

Course Title: STEM Education in Secondary Classrooms

Instructors: Richard Mittelstedt & Shaobo Huang

Mechanical Engineering, South Dakota School of Mine & Technology

Contact Information: 605-394-2656, Shaobo.Huang@sdsmt.edu

Office Hours: By appointments

Course Overview

This course prepares the participants with pedagogical knowledge to integrate engineering and science projects into the curriculum design for secondary mathematics and science education. This course will also emphasize the participants' teaching efficacy and participation in teacher communities to collaboratively address problems of practice.

Course Objectives:

- Understand and unpack the Next Generational Science Standards and Common Core State Standards.
- Understand how the learning theories apply to the science and mathematics teaching and learning.
- Use engineering and science projects to build deeper understanding of science and mathematics learning.
- Build an understanding of how to collect and analyze student data
- Provide constructive peer feedback

Course Requirements:

- Participate in the class discussions: Every participant is expected to contribute actively to the class discussions, share experience of teaching, providing arguments and/or examples if agreeing or disagreeing with the opinions of other colleagues.
- Write lesson plans: Each participant will write at least one lesson plan as an exit project for this course. If more than one lesson plans are drafted, at least one lesson plan need to be designed based on the primary research project through the summer SD-RET program.
- Lesson Study: Each participant will lead a 40-min discussion of the lesson study.
- Discussion board: Weekly contributions to the discussion board on the SD-RET website for each topic in the course. Each participant will initiate an original entry and provide 2+ valid responses to the journal entries submitted by other class members.

Grading:

- Class participation 20%
- Leading lesson study 25%
- Grades assigned: Pass/Fail
- Writing lesson study 35%
- Discussion board 20%

Recommended Readings:

- Heywood, J. (2005). *Engineering education: Research and development in curriculum and instruction*. John Wiley and Sons.
- Johri, A., & Olds, B. M. (Eds.). (2014). *Cambridge handbook of engineering education research*. Cambridge University Press.

Overview of Modules

Week 1 State and national standards analysis (June 12-16)

Assignments

- Identify and align the relevant standards to your lesson plan
- Post reflections on this week's topic(s) on course discussion board and prior to the next class

Week 2 Curriculum Design & Assessment and evaluation (June 19 -23)

Assignments

- Identify the goals and objectives of your lesson plan
- Recognize the learning styles of your students
- Identify the needs of your students by gender and ethnicities
- Select the learning strategies that will be infused in your lesson plan
- Post reflections on this week's topic(s) on course discussion board and prior to the next class

Week 3 Designing Curriculum with Engineering/Science Projects (June 26-30)

Assignments

- Integrate the SD-RET research project(s) in your lesson plan
- Design practices and interventions guided by the learning strategies you selected
- Select assessment and evaluation methods
- Create assessment and evaluation instruments
- Post reflections on this week's topic(s) on course discussion board and prior to the next class

Week 5 Lesson study (July 17-21)

Assignments

- Leading lesson study discussions
- Finalize lesson plan(s)
- Post reflections on this week's topic(s) on course discussion board and prior to the next class

Week 5 Presentation of research projects and lesson plan (July 24-28)

Assignments

- Final written lesson plan due
- Final Presentations