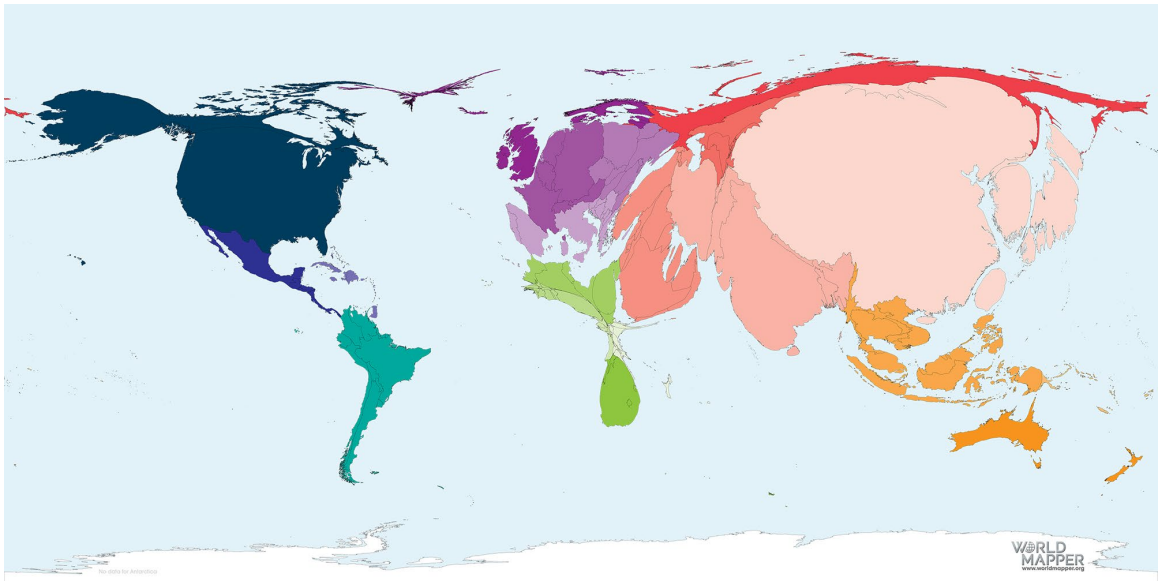
STUDY GUIDE

Theory of Energy and Sustainability Engineering (ENG 571)

Fall 2023



Carbon Emissions Map, 2020, resizing the territories according to the proportion of carbon dioxide emissions. Carbon dioxide causes roughly 60% of the 'enhanced greenhouse effect' or global warming resulting from certain gases emitted by human activities. In 2020 there were almost 50 billion tons (or 50 Gt) of carbon dioxide emitted worldwide. Of this, about 30% came from North American territories; 0.09% came from Central African territories. Emissions of carbon dioxide vary hugely between places, due to differences in lifestyle and ways of producing energy. Whilst people living in 60 territories emitted less than 1 ton per person in 2020; more than 10 tons per person were emitted by people living in the highest polluting 21 territories that year.

Most emissions in 2020 were produced by far in China (10.7 Mt CO_2), followed by the USA (4.7 Mt CO_2), India (2.4 Mt CO_2), Russia (1.6 Mt CO_2) and Japan (1 Mt CO_2). Iran, Germany, Saudi Arabia, South Korea, and Indonesia complete the "top 10".

The highest per-capita emissions show a different picture. The worst carbon emitters per capita were Qatar, followed by New Caledonia, Mongolia, Trinidad and Tobago, and Brunei. The highest emissions per GDP were produced in Mongolia, followed by Trinidad and Tobago, Turkmenistan, Libya and South Africa.

Source: https://worldmapper.org/maps/co2-emissions-2020/

COURSE ORGANIZATION

Course coordinator: Prof. Leon Liebenberg, Department of Nuclear, Plasma & Radiological Engineering, 121 Talbot Laboratory, 104 S. Wright St., Urbana 61801

E-mail: leonl@illinois.edu Tel: (217) 904-0694

Lectures: The course will be online-only and run from 8/23/2023 to 12/06/2023. All lectures have been recorded and are available on the course's webpage on Canvas.

Course webpage (Canvas): https://canvas.illinois.edu/courses/38128

If you have difficulties accessing Canvas, then please contact consult@illinois.edu, *not* the course coordinator, *nor* the instructors, *nor* the course assistant.

Instructors:

Prof. John Abelson, Materials Science & Engineering, abelson@illinois.edu
Prof. Paul Debevec, Physics, debevec@illinois.edu
Dr. Seyed Reihani, Nuclear, Plasma & Radiological Engineering, sreihani@illinois.edu
Dr. Mohsen Jahandardoost, University of Nevada, Las Vegas
Prof. Rizwan Uddin, Nuclear, Plasma & Radiological Engineering, rizwan@illinois.edu
Mr. Frank Holcomb, U.S. Army Construction Engineering Research Laboratory, fholcom2@illinois.edu
Prof. Tim Grunloh, Nuclear, Plasma & Radiological Engineering, tgrunloh@illinois.edu

The instructors are available for consultation, but by appointment only.

Course assistant ("CA"): The course assistant will grade all your assignments. You will be able to chat online (via *Piazza*) with your CA, Mr. Snehith Mekala, regarding difficulties that you might experience with general theory or assignments. The CA will, however, not help you to complete quizzes. You could also attend the CA office hours, as detailed below. Please note that students must show their own calculations when asking for assistance. Otherwise, students will be asked to first attempt the problems by themselves and to show evidence of their efforts before the CA helps.

Mr. Narasimha Rao Talluri
nt20@illinois.edu
Office hours: Sundays at 9 p.m.
https://illinois.zoom.us/s/86294147819
Meeting ID: 862 9414 7819
Password: 742698

Narasimha Rao Talluri is at UIUC, pursuing a master's degree in energy systems engineering. He received a mechanical engineering bachelor's degree from the Institute of Aeronautical Engineering in India. Narasimha is passionate about renewable energy and sustainable development.

Your queries: You may submit queries or questions anytime via *Piazza*. Students are encouraged to view their classmates' questions and to participate in course discussions on *Piazza*.

Sign up at: https://piazza.com/illinois/fall2023/eng571

Private questions should be directed using the "Private" option on *Piazza*, else the whole class will see your query / request. The course assistant or the instructor will respond to your questions as soon as they can.

The course assistant and the instructor will attempt to address your queries promptly from Mondays to Fridays (9 a.m. – 5 p.m.) and less promptly after these hours or over weekends.

Course Coordinator's office hours: Professor Liebenberg's office hours will be online-only (via Zoom) and held on Thursdays from 4:00 – 5:00 p.m.

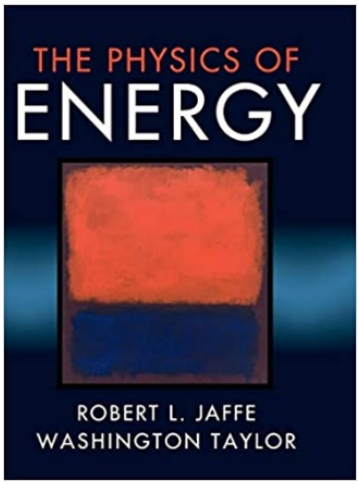
https://illinois.zoom.us/j/89833760805?pwd=K1gvL1RLeDB5bjBYNVFqYisrOFJTdz09
Meeting ID: 898 3376 0805
Password: 511839

If office hours do not work for you, then you should send Prof. Liebenberg an email clearly stating your difficulty and attaching any relevant information (such as calculations).

Course notes / slides / recordings: All lectures have been recorded and are available on the course's Canvas site. All assignments and reading materials will be posted on Canvas.

Prescribed textbook: Jaffe and Taylor: "The Physics of Energy," Cambridge University Press, eBook ASIN: B07951V6C4; Hardcover ISBN: 9781107016651 / 9781108546799.

This book (or e-book) is available from the Illini Union Bookstore or amazon.com, or from other reputable booksellers. You can also purchase the book or an e-book subscription from the publisher. A hard copy of this book is available at the front desk of the Grainger Engineering Library for short-term use inside the library.



Reading material

The prescribed textbook by Jaffe and Taylor is comprehensive, spanning from basic physics to the important details of real-world energy systems. We will assign sections to read that correspond to lectures. You can self-study any aspect you wish, for example, as part of your term project. Additional readings will be posted in the modules for each lecture.

Resources

See the extensive online class Bibliography! It is worth reading this carefully and checking out the hyperlinks.

Participation

Full class participation is essential for effective learning. You are expected to attend online lectures and to *actively participate in class discussions.*

All class communications will use your UIUC NetID email; do not use any alternate such as gmail.

Assignments

All assignments and reading materials will be posted on Canvas. All completed assignments should be uploaded as a single document (not multiple sheets). Please make sure that your work is neat and legible. Graded homework and feedback on term project deliverables will also be posted on Canvas. Your assignments will comprise the following:

- Readings *(complete prior to lectures)*
- Problems on the readings (*assigned for many, but not all, of the lectures*)
- Three homework sets
- Independent term project
- Presentation of your term project
- *No midterm or final exam*

Term project

You will complete a term project *on a topic of your choice, related to the course material*, based on a quantitative analysis. You will be provided with a template with instructions to guide you through the process.

The project will be due in stages called "Deliverables," as follows:

1. Goal and Approach
2. Methodology
3. Results
4. Discussion and Recommendations
5. Presentation: A poster or short talk (*to be determined*)

Feedback between class members

Some of the lectures are small group discussions in which fellow class members will read a portion of your term project and make constructive suggestions. Note: we have done this for years and the feedback has always been helpful, respectful, and collegial. *If you have any concerns about having your work critiqued by a fellow class member, contact the instructor to request an alternative.*

Credit distribution

Attend all lectures	10% (*both Zoom and Mediaspace keep a detailed attendance record*)
Homework and problems	40%
Term project	40%
Final presentation	10%

4 hours course credit: Those of you who signed up for 4 hours of course credit will have extra homework problems and a choice of additional class contributions (*to be discussed*).

Late work: *Term project Deliverables must be submitted on time so that the peer feedback process works properly*. For homework and other problems, credit for the assignment is reduced by 5% per day late.

No-penalty extensions to the due date will be considered by the course coordinator (Prof. Liebenberg), *but only if the student sends advance notice* by email to the course coordinator (Prof. Liebenberg), except for an emergency.

The *only* valid reasons for missing a quiz submission deadline are:

a. student illness or accidental injury;
b. serious illness, serious injury, or death in the student's direct family;
c. birth of a child for which the student is identified as a parent on the birth certificate;
d. required duty in the U.S. military (active-duty, reserve, or in a National Guard unit activated by the President or a governor), required service in a foreign military organization acting in concert with the United States, or service under provisions of the Volunteer Emergency Worker Job Protection Act;
e. participation in, or travel to, an obligatory AFROTC, NROTC, or ROTC event;
f. participation in, or travel to, varsity or DRES-sanctioned athletic events (excluding fencing, bowling, and other club sports);
g. participation in, or travel to, an organized extracurricular activity sanctioned by the College of Engineering or one of its departments, for which a full-time or emeritus faculty member of the College of Engineering attests that the student's participation is essential;
h. observance of a religious holiday;
i. any excuse allowed by the UIUC for students participating in online learning.

If the student was so seriously ill or injured as to be unable to communicate their intentions to the instructor prior to the beginning submission deadline, the advance notification requirement will be waived if the student subsequently provides satisfactory documentation of such incapacitation.

In those cases where advance notification of lateness or non-submission has been provided, or where such notice has been waived according to the provisions of the second sentence of the above paragraph, late submissions of non-submissions will be classified as unexcused unless the student provides satisfactory after-the-fact documentation, as indicated below.

For illness or injury of the student, a satisfactory letter stating that the student was medically unfit to complete the quiz by the submission deadline must be provided by an appropriate medical practitioner (C.N.P., D.D.S., D.M.D., D.O., D.P.M., M.D., O.D., or P.A.) after the quiz submission deadline. *Medical bills, prescriptions, e-mail or letters from friends or relatives, letters from naturopaths, chiropractors, psychologists, and mental health counselors, "visit slips" from McKinley Health Center, and records of calls to McKinley Health Center's Dial-a-Nurse program (with or without endorsement by an "emergency dean" in the Office of the Dean of Students) are among the types of documentation that will not be accepted.*

For serious illness, serious injury, or death in the student's family, the student's relationship to the ill, injured, or deceased party must be established, along with documentation of the illness, injury, or death.

For birth of a student's child, a photocopy of an original birth certificate, showing the student as a parent, is required.

For military duty, copies of valid military orders are required.

For participation in or travel to varsity or DRES-sanctioned athletic events or AFROTC/NROTC/ROTC events, a satisfactory letter from the Division of Intercollegiate Athletics, DRES, or the commanding officer of the detachment is required.

For participation in, or travel to, an organized extracurricular activity sanctioned by the College of Engineering or one of its departments, a satisfactory letter from the faculty sponsor is required.

Independent work: You may collaborate with your classmates to figure out the necessary concepts and approaches, *but you must solve the problems independently*. *See Academic integrity, below.*

Communication etiquette: We welcome communications concerning possible errors, or constructive suggestions about the materials. Please do not contact us to request increases in your assigned grade, outside of errors in grading. All class communications will use your UI NetID email; do not use any alternate such as gmail.

If you believe that an assignment has been incorrectly graded, communicate this with the instructor within 5 working days after the assignment has been handed back to you. After that period, your assignment will not be regraded, and your grade will remain unchanged.

Most Valuable Players (MVPs): As mentioned, you should state all your queries via Piazza. Piazza is configured to allow any student to post anonymously to their classmates whenever they prefer. In each discussion thread, different anonymous posters are automatically differentiated with pseudonyms to avoid confusion. The instructor invites you all to help answer your classmate's Piazza questions. The course assistant and the instructor will keep track of each time a student suitably answers a fellow student's Piazza question. At the end of the semester, we will tally all the results to see which students consistently and significantly helped their fellow classmates the most. Those winning students will each receive a bump of 1% in their final grade! Those winning students will also win the "Most Valuable Player" certificates that will be awarded at the end of the semester. We encourage the students in our class to make the most of this opportunity. This helps you to learn from each other's understanding of the course and increase your grades! And, as you answer the questions posted by your fellow classmates, you will realize that it also betters your own understanding of any concept.

Note: When the course assistant or instructor award "good post" awards on Piazza, which will eventually be tallied to give us the MVPs, they will use the following criteria:

- Does the question or the answer clarify a technical (not class-administrative) issue which was vague or confusing in the class instructional materials (lecture announcements and syllabus)?
- Does the question or the answer demonstrate unique and thoughtful engagement with the course material?
- Is one student going out of their way to clarify something from the lecture to another student?
- Does reading what the student wrote make you excited to learn more about the energy systems?
- Other: (New justification which we can apply retroactively).

Final grade

Letter grades assigned at semester's end are based on composite numerical scores, weighted as previously described. The instructors and the course coordinator have no predetermined "target" grade distribution and the distribution can vary significantly from semester to semester. Also, there is no "curving" of grades in this class.

Note that grades will be automatically rounded-up to the nearest whole number. For example, if you have a final grade of 93.2%, the grade becomes 93%; if you have a final grade of 93.6%, it becomes 94%.

Letter grades at semester's end

Grade meaning	Refined letter scale	Numerical scale of marks
Excellent	A+	97 - 100
	A	94 – 96
	A-	90 – 93
Good	B+	87 – 89
	B	84 – 86
	B-	80 – 83
Adequate	C+	77 – 79
	C	74 – 76
	C-	70 – 73
Marginal	D+	67 – 69
	D	64 – 66
	D-	60 – 63
Inadequate	F	0 – 59

SYLLABUS (subject to change)

Date	Topic	Speaker	Assigned or Due
Aug 21	Course objectives and topics	Prof. John Abelson	Assigned: *Survey*
Aug 23	Climate Change COP 27	Prof. Paul Debevec	
Aug 25	Term project: Defining the "problem" to be analyzed	Prof. John Abelson	Assigned: *Term project*
Aug 28	Risk, uncertainty, and elementary statistics	Prof. John Abelson	Due: *Survey*
Aug 30	Groups: Power a country by renewables?	Class members	
Sept 1	Thermodynamic and other limits	Prof. Paul Debevec	
Sept 4	*Labor Day* (no class today!)		
Sept 6	Thermodynamic and other limits, *continued*	Prof. Paul Debevec	
Sept 8	Energy economics: Fundamentals	Prof. John Abelson	
Sept 11	Energy economics: Applications	Prof. John Abelson	Due: *Deliverable #1*, Goal / Approach
Sept 13	**By Zoom:** Critique Deliverable #1	Class members	
Sept 15	Water-energy, energy-water requirements	Prof. Paul Debevec	
Sept 18	Materials for sustainability	Prof. John Abelson	Assigned: *HW 1*
Sept 20	Desalination and water pumping	Dr. Seyed Reihani	
Sept 22	Heat transfer	Dr. Seyed Reihani	
Sept 25	Building energy simulation using *ZEROS*	Prof. John Abelson	Due: HW 1
Sept 27	Groups: Home energy simulations	Class members	
Sept 29	Negative emissions: CCS, air capture, reforestation	Prof. Paul Debevec	
Oct 2	Phase change	Dr. Seyed Reihani	
Oct 4	Thermal power	Dr. Seyed Reihani	
Oct 6	Intermittency of solar and wind power	Prof. Paul Debevec	
Oct 9	Microgrid simulation using *HOMER*	Prof. John Abelson	Due: *Deliverable #2*, Methodology
Oct 11	**By Zoom:** Critique Deliverable #2	Class members	
Oct 13	Nuclear challenges: Safety and fuel disposal	Prof. Rizwan Uddin	
Oct 16	Nuclear challenges, *continued*	Prof. Rizwan Uddin	Assigned: *HW 2*
Oct 18	Proposed SMR at UI	Prof. Tim Grunloh	
Oct 20	The power grid and microgrids	Prof. Paul Debevec	
Oct 23	Energy storage, part I	Dr. Seyed Reihani	Due: *HW 2*
Oct 25	Presentation by a student or team of students	Class members	
Oct 27	Energy efficiency and conservation	Dr. Seyed Reihani	
Oct 30	Thermal conversion	Dr. Seyed Reihani	
Nov 1	Illinois Geothermal	Mr. Frank Holcomb	
Nov 3	Insolation and concentrated solar power	Prof. John Abelson	
Nov 6	Photovoltaic devices and modules	Prof. John Abelson	Due: *Deliverable #3*, Results
Nov 8	**By Zoom:** Critique Deliverable #3	Class members	
Nov 10	Geoengineering: Is it practical? Inevitable?	Prof. Paul Debevec	
Nov 13	Energy storage, part II	Dr. Seyed Reihani	Assigned: *HW 3*
Nov 15	Internal Combustion engines	Dr. Seyed Reihani	
Nov 17	Biomass, biofuels, better plants	Prof. Paul Debevec	
	– FALL ("THANKSGIVING") BREAK –		
Nov 27	Sustainable development: 5-step assessment	Prof. John Abelson	Due: *HW 3*
Nov 29	Groups: The 5-step assessment	Class members	
Dec 1	Final Presentations I	Class members	
Dec 4	Final Presentations II	Class members	Due: *Presentation* (= 4 PowerPoint slides)
Dec 6	Semester over, but…		Due: *Term project* (= 3 Deliverables + Recommendation)

Course Objectives

Students will be asked to demonstrate their knowledge of the material covered in ENG 571 through their mastery of the following course objectives:

- Learning the scientific and engineering fundamentals, as well as elements of policy and economics needed to develop energy systems and infrastructure that are sustainable in terms of resources, security, and environmental impact.

Approach

The class format will include lectures, small group problem solving, and an independent term project. Students are expected to read the materials in advance, and to engage actively during discussions.

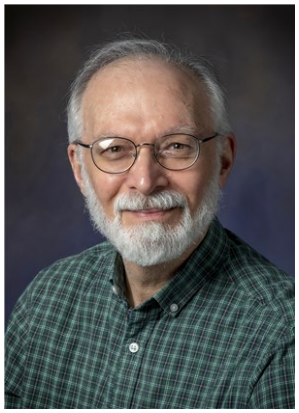
The EaSE seminar, ENG 471, is an important pre- or co-requisite for the material in this class. The lectures from Fall 2022 are posted in the Canvas module "Seminars from ENG 471."

The Energy and Sustainability Engineering (EaSE) graduate certificate

ENG 471 and ENG 571 are the core courses in the EaSE graduate certificate. If you are enrolled in any M.S. or Ph.D. degree program, consider adding the certificate to your credentials: EaSE.Illinois.edu

Guiding "big picture" questions for ENG 571

When he founded the Energy and Sustainability Engineering program at UIUC, *Professor John Abelson* generated some superb guiding "big picture" questions for ENG 571. As you go through the topics of ENG 571, Professor Abelson's questions will help you to form an interconnected understanding of the challenges and opportunities in the energy and sustainability fields and will stimulate you to ask probing questions.



Professor John Abelson, Department of Materials Science and Engineering, founder of the Energy and Sustainability Engineering program at UIUC.

There are many ways to frame these questions. As a starting point, Professor Abelson proposes the following:

> ***Stakeholders:*** What groups of people, or regions of the world, are directly affected by a given issue? Or indirectly affected?
>
> ***Time scale:*** How soon does this issue become critical enough to motivate a major stakeholder? Can changes in human activity be implemented in time to avoid or offset major consequences?
>
> ***Solutions:*** Do there exist technologies or approaches that can make a substantial reduction in impact for this issue? If technologies are available, what are the challenges to implementation – scale-up, economic, policy, social acceptance, other?
>
> If not currently available, can new technologies be developed soon enough that the anticipation of future availability can be used in current planning decisions? Here, one may include plausible incremental improvements (e.g., improved efficiency or cost reductions), but not breakthroughs, which are (by definition) unknown.
>
> *And we should not expect miracles.* There are always fundamental (thermodynamic) and practical (engineering) limits to what is possible. A good technology may reach 50 % of the fundamental limit, and a great one 75% of the limit. Never believe a claim that obviously exceeds this.
>
> ***Physical scale:*** Can the proposed technology be employed *at scale*, meaning enough units, soon enough to make an impact? This involves ramping up the *manufacturing supply chain*. In some cases, such as the fabrication of modular (compact) nuclear power plants, a supply chain does not yet exist and must be created!
>
> Note that systems with major infrastructure investment – fossil energy, for example – *require decades to change*. That is because, from an investment point of view, CEOs prefer to use existing systems until

they need physical replacement, rather than to invest in new systems earlier than otherwise needed. Only in a few cases (e.g., replacing incandescent light bulbs) is the saving from a new technology (compact fluorescent or LED bulbs) so great that early retirement makes economic sense.

The above is not good news from a sustainability perspective but is a reality that must be dealt with.

Fundamental tradeoffs: For a given situation – e.g., heating a home or driving a vehicle – *there does not exist a solution that simultaneously maximizes all benefits and minimizes costs and consequences*. (If there were, we would already be using it!)

Typically, we can lower environmental impact by investing in a more efficient system. An immediate question is whether we have (or want to spend) more money on capital costs. Also, the efficiency gain may, or may not, lower the net costs over the lifetime of the system, particularly if calculated using economic "discounting."

And there is always a minimum impact that cannot be reduced (unless we lower total demand for that technology). For example, if we insulate a house to enormous levels, the energy required to manufacture *surplus* insulation becomes greater than the energy saved by its use. Or if we reduce the fuel consumption of an automobile by changing the materials of construction to reduce the mass, above some level of improvement the energy needed to manufacture the lightweight materials is greater than the energy saved through their use. Also, it can be much more difficult – or impossible – to recycle advanced materials at the end of life of the auto.

Ecosystem services: Human activity – economic activity – cannot occur without impact on the earth and its ecosystem. Farming, logging, animal husbandry, etc., are examples of economic activity that derive from "ecosystem services." Mining, a crucial economic activity, also draws resources from the earth, but not from the active ecosystem; however, mining activity has ecosystem consequences.

When does human economic activity trigger an ecosystem degradation from which recovery of important functions is difficult or impossible on intergenerational time scales?

At high levels of economic activity, the direct or secondary effects are large and the changes (damage) to the ecosystem are obvious. At very low levels, the effects of human activity may not be noticeable or significant compared with naturally occurring variations. At moderate levels, the ecosystem still functions, but operates in a new state that, although different from the original equilibrium, may not degrade rapidly. But ecosystems are very complex and interdependent, so the real impacts may not be clear in the short run.

Academic integrity

The highest academic integrity is expected. Academic violations will however be dealt with according to the UIUC Student Code, Article 1, Part 4. Violations will be reported to the College of Engineering. The recommended penalty will be either failure of the course, or dismissal for the M.Eng. program and separation from the College of Engineering or UIUC.

Specific comments about academic integrity

- All students are responsible to refrain from infractions of academic integrity, conduct that may lead to suspicion of such infractions, and conduct that aids other in such infractions. "I did not know" is not an excuse.
- The following are academic integrity infractions (http://www.provost.illinois.edu/academicintegrity/students):
  - ✓ Cheating: using or attempting to use unauthorized materials.
  - ✓ Plagiarism: representing the words, work, or ideas of another as your own.
  - ✓ Fabrication: falsification or invention of information, including citations.
  - ✓ Facilitating infractions of academic integrity, helping, or attempting to help another commit infraction.
  - ✓ Bribes, favors, and threats: actions intended to affect a grade or evaluation.
  - ✓ Academic interference: tampering, altering, or destroying educational material or depriving someone else of access to that material.
  - ✓ Note: All infractions are documented in the campus-wide FAIR database.

- If you have difficulty completing your classwork, you should consult the instructor by showing him evidence of your attempts to solve the specific problem/s. However, most lecture time has been set aside exactly for this type of activity; use it to your full advantage.
- Copying (in whole or in part) another student's (or team's) quiz, project work, or exam is not permitted. Copying solutions from web-based answer keys such as Chegg is an honor code violation.
- Be sure to follow the course and University's regulations pertaining to the use of Artificial Intelligence (AI) tools such as Chat GPT, ChatSonic, or Jasper.
- If you choose to discuss your work with a fellow student, it should be a discussion in which one teaches the other, or where both work to a mutual understanding. The discussion should however relate to general concepts and not address the specifics of the quiz questions.
- It is not acceptable to give a fellow student your completed project work or quiz or other assignment so that they can copy it. In such a case, both you and your fellow student will have committed an academic violation.
- It is also unacceptable to copy work from a student who completed the course previously.
- You should properly cite references and sources in your written reports. Cases of cheating or plagiarism will be handled severely.

  Also, be wary to correctly use quotation marks for sentences or important data that did not originate with you. Further, paraphrasing should be kept to a minimum. When used, the paraphrased section should be specifically identified by citing the original source. It is not sufficient to simply provide a list of references but not indicate where a specific quotation or paraphrase was employed. In addition, all sources should be fully cited. As is done in scientific and engineering literature, you should briefly acknowledge in writing any significant discussions or interactions you had regarding the work you are reporting on.
- Ignorance of academic integrity or uncertainty regarding the instructor's wishes are not justifiable reasons for academic violations. If you are uncertain of the instructor's wishes or intentions, you should consult with him *before* acting.

College of Engineering statements

Sexual Misconduct Reporting Obligation

The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX Office. In turn, an individual with the Title IX Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options.

A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here: wecare.illinois.edu/resources/students/#confidential.

Other information about resources and reporting is available here: wecare.illinois.edu.

Community of Care

As members of the Illinois community, we each have a responsibility to express care and concern for one another. If you come across a classmate whose behavior concerns you, whether in regards to their well-being or yours, we encourage you to refer this behavior to the Student Assistance Center (217-333-0050 or http://odos.illinois.edu/community-ofcare/referral/). Based on your report, the staff in the Student Assistance Center reaches out to students to make sure they have the support they need to be healthy and safe.

Further, we understand the impact that struggles with mental health can have on your experience at Illinois. Significant stress, strained relationships, anxiety, excessive worry, alcohol/drug problems, a loss of motivation, or problems with eating and/or sleeping can all interfere with optimal academic performance. We encourage all students to reach out to talk with someone, and we want to make sure you are aware that you can access mental health support at the Counseling Center (https://counselingcenter.illinois.edu/) or McKinley Health Center (https://mckinley.illinois.edu/).

Mental Health

Significant stress, mood changes, excessive worry, substance/alcohol misuse or interferences in eating or sleep can have an impact on academic performance, social development, and emotional wellbeing. The University of Illinois Urbana-Champaign offers a variety of confidential services including individual and group counseling, crisis intervention, psychiatric services and specialized screenings which are covered through the Student Health Fee.

If you or someone you know experiences any of the above mental health concerns, it is strongly encouraged to contact or visit any of the University's resources provided below. Getting help is a smart and courageous thing to do for yourself and for those who care about you.

- Counseling Center (217) 333-3704
- McKinley Health Center (217) 333-2700
- National Suicide Prevention Lifeline (800) 273-8255
- Rosecrance Crisis Line (217) 359-4141 (available 24/7, 365 days a year)

Academic Integrity

The University of Illinois at Urbana-Champaign Student Code should also be considered as a part of this syllabus. Students should pay particular attention to Article 1, Part 4: Academic Integrity. Read the Code at the following URL: http://studentcode.illinois.edu/.

Academic dishonesty may result in a failing grade. Every student is expected to review and abide by the Academic Integrity Policy: https://studentcode.illinois.edu/article1/part4/1-401/. Ignorance is not an excuse for any academic dishonesty. It is your responsibility to read this policy to avoid any misunderstanding. Do not

hesitate to ask the instructor(s) if you are ever in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity.

Religious Observances

The Religious Observance Accommodation Request form is available at http://odos.illinois.edu/community-ofcare/resources/docs/Religious-ObservanceAccommodation-Request-Form.pdf. Submit the form to the instructor and to the Office of the Dean of Students (helpdean@illinois.edu) by the end of the second week of the course; in the case of exams or assignments scheduled after this period, students should submit the form to the instructor and to the Office of the Dean of Students as soon as possible.

Disability-Related Accommodations

To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the Disability Resources and Educational Services (DRES) as soon as possible. To contact DRES, you may visit 1207 S. Oak St., Champaign, call 333-4603, e-mail disability@illinois.edu or go to https://www.disability.illinois.edu. If you are concerned you have a disability-related condition that is impacting your academic progress, there are academic screening appointments available that can help diagnosis a previously undiagnosed disability. You may access these by visiting the DRES website and selecting "Request an Academic Screening" at the bottom of the page.

Family Educational Rights and Privacy Act (FERPA)

Any student who has suppressed their directory information pursuant to Family Educational Rights and Privacy Act (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See https://registrar.illinois.edu/academic-records/ferpa/ for more information on FERPA.

Inclusion

The intent is to raise student and instructor awareness of the ongoing threat of bias and racism and of the need to take personal responsibility in creating an inclusive learning environment. The Grainger College of Engineering is committed to the creation of an anti-racist, inclusive community that welcomes diversity along a number of dimensions, including, but not limited to, race, ethnicity and national origins, gender and gender identity, sexuality, disability status, class, age, or religious beliefs.

The College recognizes that we are learning together in the midst of the Black Lives Matter movement, that Black, Hispanic, and Indigenous voices and contributions have largely either been excluded from, or not recognized in, science and engineering, and that both overt racism and micro-aggressions threaten the well-being of our students and our university community.

The effectiveness of this course is dependent upon each of us to create a safe and encouraging learning environment that allows for the open exchange of ideas while also ensuring equitable opportunities and respect for all of us. Everyone is expected to help establish and maintain an environment where students, staff, and faculty can contribute without fear of personal ridicule, or intolerant or offensive language. If you witness or experience racism, discrimination, micro-aggressions, or other offensive behavior, you are encouraged to bring this to the attention of the course director if you feel comfortable.

You can also report these behaviors to the Bias Assessment and Response Team (BART) (https://bart.illinois.edu/). Based on your report, BART members will follow up and reach out to students to make sure they have the support they need to be healthy and safe. If the reported behavior also violates university policy, staff in the Office for Student Conflict Resolution may respond as well and will take appropriate action.

Emergency response recommendations can be found at the following website: http://police.illinois.edu/emergency-preparedness/. You are encouraged to review this website and the campus building floor plans website within the first 10 days of class. http://police.illinois.edu/emergencypreparedness/building-emergency-action-plans/

Enjoy the course!