

# MCHE 2990: Engineered Systems in Society

## **Course Description**

Engineering challenges of the 21<sup>st</sup> century are increasingly complex and situated within larger socio-cultural, ecological, and economic systems. The ability to understand, analyze, and navigate these inherently social contexts of modern engineering work is crucial in preparing students for the workplace of the future. Building on the foundations of engineering design established in MCH 1940 (Mechanical Engineering Design Studio and Professional Practice), this course introduces students to socio-technical complexity and explores ways to conceptually understand, systematically analyze, and holistically engage in engineering settings that are characterized by social, cultural, economic, and ecological factors.

The course integrates diverse readings, team projects, and experiential learning elements to facilitate the development of students' conceptual and practical understandings of socio-technical systems. A series of empathic communication modules provides students with opportunities to put these understandings into practice, and develop the skills necessary to engage stakeholders from a wide range of perspectives. Across all of these activities, particular attention is given to students' professional formation as critically reflective and socially engaged contemporary engineers.

## **Instructors:**

Dr. Joachim Walther ([jwalther@uga.edu](mailto:jwalther@uga.edu)) and Dr. Dominik May ([dominik.may@uga.edu](mailto:dominik.may@uga.edu)).

## **Course Objectives:**

Upon successful completion of the course, students will be able to:

- Demonstrate language and skills necessary to both effectively communicate in the modern engineering workplace and identify/solve complex, socio-technical problems in engineering practice settings.
- Show an understanding of historical and contemporary perspectives on ethical decision-making and practice in engineering.
- Apply systems thinking concepts and tools to understand and frame problems within the complex socio-technical landscape of 21st century challenges.
- Apply a refined understanding of diverse stakeholder perspectives to complex problem settings and demonstrate advanced abilities to communicate with stakeholders from similar and different backgrounds.
- Demonstrate and transfer to practice an appreciation of the impact of engineering work on today's society and the ethical responsibility of engineers.

## **Required Supplies**

The following Course Packet is required and available for purchase at Bel-Jean Copy/Print Center (For directions see: <http://www.bel-jean.com/>):

MCHE 2990: “Engineers, technology, and the social: Exploring relationships in socio-technical systems”

## **Important Dates**

See <https://reg.uga.edu/general-information/calendars/academic-calendars/>

## **Grading**

Course grades will be based on performance on written assessments, group projects, and class participation. A weighted average grade will be calculated as follows:

Participation (in-class discussions of readings, reflections, scribe report) .....	15%
Mid-term exam .....	12.5%
Online discussion.....	12.5%
Stakeholder vignettes.....	5%
Project presentations .....	10%
Magazine article.....	20%
Final exam (a minimum grade of 50% is required to pass the course) .....	25%

The final class grades will be based on the following scale:

92-100	A
89-91	A-
86-88	B+
82-85	B
79-81	B-
76-78	C+
72-75	C
66-71	C-
60-65	D
<60	F

## **Attendance Policy**

Students who miss a class should work with other students in the course and their group to make up any missed work. Documentation for medical absences should be submitted via email to the instructor as soon as possible, but no later than a week after the missed classes.

In this active-learning and team-based class format, attendance is particularly important, and your final grade may be impacted if you miss too many classes. Your participation in class activities will also be regularly noted by your professor and will contribute to part of your participation grade.

This said, your professor will not keep track of student attendance. It is up to you to ensure that your level of attendance is sufficient to meet your learning goals for this course.

**Academic Integrity** All academic work must meet the standards contained in “A Culture of Honesty.” Please be familiar with A Culture of Honesty policy and handbook. With a majority of deliverables being in electronic form and given the team-based, collaborative nature of the course, it is important to understand the difference between working together and cheating. It is encouraged for learning to take place as students discuss and work together. However, for individual submissions each student must ultimately complete and submit their own work.

All suspicions of academic misconduct will be submitted to the Academic Honesty Office. If you are found guilty of academic misconduct you will be given a zero for that assignment and incur one or several of the following consequences: final course grade of "F", placement of a dishonesty transcript notation, suspension, dismissal, or expulsion. If you have a second case of academic misconduct (over the course of your time at UGA) you will receive placement of a dishonesty transcript notation and one of the following consequences as determined by a review board: suspension, dismissal, or expulsion. **If you are unsure of whether something may be considered academic misconduct, please discuss your dilemma with your professor or with someone at the academic honesty office before turning in the assignment.** See <http://www.uga.edu/honesty/> for more details.

**Instructor’s commitment:** You can expect your professor to be courteous, respectful, and punctual; well-organized and prepared for in-class activities; answer questions clearly and in a non-negative fashion; and grade uniformly and consistently according to posted guidelines.

**Consulting with the instructor:** You are encouraged to approach your professor to ask any questions you have about either the course content or structure. In order for your peers to benefit from you question, please consider asking your questions during class time. For other inquiries, please email your professor to set up an appointment. Please consult your course documents and work with your peers to exhaust all options to answer your question prior to making an appointment.

**Engineering Accreditation ABET (2019-2020 cycle):** *The programs in the UGA College of Engineering are accredited through ABET, a nonprofit, non-governmental organization that accredits college and university programs in the disciplines of applied science, computing, engineering, and engineering technology. ABET accredits over 3,100 programs at more than 670 colleges and universities in 24 countries.*

Criterion 3 Student Outcomes and coverage in the course \*:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	Some
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	Some
3. an ability to communicate effectively with a range of audiences	Extensive
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	Extensive
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	Extensive
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	None

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies	None
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See: <https://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2019-2020/#GC3>

Course learning objectives and student outcomes:

<b>Course Learning Objectives</b>	<b>Student learning outcomes (matched ABET criteria):</b>	<b>Assessment Methods*</b>
Demonstrate language and skills necessary to both effectively communicate in the modern engineering workplace and identify/solve complex, socio-technical problems in engineering practice settings.	<b>3, 5</b>	<i>A, B, D</i>
Show an understanding of historical and contemporary perspectives on ethical decision-making and practice in engineering.	<b>2, 4</b>	<i>C, F, G</i>
Apply systems thinking concepts and tools to understand and frame problems within the complex socio-technical landscape of 21st century challenges.	<b>1, 2, 4</b>	<i>A, C, D</i>
Apply a refined understanding of diverse stakeholder perspectives to complex problem settings and demonstrate advanced abilities to communicate with stakeholders from similar and different backgrounds.	<b>3, 4, 5</b>	<i>A, B, D, E</i>
Demonstrate and transfer to practice an appreciation of the impact of engineering work on today's society and the ethical responsibility of engineers.	<b>2, 4</b>	<i>E, F, G</i>

\*Course Assessment Methods:

*A – Project (vignettes and article); B – Communication Module Reflections; C – Mid-term exam; D – Oral Presentations; E – Final Exam; F – Participation; G – Online discussion*

**Engineering Professionalism Policy** Engineers work in interdisciplinary teams to contribute to the betterment of society for all. The engineering profession is governed by a code of ethics, which is available here: <https://www.nspe.org/resources/ethics/code-ethics>. Engineering faculty at UGA expect students to act in a professional and considerate manner at all times, and to develop the orientations required for an impactful and meaningful engineering career.

**Accommodations** Students with disabilities who require accommodations in order to participate in course activities or meet course requirements should contact the Disability Resource Center [Phone (706) 542-8719]. Your professor will devise reasonable accommodations based on the recommendations of the Disability Resource Center. Visit <http://drc.uga.edu/> for more information.