PHIL 334 – Engineering Ethics and Technological Practice: Philosophical Perspectives on Engineering

Course Syllabus
Spring 2025

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Office Hours: by appointment (email me in advance) – Course materials: https://canvas.njit.edu
Weekdays: **Tuesdays and Thursdays** | Time: **11:30 AM-12:50 PM** | Room: **TIER 110**

Course description

This course presents a philosophical examination of the nature of engineering practice and applied technology. We will consider such questions as: How do the societal functions of engineers and the practical application of technologies relate to basic moral and intellectual values? What moral obligations are implied by the uses and creation of technology? What are the ethical duties of engineers in the practice of their careers?

We will study multiple meanings of ethics of engineering and technologies, situating the debate on narratives of techno-solutionism and techno-skepticism, progress, neutrality, and modernity. This course is structured in three parts: Part I: "Engineering Ethics: Theories and Tools," Part II: "Case Studies"; and Part III: "Group Seminars". The course will be graded from student engagement, a mid-term covering Part 1 and 2, and from a research paper presented as part of the seminar series.

Part I consists in the study of Ethics; Philosophy of Engineering and Technology (PET), and the Values of Design and Engineering (VDE). Engineering Ethics thought is scrutinized through a creativity-led interdisciplinary framework. PET situate the ethics, epistemology and practical implications of engineering knowledge and technological development in society. VDE discuss what setting of behaviors and responsibilities designers and engineers hold as executors of projects and infrastructures. Part II consists in applied engineering ethics, and case studies which place in evidence ethical problems demanding a moral and responsible thinking. Part III is composed by group seminars in which students present their research papers, ethical frameworks and engage colleagues in discussion.

Course learning outcomes

- Recognize moral issues: Identify social and ethical challenges in engineering.
- Exercise moral judgment: Evaluate dilemmas using ethical theories, professional ethics, and common-sense morality.
- Analyze ethical problems: Assess issues by examining data, values, stakeholders, and their interests,
- Anticipate ethical questions emerging from the design, development, and introduction of new technical systems in society,
- Develop moral creativity: Generate doable options that consider conflicting values and facts.
- Justify and argue morally: Defend decisions and engage in ethical discussions with engineers.
- Inform moral decision-making: Reflect on ethical frameworks to make informed choices.

Course materials

All course materials will be available at the course website **(https://canvas.njit.edu)**. You should check the syllabus often. Materials needed for your next class will be available right after the end of the previous class. You will be alerted in classroom if there ANY changes to the scheduled readings.

Academic Integrity

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing, or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

If you are uncertain as to what constitutes plagiarism, please refer to the article entitled "Plagiarism Lines Blur for Students in the Digital Age" available on the course website. Note on the Use of Generative Artificial Intelligence In accordance with university policies, the uncited use of generative artificial intelligence in the form of (but not limited to) ChatGPT and Grammarly is regarded as a violation of the above-referenced statement on academic integrity. If a student uses one of these technologies at any stage of the writing process without full and complete acknowledgement and attribution it will be treated as plagiarism and reported to the Office of the Dean of Students for further review. Depending on the specific circumstances, the outcome of the adjudication process may involve failure on the specific assignment or in certain instances failure for the course.

Assignments

The following activities are designed to help you achieve the class objectives. Your grade will include these components:

- **Course Engagement (25%)**: You must attend class sessions AND engage with what is being taught. You must demonstrate that you are up to date with readings. Course engagement is a combination of your attendance and participation, i.e., capacity to actively contribute to classes' debates, questioning and discussions related to the readings and presentations. The most important outcome of this course is improving students' analytic skills about Engineering Ethics to improve critical thinking about real world problems.

- **Midterm Exam (20%)**: The midterm is composed of an open essay question related to a short text provided by the instructor. Responses must be based in the text interpretation, and in relation with previous readings, theories, and debates done in classroom. Students are allowed to do consultation in printed materials.

- **Ethical Framework (10%)**: An ethical framework is **a set of principles and values that help people make decisions that are considered ethical**. A class about how to make an Ethical

Framework will provide all guidelines for students to prepare future frameworks. You can find many materials, videos, discussion, blog post, etc. to support the production of your Ethical Framework. analysis. *****Attention*****: Work generated with ChatGPT are not allowed - software will be used to check ChatGPT-generated reports.

- **Group Seminar (25%)**: Themes will be distributed among student groups. I encourage students to incorporate their personal interests into selected themes, for example their knowledge about film, sci-fi, arts and culture in general, and how it relates to their themes. Students will be graded by their capacity to articulate theories and literature, quality of presentations, and discussions held in classroom.

- **Final Case Analysis (20%)**: an essay related to a case selected by the student. This is a short, max. 2000 words (Double-spaced, Times New Roman, Font size: 12; margins: 1,5), in which the student exercises the capability of building associations between the literature and a practical case, Highlighting the key ethical questions and problems related to the technology under analysis.

Verification of Presence - Academic Engagement Assignment

Beginning with the Fall 2024 semester, our process for conducting "Verification of Presence" will differ substantially from past practice. **Now students have to self-report their presence**. Instructors will no longer be required to manually take and record attendance in order to verify the presence of each student. Please, go to you Canvas section and complete the "Academic Engagement Assignment". Students will be asked to reflect on what they hope to get out of your class. Completion of this assignment will serve as verification of presence for the given student. Please note that this assignment need not be graded nor count toward the student's final grade.

Grading

Your final grade will be assigned based on the following scale:

A	=	100% - 90%
B+	=	89.99% - 86%
B	=	85.99% - 80%
C	=	79.99% - 70%
D	=	69.99% - 60%
F	=	< 60%

Course Readings

Reading materials are mainly composed by short articles, commentary pieces, YouTube videos and interviews. All materials will be provided in PDF form and available in Canvas. I expect that students come to class reasonably able to answer the question of "what did the author argue in this reading", which requires you to grasp the general argument provided by the author. If you find yourself spending too much time getting through the readings, feel free to come into office hours.

COURSE SCHEDULE

Readings and assignments are to be completed by the beginning of class on the date they are listed.

PART I: ENGINEERING ETHICS: THEORIES AND TOOLS

Week 1 – Introduction to Engineering Ethics

- Tuesday, **January 21**: Welcome Section: Course introduction and Syllabus

- Thursday, **January 23**: What is Engineering Ethics?
  Reading: Harris, C. E., Davis, M., Pritchard, M. S., & Rabins, M. J. (1996). ***Engineering Ethics: What? Why? How? And When?*** Journal of Engineering Education, 85(2), 93–96.

Week 2 – Engineering Ethics: Principles, concepts, and methods

- Tuesday, **January 28**: Philosophy of Engineering
  Reading: van de Poel, I. (2009). ***Philosophy and Engineering: Setting the Stage***. In: Poel, I., Goldberg, D. (eds) Philosophy of Engineering and Technology, vol 2. Springer, Dordrecht.

- Thursday, **January 30**: Engineering Ethics
  Reading: van de Poel, Ibo. ***Engineering Ethics***. In *Encyclopedia of Global Bioethics*, 1–10. Cham: Springer International Publishing, 2015. DOI: 10.1007/978-3-319-05544-2_171-1.

Week 3 – How Engineers Think? Ethics, Practice and Values

- Tuesday, **February 4**: Engineering Ethics and Values Studies
  Reading: Hollander, R. D., & Steneck, N. H. (1990). ***Science- and Engineering-Related Ethics and Values Studies: Characteristics of an Emerging Field of Research***.
  Science, Technology, & Human Values, 15(1), 84-104.

- Thursday, **February 6**: How Engineers Think?
  Reading: Lazebnik Y. ***Can a biologist fix a radio?--Or, what I learned while studying apoptosis.*** Cancer Cell. 2002 Sep;2(3):179-82. doi: 10.1016/s1535-6108(02)00133-2.

Week 4 – Engineering with Moral Dilemmas

- Tuesday, **February 11**: Dealing with Moral Dilemmas through Design
  Reading: van de Poel I. ***Dealing with Moral Dilemmas through Design***. In: van den Hoven J, Miller S, Pogge T, eds. Designing in Ethics. Cambridge University Press; 2017:57-77.

- Thursday, **February 13**: The Modernist City: Problems and Paradoxes of Brasilia, Brazil.
  Reading: Holston, James. ***The myth of the concrete***, The modernist city: an anthropological critique of Brasilia (Part I).

Week 5 – Mid-term | Making Ethical Frameworks

- Tuesday, **February 18**: ***Mid-term*** *(in Classroom)*

- Thursday, **February 20**: Why and How to make an Ethical Framework?
  Reading: ***What is an ethical decision-making framework?*** Pennsylvania State University. https://aese.psu.edu/teachag/curriculum/modules/bioethics-1/what-is-an-ethical-decision-making-framework

PART II CASE STUDIES

Week 6 – Misuses: Drones and the Scarlett Johansson's Lawsuit

- Tuesday, **February 25**: Drones Misuse
  Reading: A. Sabra, H. Wridan, N. M. Alkhatani and F. Al-Harby, "***Description of Security Impact of Drones Challenges and Opportunities***," *2018 21st Saudi Computer Society National Computer Conference (NCC)*, Riyadh, Saudi Arabia, 2018, pp. 1-5, doi: 10.1109/NCG.2018.8593136.

- Thursday, **February 27**: OpenAI vs. Scarlett Johansson.
  Reading: Jones N. ***Who owns your voice? Scarlett Johansson OpenAI complaint raises questions***. Nature. 2024 May 29. doi: 10.1038/d41586-024-01578-4.

Week 7 – Designing and Engineering exclusion.

- [Monday] **March 4**: Le Corbusier Ethics: Modernists and utopias.
  Reading: ***Le Corbusier's Fatal Flaws – A Critique of Modernism***. Trinity College Digital Repository, 2015. Trinity Student Scholarship. Trinity College Digital Repository, JSTOR, https://jstor.org/stable/community.38593830.

- [Wednesday] **March 6**: Disability and Engineering.
  Reading: Hersh, M. (2017). ***Ethical engineering and respect for the 'other'***. IFAC-PapersOnLine, 50(1), 10614-10619.

Week 8 – Engineering Disasters: Risk, responsibility, and the public opinion.

- [Monday] **March 11**: "A Major Malfunction": The Space Shuttle Challenger explosion
  Reading: Charles E. Harris, Jr. 1992. ***The Space Shuttle Challenger Disaster***. Online Ethics Center.https://onlineethics.org/cases/engineering-ethics-cases-texas-am/space-shuttle-challenger-disaster.
  Video: ***Lessons From the Challenger Tragedy*** **| Retro Report on PBS** https://www.youtube.com/watch?v=Ds6ie8IV-LI

- [Wednesday] **March 13**, The Fukushima Disaster
  Reading: Hasegawa, K. (2012). ***Facing Nuclear Risks: Lessons from the Fukushima Nuclear Disaster.*** International Journal of Japanese Sociology*, 21(1), 84–91*.doi:10.1111/j.1475-6781.2012.01164.x
  Video: **Fukushima: Living with a Disaster** | Greenpeace International https://www.youtube.com/watch?v=oe_TCM7f71w

  Reminder about Group Seminar prep!

SPRING BREAK: 16 – 22 March 2025.

Week 9 – Engineers and AI: Ethics, promises and paradoxes

- Tuesday, **March 25,** Ethics of Artificial Intelligence
  Reading: Nyholm, S. (2023). ***Artificial Intelligence, Ethics of***. In: Sellers, M., Kirste, S. (eds) Encyclopedia of the Philosophy of Law and Social Philosophy. Springer, Dordrecht. https://doi.org/10.1007/978-94-007-6519-1_1093

- Thursday, **March 27**, Group seminar prep.: seminars guide, expectations, and Q&A

PART III GROUP SEMINARS

Week 10 – Examining the ethics of voice assistants

- Tuesday, **April 1**, **Voice Assistants: Ethical concerns**
  Reading: William Seymour, Xiao Zhan, Mark Coté, and Jose Such. 2023. ***A Systematic Review of Ethical Concerns with Voice Assistants***. In Proceedings of the 2023 AAAI/ACM Conference on AI, Ethics, and Society (AIES '23). Association for Computing Machinery, New York, NY, USA, 131–145. https://doi.org/10.1145/3600211.3604679

  Case: **"I knew they were listening to us!"**
  A computer engineer is tasked with building an algorithm to capture and automatically send transcripts of a family's dinner table conversations to a start-up developing mental health apps for young adults."

- Thursday, **April 3**, **Making an Ethical Framework** (*homework – remotely, see "Assignments."*)
  Due: Thursday, April 3 UNTIL 6PM.

Week 11 – April 8 and 10, Final Case Study week | Due April 11, FRIDAY, 11:59PM

Week 12 – Ethical and Environmental responsibilities of Engineers

- Tuesday, **April 15**, **Oil exploration in the Brazilian Amazon**
  Readings: Sara Brown. ***Mouth of the Amazon oil exploration clashes with Lula's climate promises***. Available at https://news.mongabay.com/2023/04/mouth-of-the-amazon-oil-exploration-clashes-with-lulas-climate-promises/

  Case: **Are there no conflicts of interest?**
  "A technical engineer responsible for supervising and preparing environmental impact reports in the oil sector quits their government job and is hired as a director by the leading multinational company involved in the Oil Exploration Plan 2030."

- Thursday, **April 17**, **Recycling: Engineering sustainable systems**
  Readings: Renée Cho. ***Recycling in the U.S. Is Broken. How Do We Fix It?*** State of the Planet – News from the Columbia Climate School, March 13, 2020. Available at: https://news.climate.columbia.edu/2020/03/13/fix-recycling-america/

  Case: "**We will lose market share, though.**"
  "A recently graduated engineer proposed using an alternative recycling material to package products for a local family-owned company. This initiative could significantly reduce plastic waste in their town but would increase the final price of these products in the supermarket."

Week 13 – Technology, Civic Values, and Energy Crisis.

- Tuesday, **April 22**, **Smart Cities**

  Reading ***The truth about smart cities: "In the end, they will destroy democracy"***. *The Guardian*, Wed 17 Dec. 2014. Available at https://www.theguardian.com/cities/2014/dec/17/truth-smart-city-destroy-democracy-urban-thinkers-buzzphrase

  Case: **It is for the good of the city!**
  "A private company is responsible for storing all data from the inhabitants of its tech town and sending reports to the mayor's office. The mayor wants to assess whether people would protest against the construction of a shopping mall on the site of a park dedicated to a locally respected climate change activist and Nobel Prize laureate."

- Thursday, April 24, **AI Energy Crisis**

  Readings: ***AI Is Pushing the World Toward An Energy Crisis.*** https://www.forbes.com/sites/arielcohen/2024/05/23/ai-is-pushing-the-world-towards-an-energy-crisis/

  Projecting the Electricity Demand Growth of Generative AI Large Language Models in the US. https://www.energypolicy.columbia.edu/projecting-the-electricity-demand-growth-of-generative-ai-large-language-models-in-the-us/

  Case: **The energy is finite - so is the budget.**
  "A board of Engineers has been consulted by the New Jersey state government to determine whether the federal funding available for AI infrastructure should be used to build a supercomputer, upgrade engineering research at universities, or construct a new power plant to support the electricity demands of ongoing AI initiatives."

Week 14 – Responsible Innovation: Quantum Computing and Big Tech Ethics

- Tuesday, **April 29**, **Responsible Quantum Computing**

  Readings: Mira Wolf-Bauwens, Ryan Mandelbaum. ***The era of quantum utility must also be the era of responsible quantum computing.*** IBM, January 16, 2024. Available at https://www.ibm.com/quantum/blog/responsible-quantum

  Carolyn Ten Holter, Philip Inglesant & Marina Jirotka (2023) **Reading the road: challenges and opportunities on the path to responsible innovation in quantum computing**, Technology Analysis & Strategic Management, 35:7, 844-856, DOI: 10.1080/09537325.2021.1988070

  Case: **Technology advances faster than bureaucracy.**
  "The government recommended that computer scientists and engineers learn about quantum-based technologies. Academics plan to create new courses in the field, while companies prefer to do so by hiring highly qualified professionals from other countries, arguing that there is no time to train people domestically."

- Thursday, **May 1**, **Big Tech Ethics**

  Readings: Moss E, Metcalf J. ***The Ethical Dilemma at the heart of Big Tech Companies***. Harvard Business Review, Nov. 14, 2019. Available at:

https://hbr.org/2019/11/the-ethical-dilemma-at-the-heart-of-big-tech-companies.

Piper K. **Google's brand-new AI ethics board is already falling apart**. Apr. 3, 2019. https://www.vox.com/future-perfect/2019/4/3/18292526/google-ai-ethics-board-letter-acquisti-kay-coles-james.

Case: **"Big tech companies are transparent—about what they don't want."**
"Big tech CEOs and investors have set a global agenda to ensure that human rights and democratic values are upheld in technology development. The first report, however, dismisses the need for transparency and criticizes over-regulation in the sector."

Week 15 – Wrap up session and Final Case Analysis

- Tuesday, **May 6**, wrap up session, seminars highlights and discussion.

- FINAL CASE ANALYSIS Due: May 9, **FRIDAY, 11:59PM.**