

Course Description

ENGR 2200 Evaluating Innovation: Fixtures, Fads, and Flops: 3 credit hours

This course introduces foundational theories used to critically analyze the success of consumer products and other technological innovations. Case studies are utilized to exhibit the interactions between innovation and society. Critical thinking skills are emphasized.

Course Meeting Times and Instructor Information

Section	Day	Time	Room	Instructor	Email	Office
115	MWF	12:20-1:10	Lever 014	Dr. Sarah Grigg	sarahg@clemsn.edu	Lever 111

Important Course Dates

A full academic calendar is available at this [link](#), but important dates for Fall 2018 are summarized below:

- ⇒ **First day of class**..... **Wednesday, August 22**
- ⇒ Last day to add a course..... Tuesday, August 28
- ⇒ Last day to drop a course without receiving a W on your academic record..... Tuesday, September 4
- ⇒ **Exam 1** **Friday, October 5**
- ⇒ Midterm grades Friday, October 12
- ⇒ Last day to withdraw from course Friday, October 26
- ⇒ No class – Fall Break..... Monday, November 5 – Tuesday, November 6
- ⇒ **Exam 2** **Monday November 19**
- ⇒ No class – Thanksgiving Holiday..... **Wednesday, November 21 – Friday, November 23**
- ⇒ Last day of class for courses Friday, December 7
- ⇒ **Final Exam**..... **Monday December 10**

Office Hours/Communication Strategy

The best way to contact me is via email. I try to respond to emails quickly, but please allow one business day for responses. Use a descriptive subject line when sending emails, such as: “ENGR 2200- R2 Question”. Emails with subject lines containing the course number will be given priority and receive a faster response.

I will be available in Lever 111 for drop-in office hours:

Mondays, 1:30 – 3:30 pm

Thursdays, 2:00 – 3:00 pm

If these times do not work with your schedule, please email me for a one-on-one appointment. In general, I have an open door policy. If I am in my office and available, I'll be happy to help if you stop by.

Course Content

Distribution of content coverage in this class include:

- **Critical Thinking – 15%**
 - Elements of reasoning
 - Intellectual standards
 - Heuristics and decision making
- **Innovation Mindset – 15%**
 - Human-centered design thinking
 - Product development process
 - Innovation (change) style
- **Evaluating Innovation Success – 25%**
 - Product Life Cycle
 - Market/Situation Analysis
 - Technology Adoption / Diffusion of innovation
- **Societal Factors and Implications– 25%**
 - Disruptive Innovations
 - Hierarchy of human needs
 - Environmental impact
- **Professional Communication – 10%**
 - Critical analysis of innovation and innovative technologies (written and presented)
 - Objectively engage in group discussions
- **Course Mechanics and Assessment – 10%**
 - California Critical Thinking Tests (2)
 - Module Quizzes (10)

Course Requirements (Textbooks and Materials)

- ✚ Required Textbook:
 - Richard Paul, Robert Niewoehner, and Linda Elder. 2007. Engineering Reasoning. ISBN 0-944583-33-4
 - Rowan Gibson. 2015. The 4 Lenses of Innovation. ISBN 978-1-118-74024-8
 - Steven Johnson. 2014. How we got to Now ISBN 978-1-59463-296-9
- ✚ Laptop
 - Windows: Microsoft Office 2013 (Word, PowerPoint, Excel)

Evaluation Plan/ Grade Distribution

Note all final grades are truncated. Late work will not be accepted.

- **Assignments (40%)**
 - Previews: Readings and Lectures
 - Reflections: Discussion Board Posts 10%
 - Essays: Disruptive Innovations 20%
 - Post-module Survey: Quiz on content 10%
- **Exams (60%)**
 - Foundations Exam 15%
 - Mindset Exam 15%
 - Comprehensive Final exam 30%

A=90-100

B=80-90

C=70-80

D=60-70

F=0-60

Assignments will serve as artifacts exhibiting critical thinking and will be used in the evaluation of the CT² program and may be evaluated for Critical Thinking Research initiatives. If you do not want your work included in the data set used for research, contact your instructor in writing at sarahg@clemsun.edu.

General Education Competencies

This course is designed to address two general education competencies.

F. Science and Technology in Society

Demonstrate an understanding of issues created by the complex interactions among science, technology, and society.

H. Critical Thinking

Demonstrate the ability to assemble information relevant to a significant, complex issue, evaluate the quality and utility of the information, and use the outcome of the analysis to reach a logical conclusion about the issue.

Critical Thinking Seminar Overview

This is a Critical Thinking Seminar (CT²) that is designed to actively engage students in thinking deeply about the relationships between innovation and society. CT² seminars are part of the Clemson University's Quality Enhancement Plan – more information can be found here: <http://www.clemson.edu/assessment/thinks2/>



Critical thinking is a process of thinking in a clear and systematic way in order to gain a deeper understanding of a system and make informed, unbiased judgments. To do so requires engaging in metacognition to reflect on your own biases and assumptions, and considering how you create knowledge. Critical thinking does not come naturally to most people; but through this course, we will work to improve your critical thinking skills which is instrumental to becoming successful entrepreneurs.

A significant portion of the course will be peer-lead discussions of various products or companies that have made a lasting impression on society. Special focus will be on scientific, technological, and engineering innovations and how societal factors impacted the success or failure of these innovations.

Student submissions of assignments will be collected and used to evaluate the effectiveness of this course and the Clemson Thinks² program in promoting critical thinking skills. These assignments will consist of critical analyses of case studies to evaluate the source in terms of intellectual standards and to determine the factors contributing to the success of an innovation using elements of critical thinking.

As part of this research effort, students are asked to complete the California Critical Thinking Skills Test (CCTST) twice during the semester, once at the beginning of the course and once at the end of the course. Students who do not want their work included in the research study should inform me at sarahg@clemson.edu by the end of the semester.

Documented Disabilities

Reasonable accommodations will be made for students with verifiable disabilities. You must present the official paperwork to the instructor at least one week prior to any activity for which accommodations are required.

Students should make an appointment with Disability Services to discuss their specific needs. Student Disability Services is located in the Academic Success Center building; phone: 864.656.6848. Please be aware accommodations do not carry over from semester to semester, and new Accommodation Letters must be presented each semester.

Topic Outline

This course will progress through modules. You must complete all activities within one module, before proceeding to the next module.

Module 0: Getting Started! Expectations and Baseline Assessments

Module 1: Perspectives on Innovation

Module 2: Evaluating the Impact of Innovation

Module 3: Critical Thinking in Engineering Design

Module 4: Challenging Orthodoxies & Harnessing Trends

Module 5: Leveraging Resources & Understanding Needs

Module 6: Building Innovations & Social Entrepreneurship

Module 7: Product Design Challenge

Student Learning Objectives

The goals of this class are to improve critical thinking skills and understand the social, economic, and environmental impacts of innovation and how societal needs drive innovation.

Science, Technology, & Society: demonstrates an understanding of issues created by the complex interactions among science, technology, and society.

1. Recognize disruptive innovations and the societal, economic, and environmental impacts.
2. Evaluate the influence of society and culture on product success or failure
3. Understand the roles and ethical responsibilities of design engineers and how failing to communicate concerns with team members can lead to disaster.

Critical Thinking: demonstrates the ability to assemble information relevant to a significant, complex issue, evaluate the quality and utility of the information, and use the outcomes of the analysis to reach a logical conclusion about the issue

1. Develop and employ critical thinking skills to formulate judgments of innovations
2. Analyze information regarding innovations using design innovation and product development models.

Communication: demonstrates college level writing/speaking and/or multimedia communication using relevant, appropriately documented sources to express logically organized, fully-developed ideas.

1. Explain your perspective on an issue concerning scientific, technological, or engineering innovation in writing.
2. Engage an audience in an electronic presentation of technical information.

Entrepreneurial Mindset: demonstrates the ability to create personal, economic, and societal value through engineering design.

1. Demonstrate constant curiosity about our changing world and explore a contrarian view of accepted solutions
2. Integrate information from many sources to gain insight and assess and manage risk
3. Identify unexpected opportunities to create extraordinary value and persist through and learn from failure

ABET Competencies

This course is designed to satisfy the following ABET Competencies. For more information, please refer to <http://www.abet.org>.

Engineering programs must demonstrate that their graduates have:

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data**
- (c) an ability to design a system, component, or process to meet desired needs
- (d) an ability to function on multi-disciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility**
- (g) an ability to communicate effectively**
- (h) the broad education necessary to understand impact of engineering solutions in global and societal context**
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues**
- (k) an ability to use techniques, skills, and modern engineering tools necessary for engineering practice