenting
 - Creative Thinking
 - Critical Thinking
 - Problem Solving
 - Exploring Possibilities
 - Discovering
- B. Engagement in Early Childhood
 - Tinkering – *"using stuff"*
 - Making – *"using stuff to make stuff"*
 - Engineering - *"using stuff to make stuff that does stuff"*
- C. The Learning Environment
 - Materials and Equipment
 - Learning Centers
 - Activities
 - Safety

V. Technology in Early Childhood

- A. Adapting and Integrating Technology
 - Selection
 - Use
 - Integration
 - Evaluation
- B. Types of Technology
 - Smart Board
 - Computers / Laptops
 - Tablets and iPads
 - Digital Cameras
 - Video
 - Webcams, Skype
 - E-Books
 - Robotics
- C. Digital Media: Content and Context
- D. Appropriate use of Technology
- E. Teaching Strategies
- F. Technology and Play
 - Equipment
 - Machinery
 - Tools

- G. The Learning Environment
 - Materials and Equipment
 - Learning Centers
 - Activities

VI. Teaching Practices to Support STEM

- A. Intentional Teaching
- B. Teaching for Understanding
- C. Encouraging Inquiry
- D. Planning and Preparing
- E. Developmentally Appropriate STEM Experiences

VII. Integrating STEM in Early Childhood

- A. Daily Learning Experiences
- B. Integrated Curriculum
- C. STEM Learning and Life Skills
 - Spatial Reasoning
 - Perspective Taking
 - Motor Development
 - Cognitive Processes
 - Critical and Creative Thinking Skills
 - Problem Solving Skills

VIII. Observing and Assessing STEM

- Documentation
- Recording: Photos, Video
- Reflecting, Discussing, and Exploring
- Planning
- Questions and Follow Up Activities
- Promoting STEM