EGEN 511 – Engineering Methods for Teachers (3 cr)

Instructors:
Dr. Todd Kaiser
Dr. John Graves

Time & Location:
13 week semester online course

Text:

Pre-Requisites:
Teacher of science, admission to the MSSE Program or equivalent

Course Catalog Description:
This course is designed to introduce the concepts of engineering technology design to equip teachers of science to meet and exceed emerging standards of teaching engineering process K-12. A balanced approach of engineering processes and educational pedagogy will be the cornerstones of the course.

Course Description:
This course introduces students to the concepts necessary to effectively create and implement engineering methods strategies for K-12 students. Using the Next Generation Science Standards’ criteria for engineering, teachers will learn the engineering design process and develop a repertoire of resources for engineering design.

Outcomes: At the end of this course a student should be able to:

• describe the difference between science and engineering
• demonstrate a practical understanding and application of engineering design appropriate for teaching, including but not limited to, technology, generating and developing ideas, drawing, reverse engineering, testing, evaluating and manufacturing through specific assignments
• demonstrate an understanding of the engineering design process as it applies to K-12 students
• complete teaching units that meet and/or exceed the Next Generation Science Standards of engineering
• engage in on-going discussion with fellow classmates and the instructors specific to engineering design principles

Course Topics:
Week 1: Technology: The Human-designed World (Chapter 1)
Week 2: The Process of Design (Chapter 2)
Week 3: Engineering in NGSS
Week 4: Development of a Team (Chapter 3)
Week 5: Generating and Developing Ideas (Chapter 4)
Week 6: Drawing to Develop Design Ideas (Chapter 5)
Week 7: Reverse Engineering (Chapter 6)
Week 8: Investigating and Researching for Design Development (Chapter 7)
Week 9: Technical Drawing (Chapter 8)
Week 10: Testing and Evaluating (Chapter 9)
Week 11: Manufacturing (Chapter 10)
Week 12: Creating an Engineering Focused Classroom
Week 13: Peer Review of Final Projects

Performance Outcomes
Performance requirements include the following:
• application of engineering design processes in the K-12 classroom
• synthesis of engineering design processes and educational pedagogy
• creation of lessons and units of study that meet the engineering standards of the Next Generation Science Standards
• collaboration with other teachers of science

Performance Assessments
Student learning will be assessed through the following:
• active participation in weekly on-line discussions
• written assignments in Design Process, Engineering in NGSS, Reverse Engineering, Testing & Evaluation
• Design Idea Drawing
• Final Project: a series of lessons or unit of study that encapsulates the course content to be implemented in a K-12 classroom

Grading
Assignments will scored on the basis of the writing rubric, found on the Help Pages. Unlike rubrics in other courses that are more specific, these are more broad due to the open nature of individual writing of educational research.

Remember, this is a graduate level course and the writing must be graduate level quality. Extensive guidance is provided on the Writing Expectations of the Help Pages. Please review these before submitting your written assignments.

Course Grading:
A (94-100%)
A- (90-93%)
B+ (87-89%)
B (84-86%)
B- (80-83%)
C+ (77-79%)
C (74-76%)
C- (70-73%)
D+ (67-69%)
D (64-66%)
D- (60-66%)
F (0-59%)

Submitting Assignments
When submitting assignments, please save your file as a Microsoft Word document. Nearly all files in the MSSE Program are created on Microsoft Word. I use the Track Changes feature of Word to provide feedback and editing of your papers. Be sure to have Track Changes turned on in your Word
application. Also, be sure to submit a "clean" copy file each time you submit. Assignments will be returned to the Dropbox within one week after submission. If more time than that has transpired, be sure to check with John about the status of your assignment(s).

**Re-doing Assignments**

You are welcome to re-do an assignment if you did not receive a score acceptable to you. You must re-submit the assignment in its entirety, having made the appropriate corrections or additions. Leave the original submission intact and then ADD your corrections in bold or in color. If you are using Microsoft Word, make the corrections in a type and/or font other than you used for the original assignment. That makes it easy for me to see the exact changes you made. It is assumed that the revised work will be of "exemplary" quality and your score will be changed to reflect your extra effort and work. At some point in the course, this option may be removed...be sure to check weekly assignments. Resubmissions will be awarded a maximum of 90%.

**Maintaining Intellectual Integrity (Plagiarism)**

Paraphrasing or quoting another’s work without citing the source is a form of academic misconduct. Even inadvertent or unintentional misuse or appropriation of another's work (such as relying heavily on source material that is not expressly acknowledged) is considered plagiarism. All sources of information that are not your original thoughts need to be cited. This includes, but is not limited to, journal articles, textbooks and online resources. Adapted from MSU Syllabus language page: [http://www.montana.edu/teachlearn/TLResources/SyllabusLanguage.html](http://www.montana.edu/teachlearn/TLResources/SyllabusLanguage.html)

The Dropbox of D2L has a plagiarism checking feature attached to it called Turnitin. It will be activated for all submitted assignments.

**Discussion Seminar Participation**

Each week, you must participate in the general discussion. The discussion assessment will be based on the self-assessment reflection rubric, which each student will submit at the end of each week to the Dropbox. If you are assigned Discussion Leader for the week, please follow the Discussion Leader Guidelines and submit the Discussion Leader Rubric.

**Late Work**

Assignments are due by midnight, Montana time, on the date posted. Submissions received AFTER that time will receive a late penalty of 10%. However, if you know you are going to be late with an assignment, please let the instructors know and you will be exempt from the late penalty as long as you have a compelling reason for the lateness and you provide a reasonable, timely due date. A phone message on Sunday night informing John of an internet connection problem and that you hope to be able to submit by noon on Tuesday is an acceptable reason to receive an exemption from the late penalty. The instructor realizes that we are all busy and situations will arise that are beyond our control. The request is that you be responsible with both communication and completion of the required work.

**Grades**

Current grades and your standing in the course will be available by checking the Grades link on the course. If you have questions or concerns about your grades, be sure to ask.
**Keys to Success**

The following practices have proven to help students be as successful as possible in my online courses:

- Communicate, communicate, communicate. When in doubt, ask. If you are behind, let me know. If you get stuck, give a call. I can usually clear up in a five minute phone call what may take you days to figure out on your own.
- Keep up with NEWS and email messages. I post vital information in the NEWS section and through email messages. Make it a habit to check these every time you login.
- Use the course Helps. The resources are there to assist you with assignments, writing and more. Use them.
- Read all the feedback provided on assignments and make changes accordingly to the next assignment. Don't get into the habit of creating bad habits...each assignment should be an improvement on the prior.
- Try not to fall behind. If you do, stay current with the week you re-join the course and make up the missing work as you can. That prevents you from getting farther behind.
- Enjoy the journey. This is a process...a marathon, not a sprint. Enjoy it, but don't forget to take that first step.

**Student Conduct**

Montana State University expects all students to conduct themselves as honest, responsible and law-abiding members of the academic community and to respect the rights of other students, members of the faculty and staff and the public to use, enjoy and participate in the University programs and facilities. For additional information reference see

www2.montana.edu/policy/student_conduct/student_conduct-code_2008-2009.htm

**Collaboration:**

University policy states that, unless otherwise specified, students may not collaborate on graded material. Any exceptions to this policy will be stated explicitly for individual assignments. If you have any questions about the limits of collaboration, you are expected to ask for clarification.

**Academic Misconduct:**

Section 420 of the Student Conduct Code describes academic misconduct as including but not limited to plagiarism, cheating, multiple submissions, or facilitating others’ misconduct. Possible sanctions for academic misconduct range from an oral reprimand to expulsion from the university.

**Academic Expectations:**

Section 310.00 in the MSU Conduct Guidelines states that students must:
A. be prompt and regular in attending classes;
B. be well prepared for classes;
C. submit required assignments in a timely manner;
D. take exams when scheduled;
E. act in a respectful manner toward other students and the instructor and in a way that does not detract from the learning experience; and
F. make and keep appointments when necessary to meet with the instructor.
In addition to the above items, students are expected to meet any additional course and behavioral standards as defined by the instructor.