

ENGINEERING CULTURES

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SYLLABUS**Learning objectives**

What is engineering for? What are engineers for? How do engineers engage the world and expect its inhabitants to behave? What sources of influence do they recognize and accept?

The main goal of Engineering Cultures is to help engineering students (and other students) learn to work better with people who define problems differently than they do. Course modules travel around the world, examining how what counts as an engineer and engineering knowledge has varied over time and from place to place. We explore the historical emergence of dominant practices of engineering formation and patterns of engineering work across different countries, all to better understand contrasts and encounters among different engineering perspectives that live in the present.

Students take the crucial first steps toward becoming “global engineers” by coming to recognize and value that they live and work in a world of diverse perspectives. In addition to better understanding the origins of their own perspectives, participants gain concrete strategies for understanding different approaches to technical work they will encounter on the job and for engaging in shared problem solving in the midst of those differences. When course modules work best, they help students figure out how and where to locate engineering problem solving in their lives while still holding onto their dreams.

Non-engineers are welcome to enroll and participate in the course. We make appropriate adjustments in course requirements. Students from the sciences will find many analogies with experiences in their fields. Students from the humanities and social sciences will be able to use this course to practice positioning themselves in a world of different perspectives, using engineers as case examples.

Course learning strategies

In highly structured undergraduate curricula, engineering students learn to apply a rigorous and valuable methodology for solving mathematical problems. Yet the problems students solve tend to be ‘given.’ In the working world, engineers must regularly engage and work with people who define problems differently than they do. The standard method of engineering problem solving applies only to the individual problem solver or integrated team seeking one problem definition. It offers no guidance to collections of problem solvers who define problems differently from one another.

This course offers three strategies to help you prepare for work productively and collaboratively amidst contrasting problem definitions. First and foremost, you will achieve a higher level of understanding of the sorts of differences among engineers you will encounter around the world. In each country we examine, we ask: What does it mean to become an engineer? What is valued as

engineering knowledge? Where do engineers do their work? Second, the homework assignments, exam questions and discussion section activities are all geared to help you practice positioning yourself in a world of different perspectives. Third, the course offers an extension of the engineering method called Location, Knowledge, and Desire, which locates the difficult work of collaborative problem definition at the core of engineering practice alongside mathematical problem solving. You can both try this method out within the course and, if you find it interesting or helpful, carry it with you to other contexts.

Course structure

Engineering Cultures is a demanding course that asks you to work through your own perspective as an engineering student (or any other discipline) while offering you the opportunity to learn perspectives that differ from your own.

The main structure of this course consists of two lecture-discussions and one small-group discussion each week. The purpose of this structure is to maximize the chance of achieving two conflicting goals simultaneously: (1) advancing the learning of 140 students in one class [approximately 275-300 request it each semester] while (2) providing numerous opportunities for the give-and-take of small-group discussions. We have designed the discussions, as well as the assignments built around them, to give you practical experience at positioning yourselves in worlds of different perspectives. We work closely together in instructional design and grading throughout the semester.

Course content consists of eight modules. Note that no textbook exists for this novel course. Rather, course readings consist of an imperfect selection of materials from original sources, academic research, and popular literature. All pass through the required content for each module, but none cover that content sufficiently. Lecture-discussions and Friday discussions devote considerable time to filling in the rest of the story, so that in any given location you will understand what it means to become an engineer, what engineers value as their knowledge, and where engineers do their work.

Course requirements

See the Scholar site for syllabus, resources, assignments, and grades. Most of the readings are available both in a printed packet (Kopy Corner: 101 McDonald St, 951-8600) and as pdf files to download. We strongly recommend obtaining the printed packet. The book on Korea will be available in October both as a free pdf through the library and through purchase on Amazon.

Your major responsibility is to keep up with the reading assignments. Come to both lectures and recitations ready to raise and answer questions and to discuss the material. Your final grade will be based on both your level of performance and your level of commitment to the learning process.

The course has a total of 400 possible points, distributed as follows:

Discussion Participation: 9 x 5 pts.	= 45 pts.
Threaded Discussions: 8 x 10 pts.	= 80 pts.
Homework Assignments: 4 x 15 pts.	= 60 pts.
Reflections 1, 2: 15, 20 pts. respectively	= 35 pts.
<u>Exams: 3 x 60 pts.</u>	<u>= 180 pts.</u>
Total	= 400 pts.

Weekly discussion meetings and participation

Weekly class meetings exist to benefit you. They provide student/instructor interaction and sustain a community for learning. These meetings are also a place for you to ask questions about topics covered in the M/W presentations, reading assignments, upcoming exams, etc. You earn class participation points when you attend and *contribute* to discussions. You are expected to *participate* in all ten scheduled recitation meetings. Nine recitation meetings count toward your class participation point total for grading purposes. Discussion instructors have the authority to design specific tasks for you to complete for your participation grade.

Weekly writing assignments

You have a series of writing assignments to complete throughout the semester. These include threaded discussions, homeworks, and reflections assignments. All assignments are available at the course Scholar site and must be completed on or before the assignment due date listed on the Master Schedule. This variable assignment structure is designed to challenge you to take responsibility for your learning while also giving you significant flexibility. See below for the grading standards for threaded discussions and homeworks/reflections assignments.

Threaded discussions

Discussions are short contributions that display your knowledge of course readings and concepts by offering informed, thoughtful reactions. You complete threaded discussions through the Scholar Forum interface for your section. We offer you sets of topics to consider as you formulate your reactions. You must participate in all nine threaded discussions during the semester. Each threaded discussion is worth a maximum of 10 points. For guidance in contributing threaded discussions, see the Grading Standards for Threaded Discussions below.

Homeworks/reflections assignments:

Homeworks and reflections assignments are formal essays, designed to demonstrate your knowledge both of course contents and of your own strategies for engaging potential and actual worlds of work. The due dates for the four homework assignments and the two reflections assignments are listed on the Master Schedule. They are submitted *in person* at the weekly discussion/recitation meetings. Each homework is worth 15 points. The reflections assignments are worth 15 and 20 points respectively.

Exams

Exams consist of short-answer and paragraph-length questions. They are non-cumulative. Exams are timed and are typically comprised of two parts: (1) a question and answer portion that includes a variety of questions (such as ID questions, short answer, fill in the blank, short essay, etc.), and (2) a short essay portion. The total points for each exam is 60 points. We will post sample questions from old exams on the Scholar site.

On exams, the material of highest priority is that which was both in the reading and discussed in class. Next highest is material discussed in class but not in the reading. Third is material discussed in the reading but not in class; in this case you will be responsible only for general ideas.

Grading

We guarantee the return of homeworks within one week and exams in two weeks. All four of us grade exams. Recitation instructors grade the homeworks, reader responses, and reflections assignments.

We re-grade assignments without prejudice according to the following policy. Within one week of receiving a graded assignment, you submit a written request for re-grading with an explanation for why you think you deserve more points. Whoever graded that assignment will review it and respond in writing with a decision. If you still have concerns, you submit that request directly to Gary, who will then respond in writing with a final decision.

The course works on a 90-100, 80-90, etc., scale for final grading. We do award +'s and -'s. In exam grading, we will curve students up if we judge the exam to have been too difficult. We never curve students down.

In order to minimize inequities among the grading practices of recitation instructors, at the end of the semester we curve their grades as follows: On each exam, we calculate a median score for each instructor. At the end of the semester, we total all the medians. Any point differential is added to the lower scores to bring them up to the score of the highest instructor. We will inform you only of the amount of this curve, not the running total of medians.

Late work is not accepted. If you anticipate extenuating circumstances that may prevent you from completing an assignment, please arrange with your recitation instructor an alternate deadline or assignment in advance. If you have a medical emergency, provide a copy of the appropriate paperwork to your recitation instructor when you return.

This course has no extra-credit assignments.

Accommodations

We are happy to accommodate students with documented disabilities. Please let us know as soon as possible.

Honor code

The Virginia Tech Honor Pledge is: "I have neither given nor received unauthorized assistance on this assignment." *Violations will be prosecuted, as I have no tolerance for plagiarism or any other form of lying or cheating.* Read about the Code at www.honorsystem.vt.edu so that you understand how the process works. If you are unsure about what constitutes plagiarism on an assignment, please ask *before* submitting it

Equity and respect

Throughout the semester, we ask you to examine your perspectives and values as individuals, engineers, students, and people situated in a globalized world. As you engage in self-discovery and learn about your classmates, we encourage you to respect and appreciate differences. Our classroom needs to be open and hospitable to all class members.

Appendix 1: grading standards for threaded discussion assignments

A threaded discussion contribution is an online, written response to the readings and other class activities during the previous week.

The main purpose of this assignment is to help you practice positioning yourself in a world of differing perspectives. Your challenge is to be disciplined in your reading and thoughtful in your reactions. When the assignment works well, it sharpens your ability both to listen to other perspectives and to develop and articulate your own. In addition, contributing to weekly threaded discussions will help you prepare for Friday lab/recitations and complete your Reflections assignments.

You are required to contribute one or more responses for which online discussions are posted. Each response should be 1-2 paragraphs in length and is worth 10 points. You will receive credit and a grade per week rather than per response.

You post your contribution in a forums at your Scholar site. Each response must demonstrate an understanding of the reading for that week. In particular, responses should quote directly from at least one assigned reading (cite the author's last name and page number of the quotation). Feel free to respond to other class material as well. Recitation instructors will post in advance potential topics for you to consider in your comments.

At least 4 of your 8 postings should respond to at least one other student's posting. Feel free either to contribute to one of the topics we identify or introduce a new topic. When you respond to other classmates' postings, you may constructively challenge another's assumptions, seek to describe one another's perspective, or otherwise account for similarities and differences in the positions you take.

The due date for all postings is 5PM, mostly on Thursdays. Please review all online postings prior to coming to recitation on Friday.

Rubric for evaluation of contributions to threaded discussions

For the grade of B (8 or 8.5 pts): Shows clear comprehension of the readings, and understanding of classroom discussions and assignment. Is thoughtful and reflective, written in a clear, comprehensible style without major spelling or grammatical errors.

For the grade of A (9, 9.5, or 10 pts): In addition to meeting all the requirements for the B grade, asks generative questions that point readers in the direction of more sustained inquiry and discussion. Provides insightful analysis of readings and classroom discussions, and goes beyond issues raised in class.

For the grade of C (7 or 7.5 pts): Appropriately addresses the readings, classroom discussions, and assignment, but demonstrates more limited comprehension, thought, and reflection. Is not entirely clear and comprehensible. May have significant grammatical and/or spelling errors.

For the grade of D: (6 or 6.5 pts): Significantly fails to comprehend the readings, classroom discussions, and assignment. Demonstrates very little thought and reflection. May be unclear to the point of being almost incomprehensible. May have major grammatical and spelling errors.

For the grade of F: (5 pts or below): Entirely fails to comprehend the readings, classroom discussions, and assignment. No thought or reflection. Entirely unclear or incomprehensible. Major grammatical and spelling errors.

Appendix 2: grading standards for homeworks and reflections assignments

Homeworks and reflections assignments are formal essays. We look for three things in essays:

- (1) A well-structured argument. In a longer piece, this means a good introduction and conclusion, with well-structured paragraphs in the middle. In a short piece, this means well-structured paragraphs, possibly with an introductory and/or concluding sentence or two. The paragraphs must respond directly and fully to the question.
- (2): Good mechanics. This includes good sentences, grammar, spelling, etc. This is a time to practice your writing when the stakes are fairly small.

(3) Nuggets of insight. Nuggets of insight are bits of evidence that you are bringing something to the question and are not simply reporting what someone else has said or done. Presence of a nugget indicates that you have reflected on the material some and are attempting to take something significant away from your experience with the material. The best answers have all three.

Homeworks and reflections assignments are graded according to the following criteria:

- (A): Great work that meets or exceeds all requirements.
- (B): Good work that meets most requirements.
- (C): Fair work that meets minimal length and content requirements.
- (D): Poor work that fails to meet length and content requirements.
- (F): Unacceptable work

The points equivalents are as follows:

	10pts	15pts	20pts
A		15	20
	10	14.5	19.5
	9.5	14	19
	9	13.5	18.5
			18
B	8.5	12.5	17.5
	8	12	17
			16.5
			16
C	7.5	11.5	15.5
	7	11	15
		10.5	14.5
			14
D	6.5	10	13.5
	6	9.5	13
		9	12.5
			12
F	5.5 and below	8.5 and below	11.5 and below