STUDY GUIDE

Orientation to Capstone Project in Energy Engineering (ENG 573—ESN)

Fall 2025

Prof. Leon Liebenberg

*Energy entrepreneur **Steve Vavrik** (Earthrise Energy) discusses project developments with his engineering team. He successfully raised $600 million to build a 270 MW$_e$ solar farm in Gibson City, Illinois. Image credit: Earthrise Energy*

Aerial image of the first stage of Earthrise Energy's 270 MW$_e$ solar farm, which will eventually house more than 595,000 bifacial solar modules of 590 W each, and 75 4-MW$_e$ inverters. Image credit: Earthrise Energy

COURSE ORGANIZATION

Instructor: Prof. Leon Liebenberg, Energy and Sustainability Engineering, Department of Nuclear, Plasma & Radiological Engineering, 121 Talbot Laboratory, 104 S. Wright St., Urbana 61801

E-mail: leonl@illinois.edu   Tel: (217) 300-5496

Lectures: The course will be presented in room 2015 of ECEB (Electrical and Computer Engineering Building) on Mondays between 4:00 and 4:50 p.m. Lectures will be recorded and placed on the course's Canvas site in the Modules folder. Recordings will also be available on Media Space: https://mediaspace.illinois.edu/channel/channelid/351571852

Students who have registered to take the course asynchronously may join the class online; all other students must participate in-person in every lecture.

Zoom link for online students: If you have registered for the course as an online student, you should join the class using the following Zoom link:

Join Zoom Meeting
https://illinois.zoom.us/j/86378573336?pwd=dHfubbb4GyDdnzAEblwoxATCzhRmLv.1

Meeting ID: 863 7857 3336
Password: 654879

Course Organization: You are expected to adhere strictly to the syllabus, complete the readings, and meet all assignment deadlines. The instructor will not provide reminders for course deliverables; it is your responsibility to manage and complete these tasks independently. As a master's level course, it requires you to develop proficiency in independent work and demonstrate mastery of the learned concepts. This course is therefore self-directed with minimal guidance from the instructor and teaching assistant.

Electronic devices (including cell phones and laptops) are not permitted during class. To foster a focused, thoughtful, and fully engaged learning environment, the use of electronic devices is not allowed during lectures. Our sessions rely heavily on active participation, meaningful discussion, and critical reflection—all of which are best supported when we are fully present and free from digital distractions.

Course webpage (Canvas): https://canvas.illinois.edu/courses/60098

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

Instructor's office hours: Professor Liebenberg's office hours will be held online-only via Zoom on Thursdays from 3:00 p.m. to 3:50 p.m. (excluding holidays).

Join Zoom Meeting:
https://illinois.zoom.us/j/84776638551?pwd=4E6uBrLgaDZr5k1SHqTAaFFDSjZGLa.1

Meeting ID: 847 7663 8551

Password: 217479

If these office hours are inconvenient for you, please email Professor Liebenberg detailing your difficulty and attaching any relevant information, such as calculations.

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/fall2025/eng573esn

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. No questions will be taken during holidays.

Course Assistant: Your course assistant (CA), Mr. Simon Wang, will grade all your assignments and assist with certain class activities. You will be able to chat online (via Piazza or via email) with your CA.

Simon Wang, xw106@illinois.edu

Course Observer: Mr. Feras Alshaheen has kindly agreed to participate in some of your classes. He has a wealth of energy industry experience and knows the MEng (Energy Systems) program well.

Feras Alshaheen, ferasaa2@illinois.edu

COURSE OVERVIEW

Course Overview: This 1-credit-hour master's course in energy engineering is designed to enhance professional skills through both individual and team projects. The course focuses on developing writing, communication, and teamwork abilities. Key activities include cultivating an entrepreneurial mindset; critiquing journal papers and technical reports; generating executive summaries, fact sheets, and pitch decks; analyzing case studies; participating in a voluntary site visit; engaging in debates and discussions; practicing reflective exercises; peer-evaluating classmates' work; participating in collaborative learning exercises; and presenting research findings during lectures or in written documents. As a master's level course, it emphasizes guided self-directed learning and requires students to demonstrate proficiency and mastery in these areas.

Course Duration

- **Length:** 15 Weeks
- **Format:** Weekly Lectures (in-person and online, recorded), Team meetings, Discussions, Peer reviews, Presentations, Site visit, Guest lecture(s).

Learning Objectives

1. **Identifying possible topics and techniques for your ENG 573 (3-credit hour) capstone course:** All activities in ENG 573-ESN are designed to help students develop the critical and creative thinking skills essential for both their graduate studies and the 3-credit-hour ENG 573 capstone project later on in their master's program. This course also supports students in exploring their specific interests within the field of energy systems and in identifying potential topics they may wish to pursue for their ENG 573 capstone layer on in their master's program.

   The coursework in ENG 573-ESN focuses on designing a *hypothetical* ENG 573 capstone project. It is important to note that the topics explored in ENG 573-ESN are not part of the official ENG 573 capstone itself; rather, they serve as opportunities to experiment with ideas and learn techniques that may later be applied to the development of a real ENG 573 capstone project.

2. **Develop Entrepreneurial Thinking Skills:** In class participation exercises and homework assignments, students are encouraged to utilize various entrepreneurial thinking attributes. These include fostering curiosity and courage, embracing change, motivating oneself and others, enhancing self-awareness and reflection, improving teamwork and empathy, designing within constraints, employing foresight, balancing big picture and detailed thinking, simplifying complex ideas, learning from failure, mitigating risks, using storytelling, focusing on practical implementation, and considering sustainability, among others.

3. **Develop Writing Skills:** Critique and annotate recent journal papers in energy engineering, understanding the goals, methodology, contributions, and validity.

4. **Develop Communication Skills:** Engage actively in class discussions and debates. Present paper summaries and critiques to a non-specialist audience using PowerPoint presentations, narrative memos, fact sheets, or social media.

5. **Develop Team Working and Engineering Skills:** Form teams to research and create a funding proposal for a sustainability project, which might include a class presentation and formal proposal submission. Teams may also be assigned tasks such as critiquing technical papers or conducting other assessments. Additionally, some class participation activities will involve collaborative teamwork.

Grading Breakdown

- Class participation exercises: **10%**
- Individual assignments: **40%**
- Team activities: **50%**

Readings and Resources

- **Recommended Reading:** Selected papers and resources provided during lectures.
- **Additional Resources:** Access to academic databases and proposal guidelines, where appropriate.

Guest presentations: Other professors and senior graduate students might visit the class, and guest speakers from the Technology Entrepreneur Center or an energy entrepreneur may also participate in some of the lectures.

Peer Grading of Classmates' Work

You may be asked to peer-grade another student's assignment or deliverable. The goal of this process is to support peer learning—that is, learning from one another by engaging with different perspectives and approaches.

When peer-grading, it is essential to follow the provided grading rubric and answer key precisely. Avoid being either too lenient or too harsh, as students may be penalized for significant deviations from the expected standards.

For open-ended questions, provide thoughtful and constructive comments to support your evaluation.

Please note that final grades for all assignments will be determined by the teaching assistant and the instructor, regardless of peer grading.

Peer-evaluations of Team Performance: You might do some graded activities in teams of three. Your team's success depends on everyone doing their part. While your team will receive one shared grade for each assignment, you can highlight teammates who worked especially hard—or raise concerns about unequal participation—through peer evaluations. This helps keep things fair and ensures accountability.

Each team member will *anonymously* rate the contributions of the others. If there are n team members, each team member will have a total of $(n-1) \times 100$ points to assign to the other team members. You will be able to assign a maximum of 130 points and a minimum of 70 points per person. So, if your team comprises three members $(n = 3)$, you must allocate a *total* of $(3-1) \times 100 = 200$ points to the other two members of your team.

This system helps reward those who go above and beyond, and fairly reflect if someone didn't do their share.

To prevent surprises at the end of the semester, teams will complete peer evaluations after each of the three mini-projects. You'll also be given a *team agreement* template to fill out before starting your first project. In it, you'll outline how you plan to work together and how you'll evaluate each other's contributions.

Peer evaluation scores will be used to adjust your individual score. Here's how it works:

- Your average peer score will be divided by 100 to get a *multiplier.*
- Your final score = *team score* × your *multiplier.*

Examples:

- If your teammates give you an average score of 100, your multiplier is 1.0, and you'll get the full team score.
  → Team score = say, 94% → Your score = 94%

- If your average score is 80, your multiplier is 0.8.
  → Team score = say, 94% → Your score = 75.2%

- If your average score is 120, your multiplier is 1.2.
  → Team score = say, 94% → Your score = 112.8%

COURSE OBJECTIVES AND SAMPLE SALIENT COMPONENTS

1. **Develop Entrepreneurial Mindset:** Throughout the course, you utilize various entrepreneurial thinking attributes, including having drive and focus, fostering curiosity and courage, embracing change, motivating oneself and others, enhancing self-awareness and reflection, improving teamwork and empathy, designing within constraints, employing foresight, balancing big picture and detailed thinking, simplifying complex ideas, learning from failure, mitigating risks, using storytelling, focusing on practical implementation, and considering sustainability, among others. You will use these attributes to help identify opportunities, perform value identification, and planning for action-oriented problem-solving.

2. **Develop Writing Skills**
   o **Example Task:** Each student will be provided or be asked to select recent journal papers (published within the last five years) in an area of energy engineering. They will critically evaluate the papers' goals, methodology, contributions, significance, and the validity of the authors' claims.
   o **Example Requirements:**
     - Annotate the papers, for instance, by using "doodle summaries", by simplifying key concepts where possible.
     - Read additional sources to gain a comprehensive understanding of the topic to enhance the critique and annotation.
   o **Example Field Options:** Papers could be from various energy systems-related fields, including but not limited to biomass energy, chemical engineering, materials science, electrical engineering, energy markets, environmental economics, renewable energy, nuclear energy, and solar technologies.

   o **Detailed assignment descriptions** with grading rubrics will be made available on Canvas.

3. **Develop Communication Skills**
   o **Example Task:** Students will present selected papers, including their annotations and critique, to the class using a PowerPoint presentation.
   o **Example Requirements:**
     - The presentation must be understandable to a non-specialist audience.
     - Peers, the teaching assistant, and the instructor will evaluate the presentations.
     - Students whose evaluation scores differ significantly from those of the instructor or CA will face a penalty on their presentation grade.

4. **Develop Teamwork and Engineering Skills**
   o **Team Formation:** Students will form teams of two (with one possible team of three) and select a project topic from a provided list. The teaching assistant will allocate team members based on results from the Learning Preferences survey complete in the first lecture.
   o **Example Tasks:**
     - Conduct independent research on the selected topic.
     - Prepare a funding proposal for a hypothetical or existing engineering project that is to be implemented or expanded on the University campus.

   o **Example Evaluation Components:**
     - **Project Presentation:** Teams will pitch their ideas to the class for feedback.
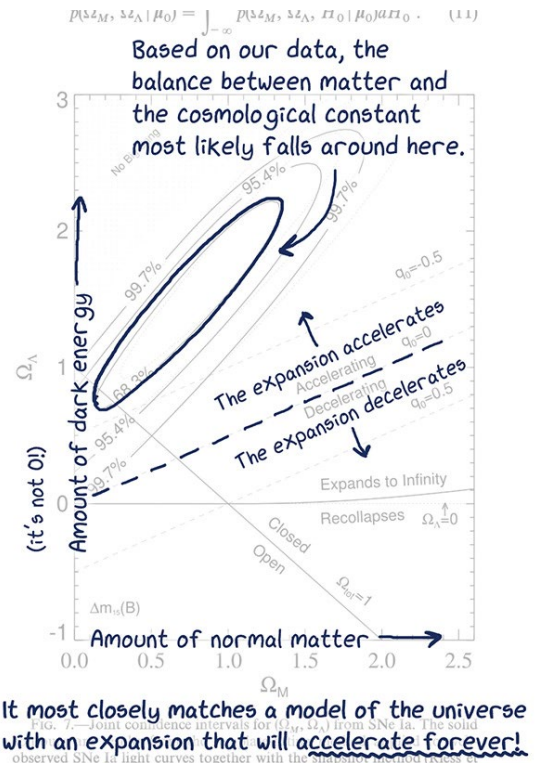
COURSE SCHEDULE / SYLLABUS (subject to change)

Week 1 (Aug. 25): Introduction

- **Lecture:** Course objectives, expectations, and grading criteria.
- **Activity:** Course overview. Brief discussion of requirement for professional development skills. Class participation: complete learning preferences survey.
- **Class Participation Exercise 1:** Complete the short in-class questionnaire. (Due during class time)
- **Assignment 1:** Annotate a short technical paper using a doodle summary. (Due Week 3)

Week 2 (Sept. 1): LABOR DAY (no class)

Week 3 (Sept. 8): Entrepreneurial mindset (individual assignment)

- **Lecture:** Explore the significance of adopting an entrepreneurial mindset when addressing complex problems.
- **Activity:** In pairs, brainstorm solutions to a posed energy challenge, applying the principles of an entrepreneurial mindset.
- **Class Participation Exercise 3:** Overview of an entrepreneurial mindset framework (Curiosity, Connections, Creating Value). (Due during class time)
- **Assignment 3:** Create a one-page fact sheet summarizing your ideas for addressing the specified energy challenge, using attributes of an entrepreneurial mindset. (Due Week 4)

Week 4 (Sept. 15): Writing an executive summary (individual assignment)

- **Lecture:** Learn how to craft an effective executive summary.
- **Activity:** Use Google Scholar to find one recent journal paper (of no less than 10 printed pages) that outlines the state-of-the-art in field of **utility-scale solar power**.

  Note that all project ideas this semester will focus on solving challenges related to utility-scale solar-electrical energy deployment in Illinois. Regarding your choice of solar-electricity project, you could, for instance, focus on one of the following themes:

  - ✓ Community solar for underserved neighborhoods
  - ✓ Solar + storage business models
  - ✓ Grid integration challenges (e.g., grid-following vs. grid-forming inverters)
  - ✓ Strategies to overcome land-purchase for a solar farm
  - ✓ Policy barriers and financing mechanisms
  - ✓ Recycling or repurposing of PV modules

- **Activity:** Using ChatGPT and other AI tools (Adhere to the course study guide / syllabus!)

- **Class Participation Exercise 4:** *Reflect on Value proposition* – Imagine your team is working on a startup idea that would support Earthrise Energy in advancing solar energy adoption in Midwest Illinois. What is the problem or the pain point which the idea or solution addresses? Who's your customer? What's your value proposition (for whom, and why?)? (Due in class)

- **Assignment 4:** Prepare a 300–350-word executive summary of the selected journal paper, but using language that a general audience would understand, related to your area of interest in energy systems.. (Due Week 5)

Week 5 (Sept. 22): Peer grading of executive summaries (individual assignment)

- **Lecture:** Effective feedback techniques and strategies for document revision.
- **Activity:** Review effective peer reviewing techniques, offering constructive feedback and suggestions. Additionally, continue researching your chosen topics in preparation for your final project proposal presentations later in the course.
- **Assignment 5:** Submit marked summary document with peer feedback. (Due Week 6)

Week 6 (Sept. 29): Research and Proposal Development (team assignment)

- **Lecture:** Overview of utility-scale energy project themes, including deployment, grid integration, community impact, and innovative business models.
  Note: Teams may choose any *sustainable energy system* (solar, wind, water, geothermal, nuclear power, battery storage, hydrogen storage, etc.), as long as it's utility-scale. No coal, oil, or natural gas projects will be allowed, nor any carbon capture projects.
  Overview of cost structures, revenue models, and customer segmentation using a simplified Lean Canvas. Discuss typical requirements for project idea proposals. Presentation techniques and feedback strategies.
- **Activity:** Discuss project ideas in allocated teams.
  Contact a stakeholder during the semester—this could be a community group, municipal energy office, or someone at an energy company (even if it's just an email exchange).
  Teams conduct research and begin drafting proposals. Please note that all further project will be based on this assignment, so be sure to do excellent research and to select a suitable project.
- **Real stakeholder(s):** Identify at least one real stakeholder or user group your project could serve (e.g., a community, a company, a utility). You are encouraged to use a Business Model Canvas-lite, e.g., "What is the need? Who will use it? How will it create value?"
- **Assignment 6:** Submit 500-word project proposal. (Due Week 7). Prepare for next week's presentation.

Week 7 (Oct. 6): Problem–Solution Pitch (team assignment)

- **Activity:** Teams present their project idea proposals (from Assignment 6) to the class. Students ask questions in class and make recommendations to improve proposals. Teams must define a minimum viable prototype (MVP) that could demonstrate feasibility.
- **Assignment 7:** Teams present their proposals from Assignment 6 in class.
  Teams submit their updated PowerPoint presentation files on Canvas, incorporating suggestions made in class. (Due Week 8)

Week 8 (Oct. 13): Site Visit to Earthrise Energy's 270-MW$_e$ Solar Farm, Gibson City, Illinois (teams)

- **Activity:** The class will visit a utility-scale energy site. One option is for in-person students to visit the 270-MW$_e$ Solar Farm, Gibson City, Illinois. Those who cannot attend will conduct a virtual investigation using public records, company materials, or online research. The visit will include not just technical details but also financing, permitting, stakeholder negotiation, and operational logistics. Details will be communicated later in the course.

- **Assignment 8:**

  Students will work in their allocated teams and produce a fact sheet of 400 - 500 words that <u>graphically</u> explains the following (with suitable annotations):

  - Fact sheet on the workings and components of the energy site (e.g., solar farm, including PV arrays, inverters, control systems, and interconnection points).

  - Carbon offset potential and land-use implications.

  - Describe an entrepreneurial opportunity associated with this project (e.g., installation services, O&M innovation, battery integration).

Week 9 (Oct. 20): Problem Statement Definition (team assignment)

- **Lecture:** Problem Statement Definition
- **Activity:** Project Goal Setting exercise.
- **Class Participation Exercise 9:** Complete a SMART analysis in class.
- **Assignment 9:** Students create SMART (Specific, Measurable, Achievable, Relevant, Time-bound) objectives for their capstone project. They present their goals to the class for critique and refinement. (Due Week 10)

Week 10 (Oct. 27): Ideation (team assignment)

- **Lecture:** Brainstorming sessions.
- **Activity:** In pairs, students conduct structured brainstorming sessions where students generate a wide range of ideas for addressing the problem. Use techniques like mind mapping or SCAMPER (Substitute, Combine, Adapt, Modify, Put to another use, Eliminate, and Reverse) to stimulate creativity.
- **Class Participation Exercise 10:** In-class practice with the SCAMPER technique.
- **Assignment 10:** Teams of students submit the results of their SCAMPER-based brainstorming exercise. Include value ranking: which idea creates the most value? For whom? (Due Week 11)

Week 11 (Nov. 3): Storytelling (team assignment)

- **Lecture:** Storytelling vs. "ordinary" technical reports
- **Activity:** Storytelling is used to frame and communicate problems to help people to connect with a company's (or a design engineer's) vision or goal. Using emotional elements (rather than just technical facts) enhance the logical and fact-based knowledge.
- **Assignment 11:** Students will change their SMART summaries from Week 9 and SCAMPER-edited project proposals (from Week 10) to form a 3-page (700 – 900-word) story that includes the following storytelling (or narration) elements (Due Week 12):
   - Main character (animate or inanimate)
   - Setting
   - Tension
   - Action
   - Climax
   - Resolution

   In the above, you must clearly state who the "customer" or "stakeholder" is in the story. You must also perform a "before vs. after" framing to show the impact of the idea.

Week 12 (Nov. 10): *Entrepreneur in the Arena!* **Guest participation by Mr. Steve Vavrik, CEO of Earthrise Energy (team-based assignment)**

- **"Fireside chat":** Visit by founder and ex-CEO of Earthrise Energy, Mr. Steve Vavrik. Mr. Vavrik is the entrepreneur who founded Earthrise Energy and who is constructing utility scale solar farms in the USA. Mr. Vavrik's visit (via Zoom) will be in the format of a "fireside chat" rather than a formal lecture to allow interaction. Attendance of all students (in-person and online) is mandatory.
- **Activity:** Each team must prepare a short (2-minute) start-up-style pitch deck and present their project ideas to Mr. Vavrik. Following their presentation, teams will also participate in a question-and-answer ("Q&A") session where they must effectively address Mr. Vavrik's questions as well as those from the instructor, course assistant, or course observer.
- **Assignment 12:** Teams will be assessed during class for efficacy in pitching their project ideas and in answering questions. Due in Week 13, teams must upload their edited pitch decks based on comments and suggestions of Mr. Vavrik, your instructor, course assistant, and course observer. Team must be ready to pitch their edited pitch deck to the rest of the class in Week 13.

Week 13 (Nov. 17): Idea pitching (team assignment)

- **Activity:** Teams present their edited pitch decks to the class. Peers provide feedback and suggest improvements, helping to refine and prioritize ideas. This idea pitching exercise can be considered to be a "value pitch"; it's not just *what* the idea is, but *why it matters*. You should anticipate potential objections and prepare responses.
- **Class Participation Exercise 13:** In-class peer reviews of other team's presentations.
- **Assignment 13:** Team finalize their pitch decks, following critique from the instructional staff, Mr. Vavrik, and peers. (Due Week 14)

Nov. 22 – Nov. 30: THANKSGIVING BREAK (no class)

Week 14 (Dec. 1): Final Thoughts About Capstone Projects

- **Activity:** Final thoughts about your real capstone projects which you will do at the conclusion of your studies here.

- **Assignment 14:** The purpose of the in-class assignment is to build on your team's hypothetical capstone/start-up idea by outlining the next three strategic steps you would take if you were to pursue the idea as a real business or startup. If your team were to take your idea forward as a startup or a business proposal, what would your next three steps be? (Due during lecture time)

Week 15 (Dec. 8): Project Presentations + Project Winner

- **Activity:** Top three teams (based on final report grade) will present their work to the class. Students will vote for their overall top-performing project. The winning team members will receive an A+ grade, regardless of previous performance in coursework.
  The projects/pitches will be judged using entrepreneurial principles:
  - ✓ Problem Definition & User Insight – Clear understanding of stakeholder needs.
  - ✓ Innovation & Creativity – Novelty and originality of the solution.
  - ✓ Value Creation & Feasibility – Does the solution create real value? Can it be implemented?
  - ✓ Sustainability Impact – Environmental/social benefits.
  - ✓ Communication & Storytelling – Clarity, persuasion, and narrative.

COURSE & UNIVERSITY POLICIES / RULES

Grade appeal policy: If you wish to appeal your grade on a homework assignment, mini project, or class participation exercise, you must submit to the instructor a written grade appeal request within *one week* (7 days) of when the assignment score was posted on Canvas. After this period, all grades are considered final.

Grade appeals for any assignment should be directed to the instructor via email at leonl@illinois.edu. The appeal must include:

- A *clear statement* of your grade concern.

- A *justification* of how many points you believe you deserve for the specific question(s) in question.

In the event of appeal of a mini project grade, the appeal process must be followed by the entire team. So, when sending your appeal to the instructor, be sure to *copy all your teammates* and ensure that your teammates are in accord with the appeal. Incomplete, incorrectly addressed, or vague appeals will not be considered.

Late Work Policy:

a. Project deliverables must be submitted on time to ensure the effectiveness of the peer feedback process. Late submissions will not be accepted, and no make-up assignments will be provided. Any late or missing submission will receive a grade of 0%—applied to all members of the team.
   Teams have several weeks to plan and execute their work, so it's important not to leave tasks until the last moment. Teams should plan thoroughly and have contingencies in place to handle situations where a team member may be unable to contribute due to extenuating circumstances, such as illness.
b. Late homework assignments or non-completion of class participation exercises will receive a 0% grade. Students will have around 6 days to complete each quiz, and solutions will be posted after the submission deadline passes.
c. Extensions for homework assignments or class participation deadlines may be granted at the instructor's discretion, provided the student gives advance notice by email—except in cases of emergency. Valid reasons for requesting an extension include, but are not limited to:
   i. serious illness, serious injury, or death in the student's *direct* family (not grandparents, uncles, or cousins, for instance);
   ii. birth of a child for which the student is identified as a parent on the birth certificate;
   iii. 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;

    iv. participation in, or travel to, an obligatory AFROTC, NROTC, or ROTC event;

    v. participation in, or travel to, varsity or DRES-sanctioned athletic events (excluding fencing, bowling, and other club sports);

    vi. 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;

    vii. observance of a religious holiday;

    viii. 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. The student will do well to also reach out to an emergency dean in the Office of the Dean of Students to enquire the available care resources to help you navigate your challenge. In these circumstances, students should also contact their advisor.

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: The work you submit in this course, in individual or team assignments, must reflect exclusively the effort of those listed in the submitted materials and must not come significantly from the work of others. You are encouraged to study and discuss the course materials and assignments with your peers. But you are responsible for ensuring that you follow the rules laid out in this study guide and in the University of Illinois' Academic Integrity Policy. Also see *Academic Integrity* on page 17 of this study guide.

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 as such mail will be ignored.

Use of Generative AI Technology

You are allowed to use generative AI tools such as ChatGPT (OpenAI), Microsoft Copilot/Bing Chat, Google Gemini, and others to help you learn. These tools can explain concepts, give you extra practice, and help clarify things you're unsure about. However, you must use them carefully and responsibly.

These AI tools often give incomplete, incorrect, or misleading answers, especially when it comes to advanced reasoning or technical calculations—which are common in this course. To spot these mistakes, you need to already understand the topic well, like a qualified instructor or experienced engineer would. Since students are still learning, it's easy to accept wrong answers as correct, which can seriously harm your learning or even teach you false information.

You may use AI tools to support your learning, but only if you follow the rules below and the honor code on each assignment.

Permitted Uses of AI (for Learning, Not Grading)

You may use AI tools in these two ways:

1. **As a personal tutor**
   You can ask the AI to explain concepts, break down techniques step by step, list key ideas, give extra examples, or create self-test questions for you.

2. **As a feedback tool**
   You can ask the AI to review your work, point out possible mistakes, or suggest how to improve your explanations or calculations.

AI Use That Is Not Allowed

To maintain academic integrity, you must follow these rules:

- **Do not use AI tools during graded work**, including homework, mini-projects, or participation exercises. You may use AI tools to help you understand readings, prepare for team work, or study in general.
  But you cannot use AI to generate answers or solve graded questions—unless your instructor explicitly allows it in the assignment instructions or honor code.

- **Do not submit any work created by AI**.
  Everything you turn in must be your own original thinking and effort. You must not include AI-generated solutions or text, even if you edited them.

- **Be prepared to explain your work**.
  Your instructor may ask you to explain your submission in person or in writing. If you can't explain it clearly, you may receive a score of zero and could be reported for academic misconduct.

Documentation and Citation of AI Use

If you use AI tools in your learning:

- **Keep a record**: Save or log the prompts you used, the AI's responses, and how you used them.

- **Be ready to share this record** if your instructor asks.

If an assignment *does* allow AI use, you must:

- Cite your AI use properly, using APA style. This includes the text of your prompt and a reference to the tool used (e.g., ChatGPT).

- Do not cite AI as a source of facts. AI can invent information. Always verify facts and cite the original sources they come from.

Final Notes on AI and Academic Integrity: Misusing AI tools—by submitting AI-generated work or using AI when it's not allowed—is a violation of academic integrity. Any suspected misuse will be investigated and may result in penalties under the Illinois Student Code. Please read the University of Illinois System's Generative AI Guidance for Students to learn more about your responsibilities.

Final grade

At the end of the semester, letter grades are determined based on composite numerical scores, weighted as previously described. The instructor does not have a predetermined "target" grade distribution, and it may vary significantly from semester to semester. Additionally, there is no "curving" of grades in this class. Grades will be rounded to the nearest whole number. For example, a final grade of 93.2% will be rounded *down* to 93%, while a final grade of 93.6% will be rounded *up* to 94%.

Letter grades at semester's end

Grade meaning	Refined letter scale	Numerical scale of marks
Excellent	A+	97 to 100
	A	94 to <97
	A-	90 to <94
Good	B+	87 to <90
	B	84 to <87
	B-	80 to <84
Adequate	C+	77 to <80
	C	74 to <77
	C-	70 to <74
Marginal	D+	67 to <70
	D	64 to <67
	D-	60 to <64
Inadequate	F	<60

OTHER COURSE & UNIVERSITY RULES / POLICIES & ADVICE

Teamwork: Effective teamwork requires empathy and respect. You should be willing and able to 'bend' your minds to recognize where others are coming from and what is important to them, and then to 'blend' with them, moving in a unified direction. You will learn techniques to be more receptive and connected, and to have greater influence whilst accommodating others. Rather than opposing or agreeing with other people, you will learn how to accept and acknowledge the other's position until you can understand what is important about it. This requires a willingness to flex, bend, and search to understand someone else's perspective. Once you understand their perspective, you can pivot and create an opening for that person to understand what is important to you.

Team members will communicate with each other using social media platforms of their own choosing. Historically, students enjoy collaborating using the following platforms: Discord, Zoom, Google Docs, WeChat, GroupMe, and Miro. You and your teammates should soon agree on your chosen method of online collaboration and then promptly get into that routine.

It is strongly suggested that teams use roving team leaders. For instance, a student could be team leader for the first mini-project, followed by another student leading the next mini-project, and yet another team member leading the third mini-project. This will help ensure that no single person dominates the team's actions.

Assigned team members will remain unchanged for the duration of the semester. Teams should however note that they must accommodate late-registered students into their teams, as directed by the instructor or TA. Teams may also have to negotiate lost team members as some students might drop the course. So, although ideal team sizes are 3 students, this number might become more (i.e., 4 students) depending on class size. Also, some students might join the class late and asked to merge with an existing team. The instructor and TAs will do their utmost to minimally disrupt existing teams. The full cooperation of every student is expected when forming or changing teams.

Grading the work of large teams and small teams: When grading the mini projects of regularly sized teams (with three team members), we expect the same *quality* (and correctness) of work compared to larger teams (say with four team members); but, for larger teams we expect a greater *quantity* of work than that of a larger team.

Uncooperative team members: In this engineering class, effective teamwork is paramount for successful collaboration and project completion. Students are encouraged to actively engage in open communication, share diverse perspectives, and contribute their unique skills to foster a collaborative and innovative environment. However, should any student fail to cooperate with their team or disrupt the collaborative process, appropriate measures will be taken. These measures include intervention by the instructor, potential reassignment of team roles, and, if necessary, disciplinary actions in accordance with class and University policies. This ensures a fair and conducive learning environment that promotes the development of both technical and interpersonal skills crucial for success in the field of engineering.

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 relevant College and, where relevant, to the FAIR system.

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.

- 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.
- 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.

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.

- o Counseling Center (217) 333-3704
- o McKinley Health Center (217) 333-2700
- o National Suicide Prevention Lifeline (800) 273-8255
- o 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 diagnose 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/

<p style="text-align:center; color:red;">Enjoy the course!</p>